

**PUB. 173**  
**SAILING DIRECTIONS**  
**(ENROUTE)**

★  
**INDIA**  
**AND**  
**THE BAY OF BENGAL**

★  
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**Radio Navigational Aids.**—Radio navigational aids are not described in detail. Publication No. 117 *Radio Navigational Aids* and NOAA Publication, *Selected Worldwide Marine Broadcasts*, should be consulted.

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**Wind Directions.**—Wind directions are the true directions from which winds blow.

## Reference List

The principal sources examined in the preparation of this publication were:

British Hydrographic Department Sailing Directions.

Various port handbooks.

Reports from United States Naval and merchant vessels and various shipping companies.

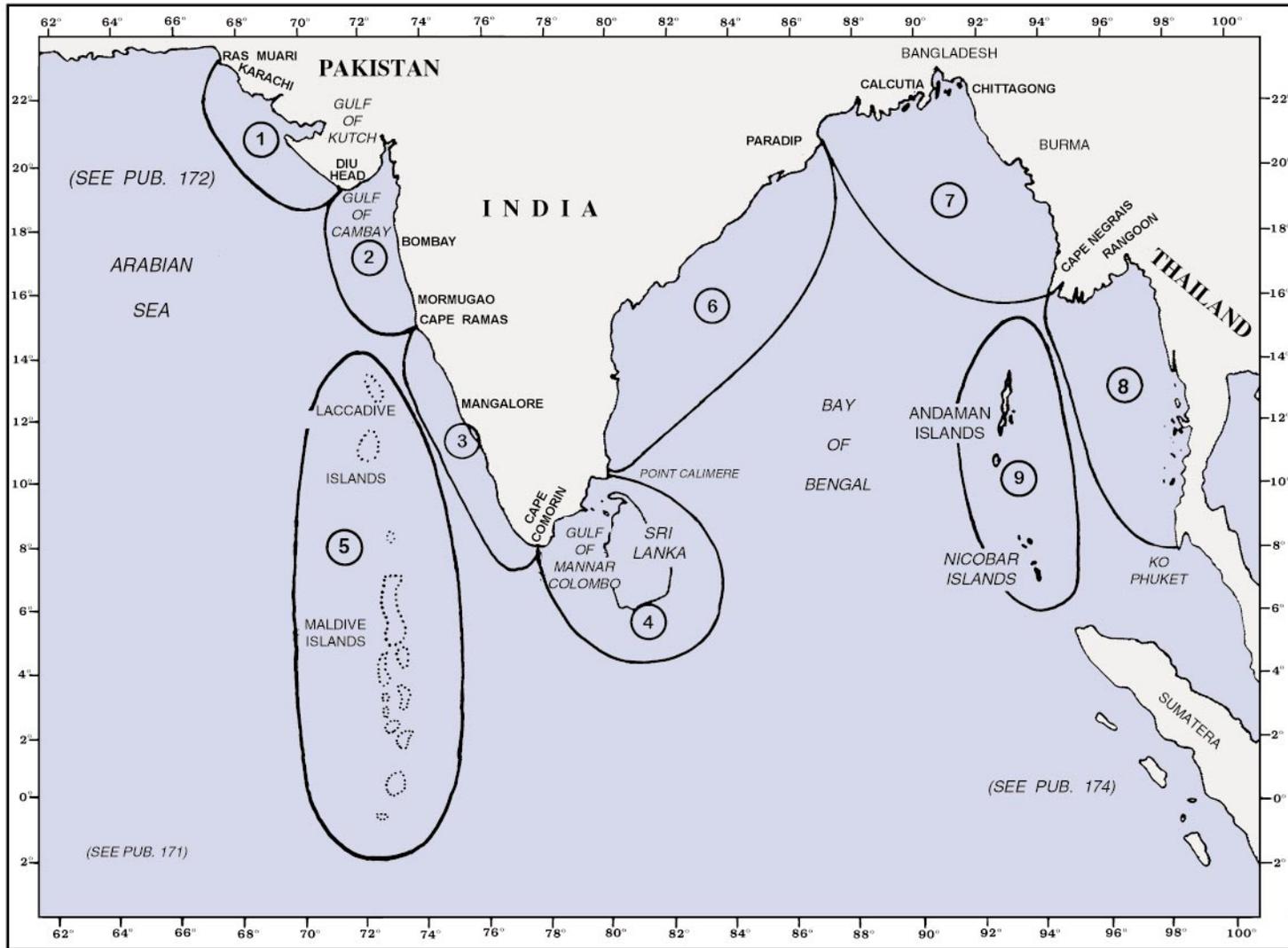
Other U.S. Government publications, reports, and documents.

Charts, light lists, tide and current tables, and other documents in possession of the Agency.

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SECTOR LIMITS —PUB. 173

## Conversion Tables

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### Feet to Meters

Feet	0	1	2	3	4	5	6	7	8	9
<b>0</b>	0.00	0.30	0.61	0.91	1.22	1.52	1.83	2.13	2.44	2.74
<b>10</b>	3.05	3.35	3.66	3.96	4.27	4.57	4.88	5.18	5.49	5.79
<b>20</b>	6.10	6.40	6.71	7.01	7.32	7.62	7.92	8.23	8.53	8.84
<b>30</b>	9.14	9.45	9.75	10.06	10.36	10.67	10.97	11.28	11.58	11.89
<b>40</b>	12.19	12.50	12.80	13.11	13.41	13.72	14.02	14.33	14.63	14.93
<b>50</b>	15.24	15.54	15.85	16.15	16.46	16.76	17.07	17.37	17.68	17.98
<b>60</b>	18.29	18.59	18.90	19.20	19.51	19.81	20.12	20.42	20.73	21.03
<b>70</b>	21.34	21.64	21.95	22.25	22.55	22.86	23.16	23.47	23.77	24.08
<b>80</b>	24.38	24.69	24.99	25.30	25.60	25.91	26.21	26.52	26.82	27.13
<b>90</b>	27.43	27.74	28.04	28.35	28.65	28.96	29.26	29.57	29.87	30.17

### Fathoms to Meters

Fathoms	0	1	2	3	4	5	6	7	8	9
<b>0</b>	0.00	1.83	3.66	5.49	7.32	9.14	10.97	12.80	14.63	16.46
<b>10</b>	18.29	20.12	21.95	23.77	25.60	27.43	29.26	31.09	32.92	34.75
<b>20</b>	36.58	38.40	40.23	42.06	43.89	45.72	47.55	49.38	51.21	53.03
<b>30</b>	54.86	56.69	58.52	60.35	62.18	64.01	65.84	67.67	69.49	71.32
<b>40</b>	73.15	74.98	76.81	78.64	80.47	82.30	84.12	85.95	87.78	89.61
<b>50</b>	91.44	93.27	95.10	96.93	98.75	100.58	102.41	104.24	106.07	107.90
<b>60</b>	109.73	111.56	113.39	115.21	117.04	118.87	120.70	122.53	124.36	126.19
<b>70</b>	128.02	129.85	131.67	133.50	135.33	137.16	138.99	140.82	142.65	144.47
<b>80</b>	146.30	148.13	149.96	151.79	153.62	155.45	157.28	159.11	160.93	162.76
<b>90</b>	164.59	166.42	168.25	170.08	171.91	173.74	175.56	177.39	179.22	181.05

### Meters to Feet

Meters	0	1	2	3	4	5	6	7	8	9
<b>0</b>	0.00	3.28	6.56	9.84	13.12	16.40	19.68	22.97	26.25	29.53
<b>10</b>	32.81	36.09	39.37	42.65	45.93	49.21	52.49	55.77	59.06	62.34
<b>20</b>	65.62	68.90	72.18	75.46	78.74	82.02	85.30	88.58	91.86	95.14
<b>30</b>	98.42	101.71	104.99	108.27	111.55	114.83	118.11	121.39	124.67	127.95
<b>40</b>	131.23	134.51	137.80	141.08	144.36	147.64	150.92	154.20	157.48	160.76
<b>50</b>	164.04	167.32	170.60	173.88	177.16	180.45	183.73	187.01	190.29	193.57
<b>60</b>	196.85	200.13	203.41	206.69	209.97	213.25	216.54	219.82	223.10	226.38
<b>70</b>	229.66	232.94	236.22	239.50	242.78	246.06	249.34	252.62	255.90	259.19
<b>80</b>	262.47	265.75	269.03	272.31	275.59	278.87	282.15	285.43	288.71	291.99
<b>90</b>	295.28	298.56	301.84	305.12	308.40	311.68	314.96	318.24	321.52	324.80

### Meters to Fathoms

Meters	0	1	2	3	4	5	6	7	8	9
<b>0</b>	0.00	0.55	1.09	1.64	2.19	2.73	3.28	3.83	4.37	4.92
<b>10</b>	5.47	6.01	6.56	7.11	7.66	8.20	8.75	9.30	9.84	10.39
<b>20</b>	10.94	11.48	12.03	12.58	13.12	13.67	14.22	14.76	15.31	15.86
<b>30</b>	16.40	16.95	17.50	18.04	18.59	19.14	19.68	20.23	20.78	21.33
<b>40</b>	21.87	22.42	22.97	23.51	24.06	24.61	25.15	25.70	26.25	26.79
<b>50</b>	27.34	27.89	28.43	28.98	29.53	30.07	30.62	31.17	31.71	32.26
<b>60</b>	32.81	33.36	33.90	34.45	35.00	35.54	36.09	36.64	37.18	37.73
<b>70</b>	38.28	38.82	39.37	39.92	40.46	41.01	41.56	42.10	42.65	43.20
<b>80</b>	43.74	44.29	44.84	45.38	45.93	46.48	47.03	47.57	48.12	48.67
<b>90</b>	49.21	49.76	50.31	50.85	51.40	51.95	52.49	53.04	53.59	54.13

## Abbreviations

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The following abbreviations may be used in the text:

### Units

°C	degree(s) Centigrade	km	kilometer(s)
cm	centimeter(s)	m	meter(s)
cu.m.	cubic meter(s)	mb	millibars
dwt	deadweight tons	MHz	megahertz
FEU	forty-foot equivalent units	mm	millimeter(s)
grt	gross registered tons	nrt	net registered tons
kHz	kilohertz	TEU	twenty-foot equivalent units

### Directions

N	north	S	south
NNE	northeast	SSW	southsouthwest
NE	northeast	SW	southwest
ENE	eastnortheast	WSW	westsouthwest
E	east	W	west
ESE	eastsoutheast	WNW	westnorthwest
SE	southeast	NW	northwest
SSE	southsoutheast	NNW	northnorthwest

### Vessel types

LASH	Lighter Aboard Ship	ro-ro	Roll-on Roll-off
LNG	Liquified Natural Gas	ULCC	Ultra Large Crude Carrier
LPG	Liquified Petroleum Gas	VLCC	Very Large Crude Carrier
OBO	Ore/Bulk/Oil		

### Time

ETA	estimated time of arrival	GMT	Greenwich Mean Time
ETD	estimated time of departure	UTC	Coordinated Universal Time

### Water level

MSL	mean sea level	LWS	low water springs
HW	high water	MHWN	mean high water neaps
LW	low water	MHWS	mean high water springs
MHW	mean high water	MLWN	mean low water neaps
MLW	mean low water	MLWS	mean low water springs
HWN	high water neaps	HAT	highest astronomical tide
HWS	high water springs	LAT	lowest astronomical tide
LWN	low water neaps		

### Communications

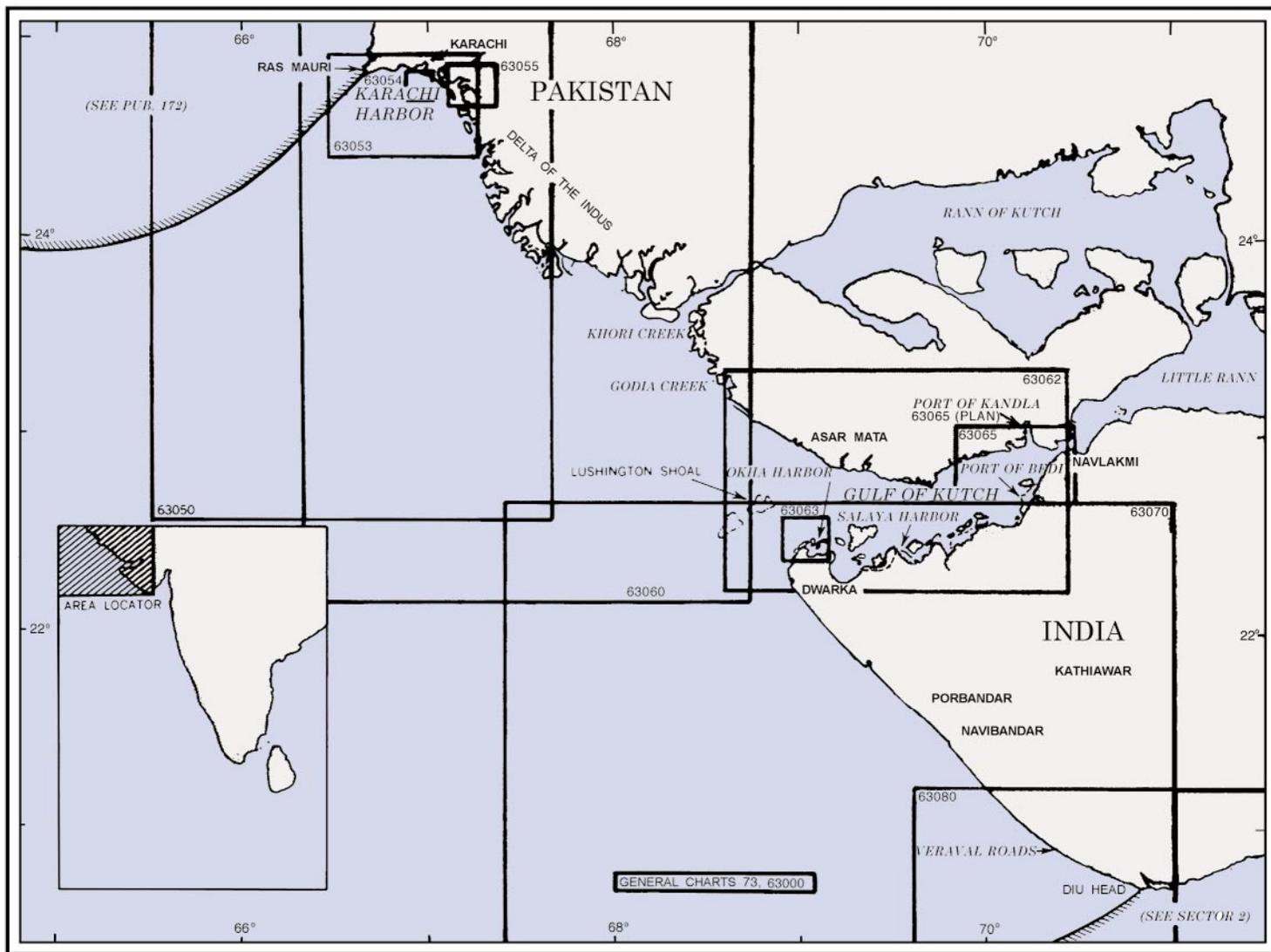
D/F	direction finder	MF	medium frequency
R/T	radiotelephone	HF	high frequency
GMDSS	Global Maritime Distress and Safety System	VHF	very high frequency
LF	low frequency	UHF	ultra high frequency

### Navigation

LANBY	Large Automatic Navigation Buoy	SPM	Single Point Mooring
NAVSAT	Navigation Satellite	TSS	Traffic Separation Scheme
ODAS	Ocean Data Acquisition System	VTC	Vessel Traffic Center
SBM	Single Buoy Mooring	VTS	Vessel Traffic Service

### Miscellaneous

COLREGS	Collision Regulations		
IALA	International Association of Lighthouse Authorities	No./Nos.	Number/Numbers
		PA	Position approximate
IHO	International Hydrographic Office	PD	Position doubtful
IMO	International Maritime Organization	Pub.	Publication
loa	length overall	St./Ste.	Saint/Sainte



Additional chart coverage may be found in NGA/DLIS Catalog of Maps, Charts, and Related Products (Unlimited Distribution).

**SECTOR 1 — CHART INFORMATION**

## SECTOR 1

### PAKISTAN AND THE WEST COAST OF INDIA—RAS MUARI TO DIU HEAD (INCLUDING THE GULF OF KUTCH)

**Plan.**—This sector describes the coasts of Pakistan and India between Ras Muari and Diu Head (20°41'N., 70°50'E.), including the Gulf of Kutch. The sector includes the port of Karachi. The arrangement of the sector is from NW to SE.

#### Ras Muari to Karachi

**1.1 Ras Muari** (Cape Monze) (24°50'N., 66°39'E.) is the W extremity of a sloping headland which rises to a pointed summit about 148m high, about 0.8 mile E of the headland. The Jhil Range, a ridge with a nearly level crest with several remarkable hummocks on it, extends about 10 miles NE of Ras Muari; the highest hummock, 234m high, lies about 3.5 miles E of Ras Muari. Ras Muari lies about 17 miles W of the entrance to Karachi and is the most likely landfall for vessels approaching Karachi from W.

Ras Muari Light, shown from a concrete tower, 51m high and painted in horizontal white and black bands, is situated on the coast about 1 mile SE of Ras Muari.

There are ten major lights in the area covered by this sector. In addition to the light on Ras Muari, they are Manora Point Light, Khuddi Light, Jakhau Light, Chachhi Light, Navinal Point Light, Mandvi Light, Pirothan Island Light, Kalubhar Tapu Light, and Humani Point Light.

**Churma Island** (24°54'N., 66°36'E.), 179m high, lies about 4 miles NW of Ras Muari.

Beauchamp Reef, a narrow ridge of sand, gravel, and shell, with a least depth of 8m, extends about 3 miles NW from a position about 4 miles W of Ras Muari.

A spit, with depths of less than 18.3m, extends about 3.5 miles SW of Ras Muari Light. Nancowry Shoal, consisting of a series of sand, gravel, and coral ridges, with depths of less than 11m, lies on the inshore part of this spit. Two 10.5m patches lie on the spit, about 1.5 and 2.3 miles, respectively, SW of Ras Muari Light.

**Caution.**—A dangerous wreck is charted 27 miles S of Karachi.

A submarine exercise area extends up to 40 miles WNW, 50 miles SW, and 25 miles SSE of Ras Muari. Naval exercises take place S and W of Ras Muari.

The coast from Ras Muari to Buleji Point (Goth Jafar), about 9 miles E, is rocky and backed by the Jhil Range. It is low and sandy to Manora Point, about 8.5 miles farther ESE.

Foul ground and shoal water, with depths of less than 9.1m, extend nearly 2 miles SSE of Buleji Point. Shoals, with depths of 9.1 to 10.3m, lie up to 2.8 miles S of the point.

A prohibited anchorage area, best seen on the chart, lies SW of Buleji Point.

**1.2** Hawkes Bay, E of Buleji Point, has general depths of less than 5.5m. A rock, with depths of less than 1.8m, lies in the middle of the entrance to the bay.

A submarine cable is laid from Hawkes Bay, leading S, then WSW and W, passing about 4.5 miles S of Ras Muari.

**Manora Point** (24°47'N., 66°59'E.), forming the W side of the entrance to Karachi, is a perpendicular cliff at the SE end of a narrow hill, about 29m high. Manora Point Light is shown from a red circular tower with white bands, 38m high, about 0.3 mile NNW of Manora Point. The signal station for communicating with vessels outside the harbor is a conspicuous lattice tower, 42.5m high, about 91m WSW of the light structure. Manora Breakwater extends about 0.2 mile SSE from Manora Point. Manora Breakwater Light, a 15m high lattice tower, is situated at the end of the breakwater.

A lighted buoy, moored off the edge of the coastal bank about 3 miles SSE of Manora Point, marks the N edge of a spoil ground and is on station from September to May. Its position is approximate and is liable to be washed away or withdrawn frequently.

#### Karachi (24°47'N., 66°59'E.)

World Port Index No. 48600

**1.3** Karachi, the principal sea and rail terminal of Pakistan, is the gateway to the fertile regions of the interior. Karachi is the largest and leading industrial city of Pakistan. The harbor is divided into the Lower Harbor and the Upper Harbor, with the principal commercial facilities situated on both sides of the Upper Harbor.

**Winds—Weather.**—The Southwest Monsoon, which generally runs from July to September, is characterized by high humidity, high temperature, and strong winds. In addition to the rain, which generally reaches Karachi in the latter part of July, the Southwest Monsoon wind brings with it fine alluvial sand, which continuously blankets the city. Some squalls reaching force 6-7 will occur during the Southwest Monsoon.

The Northeast Monsoon (December through March) is characterized by a relatively cool, dry, land breeze from the NE. Fog or mist is common at dawn and dusk during the winter months.

**Tides—Currents.**—The tidal rise at Karachi is 2.7m at MHHW and 2.4m at MLHW.

Tides at Karachi are semidiurnal and show a pronounced diurnal inequality at times, particularly at LW, occasionally falling below the level of the chart datum.

In the outer anchorage, the flood current sets E and the ebb current, which is scarcely perceptible, sets W.

The flood current sets E across the SE end of Manora Breakwater at a velocity of 2 knots, then into the channel and harbor toward the S end of W wharf, where it branches into both the Upper Harbor and Baba Channel. In the Upper Harbor, it is strongest on the W side; its greatest velocity in the entrance is about 2 knots.

The ebb current sets down the channel until abreast the oil facilities on the E side of Lower Harbor, where it sets strongly toward the E side of the channel. Its greatest velocity is about 3 knots at springs.

On the flood tidal currents, during the Southwest Monsoon, a considerable swell rolls into the Lower Harbor, making boat work at the Manora piers, which are situated on the W side of the Lower Harbor NW of Manora Point, hazardous.

**Depths—Limitations.**—The depths in the port of Karachi are reduced to the chart datum measured from the lowest astronomical tide. Due to the varying depths at berths and silting in the channels, vessels with a draft exceeding 9.7m are not permitted to enter the port. The silting usually occurs during the Southwest Monsoon; therefore, dredging in the harbor is continuously in progress to maintain the charted depth as far as possible. Although the authorized maximum draft for vessels entering or leaving the port has been 9.8m, during the Southwest Monsoon this may increase or decrease at the discretion of the port officer, according to the prevailing state and conditions.

The channel, from Fairway Lighted Buoy K to ENE of Manora Point, is dredged to a depth of 12.2m; N of this, the Lower Harbor channel, with a dredged depth of 11.3m, stretches to a position 1.5 miles NE of Manora Point. North of this position, the rest of the Lower Harbor is dredged to a depth of 9.1m on its E side and 8.2m on its W side.

The channel along the Upper Harbor is dredged to a depth of 9.1m; on the W bank are the naval dockyard and West Wharf, while on the E bank lies East Wharf. New Channel leads W of the naval dockyard and the West Wharf. It has a width of 106.7m and it is dredged to a depth of 7.6m.

When berthing, vessels are advised to let go an anchor in midstream to enable them to haul-off when leaving; however,

attention should be paid to unreliable holding ground, for the anchor may drag when casting off.

Along E side of the Lower Harbor channel are three oil piers. Berthing information is given in the accompanying table. There is a turning basin abreast Berth OP-IV which has a dredged depth of 10.4m.

On the W side of the channel, between Bunker Island and Baba Pool, there are head and stern mooring berths to accommodate vessels up to 183m in length. LASH vessels up to 259m in length, with a maximum draft of 8.2m, berth abreast Bunker Island. Caution is necessary as many stranded and dangerous wrecks, best seen on the chart, lie in the vicinity of the mooring buoys between the LASH moorings and Baba Pool.

Berthing information for East Wharf, Juna Bundar Wharf, West Wharf, and the Lower Harbor oil facilities are given in the accompanying table.

The entire frontage of West Wharf S of Berth No. 24 is occupied by a shipyard for a distance of about 0.5 mile. From the S tip, the frontage then leads about 1.25 miles NNE along the E bank of the New Channel, where numerous drydocks and slipways are situated.

The largest drydock in Karachi is situated in this area. It is 189m long and 27.4m wide, with a sill depth of 5.5m; vessels up to 26,000 dwt can be accommodated. The berths along the E and W banks of the shipyard and the drydocks are dredged to a depth of 6.7m.

**Aspect.**—The Lower Harbor is that portion of the harbor between the entrance and the S end of East Wharf. Kiamari Groin forms the NE side of the Lower Harbor. The oiling pier lies in the NE part of the outer harbor. Extensive oil storage installations in the vicinity of the oiling pier are visible from a considerable distance.

Karachi Berthing Facilities			
Berth	Length	Depth	Remarks
EAST WHARF			
Merewether Wharf			
Berth No. 1	153m	9.1m	Containers.
Berth No. 2	152m	9.1m	Containers.
Berth No. 3	167m	9.1m	Containers.
Berth No. 4	152m	9.1m	Containers.
Erskine Wharf			
Berth No. 5	149m	8.5m	Multi-purpose.
Berth No. 6	167m	8.5m	Multi-purpose.
Berth No. 7	147m	8.5m	Multi-purpose.
Berth No. 8	167m	9.5m	Multi-purpose.
James Wharf			
Berth No. 9	147m	10.4m	Bulk cargo.
Berth No. 10	147m	10.4m	Bulk cargo.
Berth No. 11	167m	10.4m	Bulk cargo.

Karachi Berthing Facilities			
Berth	Length	Depth	Remarks
Giles Wharf			
Berth No. 12	147m	10.4m	Bulk cargo.
Berth No. 13	167m	10.4m	Bulk cargo.
Berth No. 14	147m	10.4m	
Younghusband Wharf			
Berth No. 15	147m	10.4m	Containers and ro-ro.
Berth No. 16	167m	10.4m	Containers and ro-ro. Vessels with a length of 275m and over.
Berth No. 17	147m	10.4m	Containers, ro-ro, and grain discharge. Vessels with a length of 275m and over.
Berth No. 17A	36m	3.0m	Lighterage.
Napier Mole Ship Repair Berths			
Berth No. 1	79m	7.3m	
Berth No. 2	79m	7.3m	
JUNA BUNDAR WHARF			
Berth No. 25	149m	9.1m	
Berth No. 26	164m	9.1m	
Berth No. 27	164m	9.1m	
Berth No. 28	168m	9.1m	
WEST WHARF			
Berth No. 18A	374m	7.3m	Lighterage.
Berth No. 18	167m	9.7m	
Berth No. 19	167m	9.7m	
Berth No. 20	182m	9.7m	
Berth No. 21	190m	9.7m	
Berth No. 22	182m	11.6m	Containers.
Berth No. 23	213m	11.6m	Containers.
Berth No. 24	152m	11.0m	Containers and ro-ro.
Berth No. 24A	37m	5.5m	Lighterage.
LOWER HARBOR OIL FACILITIES			
Berth OP-I	196m	11.3m	Vessels up to 35,000 dwt and: 1. A maximum length of 229m. 2. A maximum beam of 30.5m. 3. A maximum draft of 10.7m.
Berth OP-IV	305m	13.4m	Vessels up to 75,000 dwt and: 1. A maximum length of 259m. 2. A maximum beam of 39.6m. 3. A maximum draft of 11.89m.

Karachi Berthing Facilities			
Berth	Length	Depth	Remarks
Berth OP-V	322m	—	Vessels up to 75,000 dwt and: 1. A maximum length of 259m. 2. A maximum beam of 39.6m. 3. A maximum draft of 11.89m. <b>Note.</b> —This facility is situated in the charted position of Berth OP-II and Berth OP-III.

The Upper Harbor is formed between East Wharf on its E side and West Wharf on its W side. Kiamari, a small town built on a sand ridge, lies E of the S part of East Wharf.

The new part of Karachi, at the head of the Upper Harbor, contains many fine buildings, while that part closest to the harbor is closely-built and crowded.

When approaching Karachi from S and passing the Indus Delta, the landmarks are not good. Land is not generally seen before sighting Manora Point. During the Southwest Monsoon, this approach is particularly hazardous. There is a continuous haze and overcast during this season, making visual determination of the ship's position difficult. From the W, Ras Muari makes a good landfall.

Several groups of large square buildings are distinguishable at Clifton, situated on some low sandhills, about 3 miles E of Manora Point.

At night, the lights on East Wharf can be seen from some distance seaward and care is necessary not to mistake them for navigational lights when approaching the port. Three conspicuous chimneys, one of which emits a flare, stand about 8 miles E of Manora Point.

Bara Andai, 28m high and marked by a light, lies about 1 mile ENE of Manora Point and is the S islet of Oyster Rocks.

**Pilotage.**—Pilotage is compulsory for merchant vessels of over 200 nrt. Pilots board incoming vessels by day or night in the vicinity of Fairway Lighted Buoy K. Pilots are requested by VHF. The Manora Point Light signal station will advise the vessel if rough weather prohibits the pilot from boarding.

The Karachi Pilot hailing and working frequencies are VHF channels 16, 12, 8, 9, and 11.

A vessel, while awaiting the pilot, should heave-to with its head to wind and sea and, on the approach of the pilot boat, bring the wind and sea on the port quarter and lower an accommodation ladder on the lee side.

**Regulations.**—Ships should contact Manora Pilot Control when within range.

Vessels should send their ETA and arrival draft to the port, via their agent, 48 hours in advance.

Inbound vessels should maintain a listening watch on VHF channel 12 when the pilot boards. Outbound vessels should maintain a listening watch on VHF channel 12 from 30 minutes prior to departure until when outside the port limits.

When arriving at the anchorage, the following information should be reported:

1. Time of arrival.
2. Vessel's name and flag.
3. Cargo.
4. Position.

Vessels with their bridge structure aft and having a length greater than 170m must arrive, sail, and shift berth during daylight hours only.

The following vessels may navigate in the harbor only between LW and 1 hour before HW:

1. Cargo vessels greater than 288m long.
2. Tankers greater than 259m long berthing at OP-I and OP-IV.

It has been reported (1995) that vessels are not allowed to depart the harbor on the ebb current.

**Signals.**—The signal station for communicating with vessels outside the harbor is the tower WSW of Manora Point Light. This tower, which is manned continuously, will flash the Morse Code Letter "U" if a vessel appears to be lying into danger.

Storm signals, using the General System, are displayed from the Manora Point Light signal station and from the N entrance of Boat Basin, about 1.5 miles N of the Manora Point Light signal station. Further information on these storm signals may be found in Pub. 160, Sailing Directions (Planning Guide) South Atlantic Ocean and Indian Ocean under "India—Signals."

**Anchorage.**—Anchoring is prohibited within the area, best seen on the charts, which extends 5 miles SW from Manora Breakwater. Anchorage is also prohibited within an area, best seen on the chart, extending about 2 miles SSW from a position about 1.5 miles NW of Manora Point.

From September to May, ships can anchor off Karachi outside the charted prohibited anchorage areas, as convenient according to draft; ships are recommended not to anchor in depths less than 9m and during April and May, they should anchor farther offshore in depths not less than 12m.

Vessels should not anchor off Karachi during the Southwest Monsoon, as several vessels have lost anchors and cables while attempting to do so.

Vessels having had more than two cases of dangerous infectious diseases aboard, or in which more than two deaths have occurred during the 12 days prior to their arrival at Karachi, must anchor in the quarantine anchorage, best seen on the chart, at the entrance to the harbor. Vessels in quarantine may enter the harbor during daylight hours only.

**Directions.**—The best approach is with Manora Point Light bearing about 040° until Fairway Lighted Buoy K is sighted and closed; then bring the leading lights in line as mentioned below. It is dangerous to proceed within 2 miles of the harbor entrance, and under no circumstance should a vessel attempt to enter the harbor without a pilot. The lighthouse should not be brought to bear less than 030° due to the heavy rollers and swell on the edge of the flats.

The approach channel to the harbor entrance is marked by a lighted range, shown from metal framed beacons situated S of Bara Andai Island. The channel is marked on either side by lighted buoys.

The best time to enter Karachi is on the first or last of the flood tidal current. A vessel should swing to an anchor and berth with its head S. When berthing during the Southwest Monsoon, it is advisable to drop an anchor in midstream to assist in hauling off.

When leaving the harbor, the pilot disembarks at the harbor entrance. Vessels should then steer through the buoyed channel on course 220° until Fairway Lighted Buoy K is passed clear. However, as stated previously, Manora Point Light should not be brought to bear less than 030°.

**Caution.**—No vessel should proceed within 2 miles of the harbor entrance without local knowledge. Vessels should not attempt to enter the harbor without a pilot.

Several vessels approaching Karachi from S have grounded on the banks off the Indus Delta through failure to sound and for not making due allowance for the SE set.

Dangey Patches, rocky heads with a least depth of 10.4m, lie about 1.5 miles WSW of Manora Point. Three dangerous wrecks lie within the red sector of Bari Andai Light, about 3 miles S, 5.8 miles S, and 4.3 miles SSE, respectively, of Bara Andai Island.

There are dangerous or stranded wrecks which lie within 1, 6, and 9 miles SW of Manora Point Light. Other dangerous wrecks lie 2.5 and 4.8 miles WSW, and 5 miles W of Manora Point Light. These dangerous wrecks may not be marked by buoys.

## Approach to Port Muhammad Bin Qasim

**1.4 Phitti Creek** (24°40'N., 67°09'E.) is entered 11 miles SE of Manora Point, between Buddo Island, which is low and sandy, and Zulfiquar Bank, which dries 0.6m. A tower, with an elevation of 24m, lies close NE of the SE extremity of Buddo Island.

Surveyor's Sand is a drying patch with its SW extremity lying 1.5 miles SW of Buddo Island. Range lights lead through the outer part of Ahsan Channel. The rear range light stands off the SE end of Surveyor's Sand.

Phitti Creek is approached by Ahsan Channel, which leads through the shallow flat fronting the entrance. This entrance is marked by Fairway Lighted Buoy, moored 7.5 miles SSW of the rear range light on Surveyor's Sand. The outer anchorage area is centered about 2 miles W of Fairway Lighted Buoy. The least depth in the anchorage is 17m, good holding ground, mud and sand. There are waiting areas on the E side of the channel SW and N of Zulfiquar Bank.

Bundal Island (Bondal Island), composed of sand dunes, lies N of Buddo Island. There are several mooring buoys in the channel E of Bundal Island. There is a prominent building on the E side of Bundal Island, 0.8 miles N of its S extremity; a beacon stands on the NE point of the island.

**Anchorage.**—Anchorage, in 16 to 20m, good holding ground, sand and mud, can be obtained in the Outer Anchorage Area, close W of Fairway Lighted Buoy. The limits of the anchorage area can best be seen on the chart. During the heavy swells of the Southwest Monsoon, vessels should anchor near the W end of the anchorage area and pay out extra cable.

**Caution.**—During the Southwest Monsoon, a heavy swell is also encountered in Ahsan Channel. During this period, suspended dust in the air also results in reduced visibility. Fog or mist may also be encountered during the winter months at dusk and at dawn.

## Port Muhammad Bin Qasim (24°46'N., 67°20'E.)

World Port Index No. 48605

**1.5** Port Muhammad Bin Qasim is situated in Phitti Creek, 27 miles SE from the center of Karachi. A newly-constructed port, it is capable of handling vessels of up to 50,000 dwt and 200m in length, with a draft of 12.6m.

**Tides—Currents.**—The spring tidal current of 3 knots on the flood and 5 knots on the ebb are normal in Phitti Creek and vessels should proceed with caution, especially in passing the dredges. Except in the entrance channel, the current mostly follows the direction of the creek.

**Depths—Limitations.**—Access to the port is through a 24-mile long channel, beginning with Ahsan Channel. Ahsan Channel is approximately 9 miles long, has been dredged to 12.4m, and is well-marked. From the vicinity of Buddo Island and Zulfiquar Bank, the channel continues through Phitti Creek and Kadiro Creek, both maintained at 11.3m, to a turning basin off the Iron Ore and Coal Jetty, a distance of 13 miles. From this jetty, the channel traverses Gharo Creek, maintained at a depth of 10m, to the Marginal Wharf, 2 miles farther up the creek.

The turning basin off the Iron Ore and Coal Jetty is maintained to a depth of 12.8m. The turning basin off the Marginal Wharf is maintained to a depth of 10.0m.

The width of the channel ranges from 185 to 280m in the approach and from 145 to 250m in the reach channel. The turning basins are 370m and 450m in diameter.

Dredging of the channel is continuous, but silting is liable to occur, particularly during the Southwest Monsoon. Buoys are liable to drag and are moved frequently to mark the best channel.

The Fauji Oil Terminal has a 46m long main platform. Dolphins extend the berthing length to 250m. There is a maintained depth of 11.3m alongside. Vessels between 25,000 dwt and 75,000 dwt can be accommodated, but in 1995 vessels were limited to a maximum length of 225m, a maximum beam of 32.2m, and a maximum draft of 10m (10.5m with special permission).

The Iron Ore and Coal Jetty, 1 mile ESE of the Fauji Oil Terminal, handles bulk carriers serving a steel mill; it is 270m long. The jetty is connected to the steel mill by a trestle and a conveyor. Vessels of 50,000 dwt can be accommodated, al-

though it is planned to increase the capacity to 100,000 dwt. Berthing limitations are given in the accompanying table.

Maximum Vessel Dimensions Iron Ore and Coal Jetty		
	Monsoon season (May to September)	Non-monsoon season (September to May)
Length	201m	225m
Draft	10.5m	9.5-10.5m
Beam	25.3m	25.3m

**Note.**—All berthing limitations are subject to change. Updated information can be obtained from the Pakistan Notice to Mariners or the local port authorities.

There are seven berths at the Marginal Wharf. Each berth is 200m long, with limiting dimensions, as follows:

Berthing Limitations—Marginal Wharf				
Berth	Maximum Vessel Dimensions			
	Size	Length	Draft	Beam
1	—	183m	9.5m	25m
2	25,000 dwt	183m	10.0m	25m
3	25,000 dwt	183m	10.0m	25m
4	25,000 dwt	183m	10.0m	25m
5	25,000 dwt	200m	11.5m	25m
6	35,000 dwt	200m	11.5m	25m
7	35,000 dwt	200m	11.5m	25m

**Note.**—All berthing limitations are subject to change. Updated information can be obtained from the Pakistan Notice to Mariners or the local port authorities.

**Pilotage.**—Pilotage is compulsory and is available during daylight hours only. Pilots board in the vicinity of Fairway Lighted Buoy. In bad weather, the pilot may board in the waiting area or in the channel abreast the SE end of Bundal Island. The pilot boat is gray-hulled with a white superstructure.

Deep-draft vessels are normally boarded by the pilot about 2.5 hours prior to HW, in order to assure that vessels berth at HW.

**Regulations.**—The vessel's ETA is required 48 hours and 24 hours in advance; messages are to be sent through Karachi. The vessel's arrival draft should be forwarded at this time, as the maximum allowable draft varies. Contact with Port Muhammad Bin Qasim Control via VHF channel 16 is required 12 hours prior to arrival.

The ETA message should contain the following information:

1. Vessel name and flag.
2. Net registered tonnage.
3. Gross registered tonnage.
4. Length overall.
5. Draft.

6. Loading/discharging information.

**Caution.**—Night navigation is restricted due to vandalism of the lighted aids to navigation.

### The Indus Delta—Phitti Creek to Khori Creek

**1.6 Winds—Weather.**—The climate of the Indus Delta is hot in the summer, cool in the winter, and unhealthy during the floods, which normally occur from June to September.

**Tides—Currents.**—The currents in the Indus Delta tend to be variable, but the sets of the currents do tend to parallel the coast.

Farther off the delta, the currents have a seasonal variation that is related to the monsoons, as follows:

1. February to September—The set is usually SE, with the strongest consistency occurring from June to August.
2. October—The currents are variable.
3. November to January—The set is usually NW.

The rate of the current is usually less than 1 knot, but a rate of as much as 2 knots can occur, usually from June through August and in December.

Tidal currents at the mouths of the Indus Delta are strong, and can attain the following rates at ebb:

1. Phitti Creek (24°40'N., 67°09'E.)—3 knots.
2. Dabba Creek (24°19'N., 67°16'E.)—3 knots.
3. Turshian Creek (24°03'N., 67°23'E.)—5 knots.
4. Sir Creek (23°38'N., 68°02'E.)—4 knots.

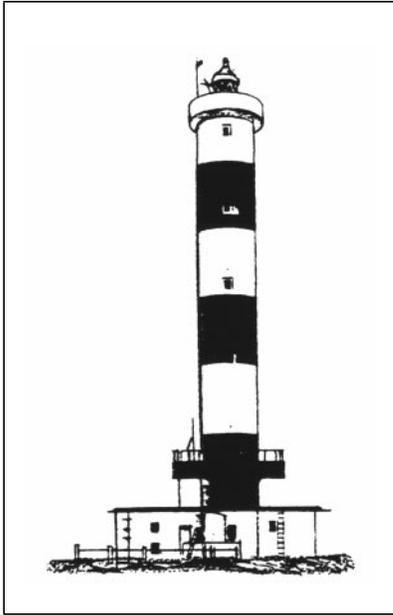
**Aspect.**—The Indus Delta extends about 115 miles SE from Karachi to Khori Creek. The delta is low and flat throughout, and is partially flooded at HW to a considerable distance inland. It is destitute of trees and shrubs, with the exception of a little jungle, and nothing is seen for many miles but swamp. The land is scarcely discernible at more than 2 miles offshore, except where bushes exist, which can be seen at LW at a distance of 5 or 6 miles.

A narrow strip of sandhills generally fronts this coast, which is backed by mangrove swamps and fronted by drying sandbanks. During the heat of the day, and especially during the dry season when the wind blows off the land, a heavy dust-haze hangs low over the coast, making the coastal features unrecognizable, even from a short distance to seaward.

**Khuddi Creek** (24°36'N., 67°12'E.) is fronted by a bar with a depth of 2.4m; within the bar a 1-mile wide channel, with depths from 4 to 11m, leads between low sandy islands on either side of the entrance. A light shown from a round tower, with black and white bands, on the S side of the creek.

**Caution.**—It is difficult to identify the different mouths of the Indus River on a coast so devoid of landmarks and, at times, partially submerged. Beacons marking the mouths have long since collapsed or disappeared, owing to the constantly changing coastline; a few beacons remain.

Vessels navigating along this coast should remain in depths over 18m, as the depths shoal abruptly in places, especially in the vicinity of The Swatch. It is dangerous for a deep-draft vessel to approach the Indus Delta, as the breakers on the shelving coastal banks, which extend many miles offshore, are often seen before the coast is sighted; this is especially so during the Southwest Monsoon, when visibility is poor and the sea breaks in depths of 5.5m or more. The discoloration of the water is very marked, especially off the main fresh water mouths on the



**Khuddi Island Light**

ebb tidal current, when during spring tides it extends more than 10 miles offshore.

Heavy tide rips are common off the mouths of the Indus Delta, especially during springs.

**1.7 Off-lying features.—Sir Creek** (Sir River) (23°38'N., 68°02'E.) enters the sea about 100 miles SE of Karachi and is the approximate boundary between India and Pakistan.

The Swatch is a remarkable submarine valley, from about 3 to 8 miles wide, extending about 52 miles SSW from approximately 23°40'N., 67°27'E. The Swatch has depths of less than 183m on either side of it, with depths exceeding 1,097m at its SW end. It is almost regular in shape and has steep sides and a flat sloping bottom. The bottom and sides of The Swatch consist of soft, gray mud, with some sand and gravel on its NW edge.

The Swatch can be of great assistance to vessels approaching Karachi from S. An echo sounder trace of maximum depths can help provide a clear indication of the vessel's position, especially during the poor visibility and the strong sets of the Southwest Monsoon.

Khori Great Bank is an extension of the coastal bank SW from the coast between The Swatch and Khori Creek. This bank has depths of 20.1 to 33m and extends as much as 60 miles offshore.

## Khori Creek to the Gulf of Kutch

**1.8 Khori Creek** (23°30'N., 68°20'E.), one of the outlets of the Rann of Kutch, has a shallow bar, but is navigable by local craft as far as Lakhpat, about 28 miles inland, on the SE side of the river. The entrance of the creek is obstructed by several sand banks, except on the E side, where a deep-water channel leads into the creek. The banks of the creek, 0.6 to 1.5m high, are broken by numerous waterways.

When a vessel is in depths of over 5.5m off the mouth of Khori Creek, the low land cannot be seen, except in the clearest weather, when the low hills NE will be visible.

**Maniara** (23°28'N., 68°37'E.), 67m high, is surmounted by a fort. The bar, with depths of 3 to 3.7m, is about 4 miles across and lies with its outer edge about 10 miles seaward of the E entrance point of Khori Creek. A dangerous wreck lies about 15 miles WSW of the entrance to Kori Creek. Inside the bar, the channel, with depths of 5.5 to 22m, leads through the creek for a distance of 10 to 12 miles. As the channel and banks are subject to constant changes, local knowledge is necessary.

**Tides—Currents.**—Tidal currents are strong in the estuary of Khori Creek, attaining a velocity of 5 knots at springs and about 3 knots at neaps. The flood sets up the channel until three-quarters flood, when it sweeps over the sand banks in the entrance.

**1.9 Godia Creek** (Goria Creek) (23°14'N., 68°35'E.), known locally as Jakhau Harbor, can be identified by some sandhills, about 9.1m high, on the N side of its entrance. The S side of the entrance is low and fronted by ridges of sand, 6.1 to 13.7m high. The coast between Godia Creek and Khori Creek, about 19 miles NW, is very low and indented by creeks.

The entrance to Godia Creek is marked N and S by beacons; a light is shown about 2 miles E of the entrance, on the S side of the creek. Local knowledge is necessary for entering the creek, as the coastline and creek is constantly changing.

The creek has depths of 5.5 to 8.8m within the entrance; the bar had a least depth of 1.2m in the fairway in 1961. Salt is loaded into barges from a jetty near the above-mentioned light.

**Signals.**—Storm signals are shown at Jakhau Harbor using the Brief System. Further information on these storm signals may be found in Pub. 160, Sailing Directions (Planning Guide) South Atlantic Ocean and Indian Ocean under "India—Signals."

**Anchorage.**—Good anchorage can be obtained, in about 8m, mud, about 5 miles SW of the creek entrance. Vessels should approach the entrance cautiously, as few distinguishable landmarks are visible until in the vicinity of the 10m curve, about 7 miles offshore.

The coast between Godia Creek and Asar Mata, about 43 miles ESE, is uniformly low and fronted by a narrow, sandy ridge, which is about 9.1m high, except near Asar Mata where it is slightly higher. Villages are numerous and the land is well-cultivated.

Chachhi Light is shown on the W side of the entrance of the **Chok River** (22°57'N., 69°00'E.), from a white masonry tower with black bands, 31m high.

Dholo Pir Temple, 10m high, is conspicuous about 3.5 miles ESE of the Chok River.

**Asar Mata** (22°50'N., 69°13'E.), a conspicuous Hindu temple, 25.3m high, lies on the coast, on the crest of the sandhills, at an elevation of 34m.

## The Gulf of Kutch

**1.10** The Gulf of Kutch, entered between Asar Mata and **Humani Point** (Vomani Point) (22°29'N., 69°04'E.), about 23 miles SSW, contains some sheltered anchorages and harbors. The shores of the gulf are uniformly low. The N shore, con-

sisting of sand and mud, is fronted by numerous shoals. The S shore is fronted with islets and islands covered with brushwood and surrounded by coral reefs.

The N shore is backed by a range of hills, about 15 to 20 miles inland, extending in an E-W direction and nearly parallel with the coast for a distance of about 35 miles. Krikubbah, 253m high, with a sharp peak, lies about 18 miles N of Asar Mata. Nanu Hill (Nunomar Hill), 434m high and circular, lies about 6.5 miles ENE of Krikubbah. Katrura, also circular and 378m high, is the highest of the E peaks of this range, which lies about 24 miles E of Nanu Hill and may sometimes be seen from the S side of the gulf.

**Tides—Currents.**—Tidal currents are strong in the estuary. Across the mouth of the Gulf of Kutch, the strong tidal currents over the uneven bottom cause a confused breaking sea. It has been reported that the tidal currents in the gulf are very irregular in direction and that a vessel proceeding into or out of the gulf may be set considerably N or S in a short time.

Along the coast on the N side of the gulf, the tidal currents set E with the flood and W with the ebb, attaining a velocity of 2 to 3 knots.

The tidal currents in the vicinity of Lushington Shoal set ESE with the flood, attaining a velocity of 1.8 knots at neaps.

At the W edge of Gurur Shoal, the tidal current sets E with the flood and W with the ebb, at a velocity of 1.5 knots at neaps.

Between Gurur Shoal and the coast S and SE, there are heavy tide rips on both sides of the fairway, particularly on the ebb tide. The sea sometimes breaks in this fairway even in calm weather.

Tidal currents over Ranwara Shoals attain a velocity of 5 knots at springs and 3 knots at neaps. They cause heavy tide rips and overfalls over the uneven ground in the vicinity of the shoals and W toward Asar Mata.

**Aspect.—Lushington Shoal** (Unniamor) (22°38'N., 68°47'E.) lies in the fairway of the W approach to the Gulf of Kutch, about 18 miles WNW of Humani Point. This danger, with a least depth of 4.3m, can usually be identified by the discoloration of the water over it. The bottom consists of sand and rock. Depths of less than 10m extend about 2 miles WSW of the shoal.

Gurur Shoal, about 5 miles NW of Humani Point, is composed of sand and rock, and has a least depth of 3m. Depths of less than 10m extend about 2.8 miles SW, and 1.5 miles NE of the shoal. A 9.4m patch lies about 6.5 miles W of Humani Point. Between Gurur Shoal and the mainland S and SE, the depths are irregular; heavy tide rips are experienced, particularly on the ebb tide, on either side of the intervening deep-water channel. The sea sometimes breaks in this channel, even in calm weather.

A shoal, with a least depth of 7.9m, lies about 5.5 miles S of Asar Mata. Detached shoals, with depths of 9.1m, lie about 2.5 miles WNW, and 1.5 miles NNW of the W end of this shoal. Ranwara Shoals, about 6 miles S of the breakwater at **Mandvi** (22°49'N., 69°21'E.), consists of two rocky shoals, oriented E-W, with depths of less than 10m, separated from each other by a narrow passage. The NW shoal, about 5.3 miles long, has an area at its E end with a depth of 3.7m. The SE shoal, about 3.5 miles long, has an area at its NW end with depths of 0.9 to 4m and depths of 5.5m and less near its SE end.

A lighted buoy is moored off the SW side of the SE shoal.

**Pilotage.**—Pilots for the Gulf of Kutch are obtained at Mandvi (22°50'N., 69°21'E.), on the N side of the gulf.

**Caution.**—In the entrance to the Gulf of Kutch, large quantities of mud and sand are sometimes held in suspension, either on the surface causing discoloration, or beneath the surface, which will be churned up by a ship's propellers, giving the impression of being in shoal water. This may occur between the meridians of 69°00'E and 69°30'E.

Strong cross currents, setting in any direction for short periods, have been reported.

The depths in the gulf are very irregular for about 30 miles inside the entrance. They then decrease gradually, with the bottom changing from rock and sand to mud.

## The Gulf of Kutch—North Coast

**1.11** The coast between **Asar Mata** (22°50'N., 69°13'E.) and Mandvi, about 7 miles E, is fronted with white sandhills, between 6.1m and 15.2m high, which are very visible at night.

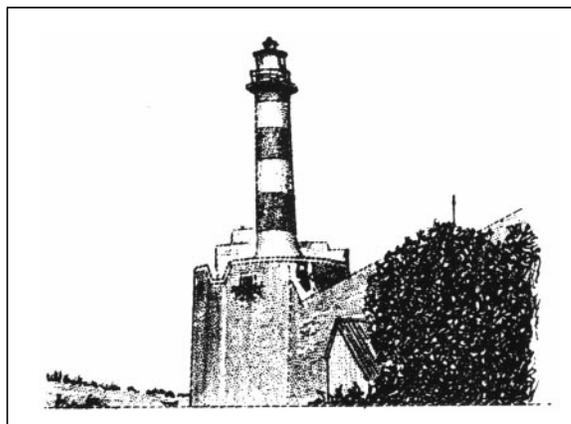
Vijayvillas Palace, Tamachi Pir Tomb, and a house are conspicuous about 3.5 miles E of Asar Mata. The tomb is situated on a sand hill, 26m high; the E end of the sand hill is a steep bluff, with a small creek at its foot.

Between Asar Mata and Mandvi, the coastal bank and some detached shoals, with depths of less than 5m, extend between 1.5 and 2 miles offshore.

## Mandvi (22°50'N., 69°21'E.)

World Port Index No. 48620

**1.12** Mandvi, situated on the W bank of the Rukmawati River, is the most important commercial town in the Gulf of Kutch. The port authority at Mandvi is exercised by the Port Officer, however, radio messages to Mandvi are relayed through Kandla Radio.



**Mandvi Light**

**Depths—Limitations.**—Albert Edward Breakwater, 564m long and lighted at the head, protects the harbor from W winds. Vessels with a maximum draft of 3.7m can berth alongside the breakwater at high tides.

The small harbor, sheltered from W winds by the breakwater, has a pier and pitched slope, where sailing vessels and lighters with a draft between 2.7 to 3m can secure alongside to work cargo on a HW only; the entire harbor dries out at a half tide. The height of HW at Mandvi ranges between 3 and 4.2m.

**Aspect.**—The town is surrounded by a wall flanked with bastions, within which a large flat roofed building forms a prominent landmark.

A conspicuous radio mast, 75m high, stands 4.5 miles NE of the entrance to the harbor. A light, with a racon, is shown from Mandvi Light, a tall white masonry tower with red bands, on the SW bastion of the wall mentioned above.

Raval Pir Tomb (Rawal Pir Tomb) is conspicuous lighted and lies about 2.5 miles E of the harbor. There are some sand hills with clumps of trees in the vicinity of the Tomb.

**Signals.**—Storm signals are displayed, in daylight only, from a flagstaff at the Customs House; the General System is used. Further information on these storm signals may be found in Pub. 160, Sailing Directions (Planning Guide) South Atlantic Ocean and Indian Ocean under “India—Signals.”

**Anchorage.**—Good anchorage may be obtained, in depths of 9 to 11m, sand and shingle bed, 2.3 miles offshore, with Mandvi Light and the breakwater lights in line bearing 358°. The tidal currents at the anchorage attain a rate of 3 knots at springs and less than 2 knots at neaps; however, farther offshore the strength increases.

Cargo is handled by means of lighters at these anchorages.

**1.13** The coast between Mandvi and **Mudwah Point** (22°46'N., 69°30'E.) is fringed by a sandbank which extends about 0.5 mile offshore in places. Mudwah Point is a sandy bluff, 12.5m high. North of this point an extensive backwater runs to within 2 miles of Raval Pir Tomb; the backwater is entirely flooded at very high spring tides and at ordinary HW during the Southwest Monsoon.

Long narrow ridges of sand, from 1.5 to 3m high, front the coast between Mudwah Point and Navinal Point, about 12 miles E; a drying bank extends about 1 mile seaward of the coast. Between these sand ridges and the mainland there is an extensive swamp which is covered with mangroves and intersected by numerous small creeks.

Sonar Durree, a sand bank, lies from 4 to 7 miles ESE of Mudwah Point and consists of detached drying ridges of sand; it is steep-to on its S side. During the first half-flood, and after half-ebb, the bank can be identified by the rippling of the water. A sonar lighted buoy is moored 1.5 miles S of Sonar Durree. From the masthead, the bank can be identified by the discolored water. There is no navigable passage N of this bank.

**1.14 Navinal Point** (22°44'N., 69°43'E.) consists of a few ridges of sand, the greatest elevation being not more than 3m. A light is shown from a yellow round tower, 28m high, with black spiral bands. A large swamp, partly covered with mangrove bushes and through which several small creeks flow, extends NW, N, and NE of the point.

**Mundra New Port** (22°54'N., 69°42'E) lies about 1.5 miles NNW of Navinal Point. The port consists of a roadstead anchorage, a lighterage jetty and a privately owned salt loading jetty. In 2002, it was reported that port authorities were constructing a larger jetty, allowing four vessels, with a maximum

draft of 15m, to berth alongside. A container terminal jetty lies close to Navinal Point. The terminal is approached from the SE through a channel marked by lighted buoys. The channel is maintained to a depth of 14.5m.

**Anchorage.**—Vessels loading salt from Mundra New Port should anchor, in 14.6 to 18.3m, fine sand and mud, about 1 mile ESE of Navinal Point.

Between Navinal Point and Nakti Creek, about 27 miles ENE, the coast is fronted by a mud flat which dries up to 3 miles offshore. A 6.7m shoal lies about 3 miles E of Navinal Point, and a chain of shoals, with depths of 0.3 to 6.4m, extends about 8.5 miles ENE of the same point.

Bhadreswar Temple, standing about 14.5 miles NE of Navinal Point, is conspicuous, with a white dome 25m high; a fort lies close W from it. Another temple, 24m high, with a dome, is about 1.3 miles S from the above temple.

A clump of banyan trees is conspicuous about 3.5 miles ENE of Bhadreswar Temple.

## The Gulf of Kutch—South Coast

**1.15 Humani Point** (Vomani Point) (22°29'N., 69°04'E.), at the N extremity of the Okhamandal Peninsula, forms the S entrance point of the Gulf of Kutch. A tower, 21m high, lies on the point. There are two beacons standing 0.2 and 0.4 mile SSE and SSW, respectively, of the point. Humani Point Light, shown from a tall white masonry tower with red bands, is fitted with a radar reflector and lies about 0.4 mile SSE from the point. A fog signal is sounded from the tower. Two radio masts; situated close SSW of the light, are marked by fixed red obstruction lights.

Okha Point, low and sandy, lies about 1 mile ESE of Humani Point and is marked by a 28m high flagstaff; the town of Okha lies on this point.

Samiani Island (Samayani Island) lies about 1 mile N of Okha Point, with its SW extremity over 30m high.

A Deep Water Route has been established leading from SW of the entrance point of the Gulf of Kutch for the use of VLCCs to approach the offshore oil terminal near Sikka Creek. The route is entered 7 miles WNW of Kachchigadh Light, leads between Lushington and Gurur Shoals, then E into the gulf, passing N of Investigator Reef. The route varies in width from 0.8 to 1.7 miles, with its first 4.5 miles having controlling depths of 25m; the 8.5 mile stretch of the route NNE of Okha, having depths of 23m.

Vessels with drafts less than 15m, navigating in the Gulf of Kutch, should keep N of the Deep Water Route and S of **Ranwara Shoals** (22°41'N., 69°22'E.).

In 1982, it was reported that the shallowest depth of 23m lies between the meridians of 69°08'E and 69°10'E.

### Okha (22°28'N., 69°05'E.)

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**1.16** The Port of Okha lies between the N end of the **Okhamandel Peninsula** (22°29'N., 69°05'E.) and Beyt Shankhodar. The port is protected and open year round, with facilities to accommodate deep-draft vessels.

The port limits extend approximately 2.8 miles NE, 2 miles NW, and 1.75 miles SW from the town. Its main exports are cement, bauxite, and sodium carbonate.

**Tides—Currents.**—The tidal rise at Okha is 3.5m at MHWS and 2.8m at MHWN.

In the W approach channel to Okha Harbor, the tidal currents set ESE with the flood and WNW with the ebb, attaining a velocity of 3.5 knots at neaps.

North of Samiyani Island, and between it and Chandri Reef, the tidal currents set SE with the flood and WNW with the ebb. The flood current attains a velocity of 3 knots at springs; the ebb current attains a velocity of 2 knots at neaps.

West of Samiyani Island, the tidal currents set NE with the flood and SW with the ebb, with a velocity of 1.8 knots at neaps. Southeast of the island, the reverse is the case.

The flood current sets strongly around the S end of Samiyani Island in a S and E direction; from there it sets S through Okha Harbor, curving E around the S end of Beyt Shankhodhar. It has a velocity of 1.3 to 1.5 knots at neaps and 2 knots at springs.

The ebb current, coming from the E around the S end of Beyt Shankhodhar, sets N through the harbor until it reaches the shoal water NW of Padmatirth Point. Here it divides into two branches, one setting along the W side of the harbor and W of Samiyani Island, and the other setting N and NE between Samiyani Island and Beyt Shankhodhar, and then WNW in the area N of Samiyani Island. The ebb current has a velocity of 1.3 to 2 knots at neaps.

Strong eddies form in the harbor at springs with both tidal currents, and a confused sea occurs over the shallow ground NW of Padmatirth Point. There is a strong undertow at the anchorage off Okha Point.

**Depths—Limitations.**—Aramda Reefs, with a least depth of 0.6m, extend about 1.5 miles from the coast, about 4 miles WSW of Humani Point.

Marian Shoal, with a least depth of 2.4m, lies about 2.5 miles W of Humani Point, and Bobby Shoal, with a least depth of 6.7m, lies about the same distance WNW of Humani Point.

Samiyani Shoal, an extensive area with depths of less than 3.3m, extends about 1.8 miles WNW from its E extremity, which lies about 0.3 mile N of the N extremity of Samiyani Island. There is a drying patch in the SE part of this shoal. Buoy No. 1 is moored about 0.2 mile W of the NW extremity of the shoal; a 5m patch lies about 0.3 mile W of the same extremity. Buoy No. 2 marks the SE end of the shoal.

Samiyani Island is fringed by a reef, which dries in places and extends about 0.2 mile NE from the NE extremity of the island. Depths of 6.1m extend about 0.3 mile farther NNW.

Chandri Reef (Chinri Reef), which dries, lies with its SW extremity about 2 miles NE of Samiyani Island. The reef lies on the SW corner of an extensive shoal with depths of less than 1.8m.

A large shoal, with depths of 2 to 5m, lies W of Chandri Reef, with its W edge about 1.5 miles NNE of Samiyani Island. Lighted Buoy No. 1 is moored about 0.5 mile W of the shoal; detached patches, with depths of 4 to 5.5m, lie between the buoy and the shoal. Less water than charted has been reported (1993) about 0.5 mile ESE of the buoy.

Chandri Rock, a shoal with a least depth of 2.4m, lies about 1.5 miles ENE of Samiyani Island and is marked close SW by a lighted buoy. Several other shoal patches lie in this vicinity.

A large shoal, the NW end of which lies about 0.3 mile E of the NE extremity of Samiyani Island, extends SSE and dries over its central portion for about 0.5 mile. Buoy No. 2 marks the NW extremity of this shoal.

A wreck, with a depth of 5m, lies 1.7 miles NNW of Samiyani Island.

The entrance channel, passing close SE of Samiyani Island, has a least depth of 4.9m in the fairway.

There are general depths of 6.1 to 9.4m in Okha Harbor.

Sayaji Pier, a concrete pile structure 122m in length, lies close S of Okha Point. The pier can accommodate vessels up to 164.6m in length, in a least depth of 7.9m, on its E side, and vessels up to 93m in length, in a least depth of 5.8m, on its W side.

Second Pier (Dry Cargo Berth), 145m long, lies close SW of Sayaji Pier and is similar to it in construction; it can accommodate vessels up to 119m long, with a draft of 7m. The E side of this pier provides a deep-water berth, is connected with the railway system, and has a depth of 9.1m alongside; berthings are port side-to. Passenger Jetty and a small slipway lie close SW from Second Pier.

Daily permissible drafts for vessels entering or leaving the port are published for each month by the port officer.

During the Northeast Monsoon, the maximum permitted length is 160m; during the Southwest Monsoon, the maximum permitted length is 164m. The maximum draft varies between 6.7 and 8.2m, depending on the height of tide. Because of the narrow entrance, it was reported (1994) that the maximum beam is restricted to 28.4m.

**Aspect.**—In addition to the landmarks and navigational aids mentioned for the S approaches to the Gulf of Kutch, a conspicuous chimney, 101m high, lies about 5.5 miles SW of Humani Point. A light is shown from the top of a building, 50m high, lying close NE of the chimney.

Samiyani Island North Light is shown from a white concrete tower with black bands standing at the NE edge of the drying reef. The Center Light is shown from a white, circular, stone tower near the center of Samiyani Island; a tomb, with a spire 27.1m high, lies close N.

Okha Point and Samiyani Island have been reported to be good radar targets at 12 to 15 miles.

Mariners are advised to keep well clear of Gurur Shoal.

**Pilotage.**—Pilotage is compulsory and is available during daylight only. Vessels should signal their ETA 24 hours before arrival, amending the time as necessary. Pilots board vessels about 1.5 miles NNW of Island Center Light, although caution is necessary as a dangerous wreck lies close N of the pilot boarding position. Vessels should not proceed farther until the arrival of the pilot. During the Northeast Monsoon, a vessel should be in the above position 1.5 hours before HW or at LW, and during the Southwest Monsoon 0.5 hour before HW or 1.5 hours before LW.

**Signals.**—There is a Coast Radio Station and a Port Radio Station. An airstrip is situated at Mithapur, 3 miles SW of Okha.

Storm signals are displayed at Okha; the General System is used. Further information on these storm signals may be found in Pub. 160, Sailing Directions (Planning Guide) South Atlantic Ocean and Indian Ocean under "India—Signals."

**Anchorage.**—Vessels can obtain anchorage in the outer roadstead, in depths of about 12m, sand and broken shell, with Samiyani Island Light bearing 171°, distant about 1.3 miles.

Vessels with a draft of not more than 4.9m and a length of less than 160m can anchor SE of Okha Point.

**Directions.**—Three channels lead to Okha, two from the N and one from the S of Samiyani Island. The E channel of the two from the N is buoyed, considered safe, and generally used. Strong tidal currents flow across this channel and it should not be attempted without local knowledge.

The best time to enter and leave the port is about the time of slack water, when the tidal currents on each side of the island are comparatively slack and a vessel may take a sheer while entering or leaving. At other times there is a strong race N and S of Samiyani Island. There is a heavy tide rip on all the shoals, especially on the ebb.

The E channel is approached to pass between Samiyani North Light and Lighted Buoy No. 2; then bringing the NE corner of Sayaji Pier in line with the 10.4m high beacon, black disc top marked, lying on Adatra Point, bearing about 207°; this leads through the fairway with a least depth of 4.9m in the channel.

The W of the two channels from the N leads close NW of Samiyani Island. It is seldom used and should not be attempted without local knowledge. The leading marks for this channel are two black beacons on Humani Point. These beacons, in line bearing 231°, lead through the fairway of this channel in a least depth of 3.5m.

The W channel, locally known as the Southern Channel, leads between Okha and Samiyani Island. The leading marks for this channel are two beacons which lie 0.3 mile apart, 1.3 miles ENE of Padmatirth Point. In line bearing 116°, they lead through the W channel in a least depth of 3.7m. Strong tidal currents flow across and the channel is extremely narrow and difficult. It is only used by coasters and small craft with local knowledge.

The continuation of all three channels S lead to anchorage and moorings SE of Okha Point.

## Okha to Bet Shankhodhar Island and Pindara Bay

**1.17** Bet Shankhodhar Island (Beyt Shankhodhar) lies with its NW extremity, Padmatirth Point, about 1 mile SE of Okha Point. The island is mainly composed of sandhills on its N part, and formation of a rocky tableland on its SW part. There are some clumps of coconut and a few other trees; the rest of the island consists of open jungle with thorny scrub.

Padmatirth Point, a small bluff tableland about 9m high, becomes an islet at highest spring tides. A small, white domed tomb lies on the point, with another tomb 0.8 mile E of it.

Bet (Beyt), a town with a pilgrim resort, lies 0.5 mile S of Padmatirth Point and is surrounded by many temples and shrines. Dwarkadish Temple, a large square building near the center of the town, is most prominent. There is a small jetty at the town.

**Hanuman Point** (22°28'N., 69°09'E.), the E extremity of the island, is composed mainly of sandhills on its NE part. Hanuman Temple, about 0.8 mile W of the point, is the only building on this part of the island.

Hanumandauda Reef lies on the foul ground extending about 1 mile N from the NE shore of Bet Shankhodhar Island.

Paga Reef, extending between 2.5 to 5.5 miles E of Hanuman Point, has a sand ridge on its SW side which covers only at HWS. The red sector of Samiyani Center Light covers Paga Reef between the bearings of 260° and 290°.

**Positra Point** (22°25'N., 69°12'E.) lies about 3.8 miles SE of Hanuman Point; the village of Positra lies 2 miles SW of the point.

**Anchorage.**—During W gales, sheltered anchorage may be obtained about 0.5 mile E of Bet Shankhodhar Island, with Hanuman Point bearing 334°; E of this position the bottom is rocky. Detached 5.5m patches lie about 1.8 miles ENE and 2 miles E of Hanuman Point.

The tidal currents at the anchorage flow S with the flood and N with the ebb, attaining a rate of 1.3 knots at neaps and 1.5 knots at springs.

**Directions.**—Vessels proceeding to the anchorage can pass either E or W of Chandri Reef. Vessels passing E of the reef should, when the village of Positra, lying on 20m high ground bears 180°, steer for it until Samiyani Center Light bears 275°, when course may be altered towards the anchorage.

Vessels passing W of Chandri Reef should, from a position about 0.8 mile N of Samiyani Center Light, steer E to pass clear N of Chandri Rock and a shoal patch about 0.3 mile N of it. The tidal current in this vicinity flows E and W at rates between 2.5 to 3 knots. Following this course, when Positra village bears 180°, steer for it and proceed, as described above, for the anchorage.

**Positra Bay** (22°26'N., 69°09'E.) is entered W between the SE point of Bet Shankhodhar Island and Positra Point; the bay is very shallow and dries in places. Local knowledge is necessary when navigating in the vicinity.

## Pindara Bay and Approaches

**1.18** The summit of Ajad Island is 8 miles SE of Positra Point and in line with Great Peak, the highest summit of Barda Hills, 35 miles SE, bearing 140°, which leads close NE of Paga Reef.

The SE bluff of the Okhamandal Peninsula, 37m high and 9.5 miles SSW of Positra Point, seen between two islets of Merodi Bet, bearing about 205°, leads close SE of Paga Reef.

Boria Reef, which dries, lies at the E edge of foul ground extending E from Positra Point; a small reef lies about 0.8 mile N, with a 3.7m shoal patch about 0.5 mile W. There is a deep channel between Paga Reef and Boria Reef; however, local knowledge is necessary when navigating in the vicinity.

**Bural Reef** (Chank Reef) (22°30'N., 69°19'E.), an extensive drying coral reef, is steep-to on its N side. The reef extends about 10 miles from E to W and 9 miles from N to S.

A stranded wreck, which has been reported to give a good radar response, lies S of the NW point; another wreck lies about 1 mile S. A light is shown and a racon transmits from a round tower, 12m high, on the NW side of Bural Reef.

Mitha Chusna (Chusra Bet) is a small rocky islet, with another islet close to it, lying at the S point of Bural Reef.

Chank Island (Chank Tapu), lying 3 miles E of Nora Island, is small and wooded. Chank Tapu Light is shown from a white, square, concrete tower with black bands at the edge of Bural Reef, 1 mile NNE of Chank Island.

Bhaidar Island (Baidar Tapu) lies 3 miles NE of Mitha Chusna, is sandy on its W part, and is covered with mangroves. Nora Island (Nora Tapu) lies 3 miles NE of Bhaidar Island and is low and covered with mangroves. The highest group of trees lie on its E side; the N side is sandy.

Pindara Bay is large and shallow. Its head forms a salt marsh, which dries out to a distance of 1.5 miles, but covers at HWS tides. The head is almost impassable and extends S forming the E side of the Okhamandal Peninsula. The W limit of the Saushtra coast extends ENE to the head of the Gulf of Kutch. Shiyardi Bet marks the E entrance to the bay; Merodi Bet the W entrance to the bay.

**Anchorage.**—Anchorage for a small vessel with local knowledge can be obtained 0.5 mile E of Merodi Bet and also on its W side, in depths of 11 to 16.5m, mud, sheltered from all winds. This anchorage can be approached by the deep channel E of Paga Reef.

Ajad (Ajar), a bluff island 21m high at its S extremity, lies 3 miles N of Shiyardi Bet. The ruins of an old tower lie high on the summit of a round hill at the S point of the island. Although the island is surrounded by rocky reef and dangers, there are deep channels N and W of the reef; several dangers exist in the fairway of the W channel. Local knowledge is essential in navigating in the vicinity.

Small vessels may anchor, in a depth of 7m, mud, close W of the NW edge of Bural Reef. Vessels are cautioned to avoid shoals extending NW and SW from the NW edge of the reef. On the E and SE sides of Bural Reef, there is good shelter from W winds; however, vessels anchoring E of the reef should avoid Bubasir Rock off its E end.

A vessel may anchor, in a depth of about 15m, mud, near the edge of the shoal with the trees on Chank Island bearing 271° distant about 2 miles, or farther SE, in a depth of 12m, with the trees bearing 293°, distant about 3 miles, where the tidal flow is NW on the ebb and SE on flood. Another anchorage lies, in a depth of about 9m, mud, 2 miles SE of Chank Island.

During the Southwest Monsoon, large local vessels seek shelter on the lee side of Chank Island.

**Directions.**—Vessels proceeding to anchor on the E side of Bural Reef and passing N of the reef should keep a good lookout for the trees on Nora Island and Chank Island and maintain a distance of about 3 miles from these islands.

**Caution.**—Along the N face of Bural Reef, the rate of tidal flow varies between 4 to 6 knots, causing heavy tide rips off the NE end.

Between Bural Reef, Chandri Reef, and Paga Reef, the uneven bottom causes overfalls and tide rips which at springs are alarming to a stranger. Kudda Reefs consist of three detached drying reefs centered about 4 miles NE of Ajad, with a channel between Bural Reef having a least depth of 7.3m in the fairway. A steep-to submerged rock extends SE from Bural Reef.

**Investigator Reef** (22°36'N., 69°33'E.), with a least depth of 8m, lies near the center of the Gulf of Kutch, about 8 miles ENE of Chank Island Light.

## Salaya Harbor

**1.19 Salaya Harbor** (22°26'N., 69°33'E.) is entered between the drying reefs extending NE from **Dhani Island** (22°24'N., 69°33'E.) and SW from Karumbhar Island. The harbor extends about 6 miles SE, with an average width of 0.7 to 0.8 mile. The continuation of the harbor S is Salaya Creek. Blunt Channel, an easterly continuation of the channel for small craft, leads S of Karumbhar Island and into Pathfinder Inlet. Blunt Channel is narrow, tortuous, and difficult to recognize when the reefs and mud flats are covered.

Storm signals are shown at Salaya; the Brief System is used. Further information on these storm signals may be found in Pub. 160, Sailing Directions (Planning Guide) South Atlantic Ocean and Indian Ocean under "India—Signals."

The harbor entrance is not easily identified when the reefs that extend from the islands are covered.

Dhani Island is a sand and mud flat, fringed with mangrove scrub. The island, with the exception of some sand ridges at its N end, is submerged at HWS. The coral reef surrounding the island extends from 1 mile to 1.5 miles NE from its NE side and dries 3m.

Kalubhar Tapu (Karumbhar Island) is similar in composition to Dhani Island. A low ridge of sand, covered with low scrub, extends along the N side of the island. Kalubhar Reef (Karumbhar Reef), extending about 1.3 miles from its N and SW sides, covers at half tide, and consists of hard dead coral, with flats of very soft mud in places.

Sykes Point lies at the junction of Salaya Creek and Blunt Channel. A pier extends N from the point; boats and lighters can go alongside for 2 hours on either side of HW, after which the reef at the head of the pier dries.

**Tides—Currents.**—The tidal rise at Salaya Harbor is 5.3m at MHWS and 4.9m at MHWN.

The tidal currents in Salaya Harbor set SE with the flood and NW with the ebb, attaining a maximum velocity of 2 knots at the entrance to the harbor.

At a distance of 2 to 3 miles outside the entrance, the tidal currents set E with the flood and W with the ebb, attaining a velocity of 1 knot at neaps.

**Depths—Limitations.**—The harbor has depths of 10 to 25m in the entrance, gradually shoaling to 9.1m about 5 miles up the harbor.

A bar of soft mud extends across the approach. The fairway in the approach has a least depth of 8.8m. Taylor Shoal, with a depth of 6.9m, lies on the bar, about 3.3 miles WNW of the W extremity of Karumbhar Island. Hand Shoals consist of two 8.2m patches lying about 0.5 mile SSW and 0.8 mile SSE, respectively, of Taylor Shoal.

Nora Rock, with a least depth of 2.1m, coral, lies on the E side of the harbor, about 1.5 miles SW of the W extremity of Karumbhar Island. A tongue, with a least depth of 6.7m, extends about 0.5 mile W from Nora Rock, and constricts the channel to a width of less than 0.2 mile.

**Aspect.**—Kalubhar Tapu Light is shown from a circular stone tower, 14m high, at the W extremity of Kalubhar Tapu.

Wooden pole beacons, 0.6m high, mark the edges of the reefs on both sides of the channel. They are intended for the guidance of local craft, and cannot be relied upon as they are not always standing. Similar beacons mark the entrance and head of Salaya Creek.

A pair of white stone beacons, 2.4m high, and in line bearing 302°, are situated about 2.5 and 3 miles, respectively, W of Kalubhar Tapu Light.

A similar pair of beacons, in line bearing 164° and about 0.35 mile apart, are situated on the W side of the harbor, about 2 miles SE of the above pair.

The town of **Salaya** (22°19'N., 69°36'E.), at the head of Salaya Creek, is closely built with small stone houses and surrounded by a wall about 12m high.

**Anchorage.**—Large vessels can obtain anchorage in Salaya Harbor, in a depth of about 14.6m, in the outer or inner anchorage. The outer anchorage is situated about 0.8 mile NNW of Nora Rock. The inner anchorage is situated about 2 miles S of Kalubhar Tapu Light.

**Directions.**—Deep-draft vessels approaching from NW, after passing Chank Island Light, steer for Kalubhar Tapu Light bearing 128°, keeping on this course until the SE beacon of the 302° range bears 114°; then steer for the beacon on that bearing until Kalubhar Tapu Light bears 114°. Steer for the light on that bearing, passing between Taylor and Hand Shoals, until the beacons in the S part of the harbor are in range 158°; then steer on this range to the anchorage.

Deep-draft vessels without local knowledge should not proceed S of Nora Rock.

Light-draft vessels continue on the 158° range until the beacon in the NW part of the harbor are in range 302° astern; the latter range leads to the inner anchorage.

## Pathfinder Inlet

**1.20 Pathfinder Inlet** (22°28'N., 69°40'E.), between Kalubhar Reef and Narara Reef, is about 0.2 to 0.3 mile wide, with depths of 24m in the entrance, decreasing to 10m about 1.5 miles within the entrance. The entrance is marked by lighted beacons on each side. Ambla Hill, 28m high, is conspicuous about 5 miles S of the entrance.

Tilburn Shoal, with a depth of 7m, lies about 1.5 miles NE of the N extremity of Kalubhar Tapu (Kalubhar Island). A detached reef, which dries 1.2m, lies on the E side of the entrance to the inlet.

**Anchorage.**—During the Southwest Monsoon, sheltered anchorage can be found, in a depth of 18m, mud, about 0.8 mile N of the inlet entrance, under the lee of Kalubhar Tapu. A small vessel, with local knowledge, can anchor, in a depth of 20m, about 1 mile within the entrance. Tidal currents at the latter anchorage attain a maximum velocity of 3 knots.

**1.21 Vadinar Offshore Oil Terminal** (Vaadinaar Terminal), a Single Buoy Mooring (SBM) terminal with discharging facilities, is situated at about 8 miles NE of Kalubhar Tapu Light. The SBM is equipped with radar reflector, a horn, and a red flashing light; it can accommodate tankers up to 300,000 dwt, with a maximum draft of 22m.

A submarine oil pipeline is laid between Narara Bet and the buoy. Crude oil discharged from the tankers is stored in a tank farm at Vadinar, S of Narara Bet, which is then pumped to a refinery 260 miles inland. A conspicuous water tower lies at Vadinar, about 4 miles S of the root of the pipeline.

In 1982, it was proposed to develop a deep-water cargo berth in Pathfinder Inlet to form part of the projected enlarged Port Vadinar. A causeway extending nearly 1.8 miles W from the W side of Narara Bet has already been completed, with a small L-shaped pier at its head, situated 1.5 miles within the E side entrance to Pathfinder Creek.

The terminal functions under the jurisdiction of Kandla Port Trust. Pilots are available and board vessels 4.5 miles NW of the SBM.

**Regulations.**—Masters should send ETA to the Superintendent Engineer, Vadinar Offshore Oil Terminal or the Deputy Conservator Kandla Port Trust, giving 36 hours prior arrival notice at the SBM pilot station. Vessels at the berth may contact one of the above on VHF channel 12 or 16.

**Anchorage.**—VLCCs awaiting pilot or berth at the SBM should anchor in position 22°33'N, 69°38'E, in a depth of 33m, mud with broken shells. It is prohibited to anchor within 2 miles of the SBM, as charted.

Vessels should berth at the SBM at slack water or during an ebb tide, approaching the buoy from W. Due to the insufficient sea room, berthing attempts should not be made from E.

## Sikka Creek Entrance

**1.22 Sikka Creek** (Sikka Kari)(22°29'N., 69°47'E.) is entered between Goos Reef and Narara Reef, about 1.5 miles W. Sikka (22°26'N., 69°50'E.), about 5 miles SE of the entrance, consists of one of the largest cement factories in India, the power house close S and the houses of the employees. The only ships calling at Sikka are coastal vessels bringing coal or loading cement. From the cement factory, an overhead ropeway runs to the deep-water jetty, about 2 miles WNW of the cement factory. Access to the jetty is provided by Sikka Channel, a deep and buoyed channel.

Storm signals are shown at Sikka; the Brief System is used. Further information on these storm signals may be found in Pub. 160, Sailing Directions (Planning Guide) South Atlantic Ocean and Indian Ocean under "India—Signals."

Goos Reef, a large drying coral reef, has a conspicuous long sand bank on it which dries before the reef itself. A white concrete beacon lies on the SW edge of Goos Reef. Narara Reef, a coral reef which covers at 0.8m, fringes Narara Bet, and extends about 2 miles N and NE of the island. The seaward edges of all reefs are generally steep-to; during the Southwest Monsoon, there are heavy breakers over the off-lying reefs.

**Tides—Currents.**—Outside the entrance to Sikka Creek, the flood current sets E and ebb current sets W, attaining a maximum velocity of about 3.5 knots. Within Sikka Creek and Sikka Channel, the tidal currents generally set in a direction parallel to the axis of the creek and channel, respectively, attaining a maximum velocity of about 2 knots.

The tidal rise at Sikka Creek is 6.2m at MHHWS, and 4.1m at MHWN.

Siri Reef, a drying coral reef, lies about 0.7 mile SW of Goos Reef and is marked on its E side by a white beacon. In 1987, it

was reported that a beacon lies on the W side of Siri Reef, with another beacon on the reef 0.35 mile SW. A small detached drying reef lies about 0.2 mile NW of Siri Reef. A 3.7m patch lies about 0.2 mile ENE of the SE extremity of Siri Reef, in the deep channel between Goos Reef and Siri Reef.

Sikka Channel, entered about 1.5 miles NNW of the deep-water jetty, has a least depth of 8.2m and a general width of about 183m.

The deep-water jetty is 79.3m long and can accommodate medium-sized vessels of up to 9.1m draft.

**Aspect.**—The entrance range, leading between the reefs into the anchorage, is marked by range beacons. A group of four chimneys, 72m high, standing at the cement factory, are conspicuous. Close S of the cement factory, the two chimneys of the powerhouse are also conspicuous.

The channel is marked by IALA Maritime Buoyage System (Region A), and leads from the fairway (red can) buoy moored 1.3 miles NNW of Siri Reef. The channel becomes narrow inward, with a least depth of 8.2m. It is reported that buoys may liable to drag in strong winds.

**Pilotage.**—Pilots come from Okha in a tug, usually boarding ships 2 hours before HW during daylight only. There are no pilots available for the stretch between Pirothan Island and the anchorages off Kalyan Light; however, local guides are provided upon request.

The pilot should be requested 48 hours in advance. The pilot boards in the vicinity of Fairway Lighted Buoy.

**Regulations.**—All vessels are to maintain a listening watch on VHF channels 11 and 13 during oil-lighting operations from May to October.

**Anchorage.**—Sikka Creek provides sheltered anchorage, in a depth of 11m, about 0.5 mile within the entrance, between the W end of Goos Reef and Siri Reef.

An outer anchorage, in depths from 17 to 20m, is established about 2.5 miles N of Siri Reef for vessels waiting to berth alongside and for berthing at Vadinar Terminal. Vessels up to 165m long, with a maximum draft of 7.9m, can use this anchorage. The anchorage is exposed to the Southwest Monsoon; in 1987, it was reported to be congested.

Ammonia Discharge Berth consists of a concrete island jetty joined to the shore ESE by a breakwater. The berth has a length of 220m, with a pair of mooring dolphins at the ends, and has an alongside depth of 11m. A road to the shore runs over the breakwater.

**Directions.**—Vessels proceeding to Sikka Creek should not proceed into depths of less than 27m until the lighted entrance buoy is sighted. This buoy should be approached in a direction from the W through N to NE until on the entrance range; then steer on the entrance range, between Siri Reef and Goos Reef, to the anchorage, taking care to avoid the 3.6m shoal, marked by a buoy, about 0.2 mile E of Siri Reef. Caution should be taken when entering Sikka Creek during a strong ebb or flood tide.

**Caution.**—Berthing is permitted only from 2 hours before until 2 hours after HW. The use of this berth is dangerous during the Southwest Monsoon.

In 1987, it was reported that vessels berth port side-to and leave stern first because of insufficient turning room off the berth. Another berth for discharging ammonia was in operation the same year.

## Sikka Creek to Bedi

**1.23** Dera Island, a mangrove islet with a range of low sandhills, lies about 2.5 miles NE of the N extremity of Goos Reef. The NW end of this islet is a bluff about 4.6m high. A drying reef extends about 1.5 miles W, 0.8 mile N, and 4.5 miles NE from the NW extremity of Dera Island.

**Pirotan Island** (22°36'N., 69°57'E.), about 6.5 miles NE of the NW extremity of Dera Island, is a good landmark as the trees on it are not allowed to be cut down. The island lies about 1 mile from the mainland, to which it is connected by a drying coral reef.

Pirotan Island Light is shown from a pyramidal concrete tower, with red bands, on the NW extremity of the island. Another light is shown from an iron framework beacon, on a stone base, on the edge of the reef about 1.5 miles NE of Pirotan Island Light.

Jindra Bet (Pirotan Swamp), with its NW extremity about 4 miles W of Pirotan Island, consists of sand and mud flats, is fringed by mangroves, and is liable to flood. The N side of the island consists of sand dunes, 1 to 3m high.

Rozi Island, rocky and 11.3m high, lies about 5 miles SE of Pirotan Island. A group of four conspicuous radio towers, having an elevation of 44m, lies on the E side of Rozi Island, and a conspicuous water tower with an elevation of 38m is situated on the SE side of the island.

A radio mast, with an elevation of 76m and marked by an obstruction light, lies 6.3 miles SE of Rozi Mata Temple.

## Bedi (22°31'N., 70°02'E.)

World Port Index No. 48650

**1.24** Bedi Docks, about 1 mile NW of the village of Bedi, form the port for Jamnagar, about 3.5 miles SE, with which they are connected by a railway. The port is an all-weather lighterage port open throughout the year. The basin at Bedi Docks dries at half-tide. Cargo is worked at the anchorage.

A stone pier, the seaward end of which covers at half tide, extends about 0.8 mile NNW from the N end of Rozi Island. Bedi Creek, providing access to Bedi Docks, is entered W of the stone pier. Tidal currents in the creek have a maximum velocity of 2.5 knots in spring tides.

**Aspect.**—**Rozi Mata Temple** (22°33'N., 70°03'E.) lies at the N end of Rozi Island. Rozi Mata Light is shown from a white circular tower, 15m high, on the NW corner of the temple courtyard. A light is shown from the head of the stone pier, about 1 mile NNW of the temple. Bedi Bandar Light is shown from a white metal framework tower lying about 1 mile SSW of Rozi Jetty.

A light is shown from Kalyan Beacon, on the NE edge of the drying reef, about 1.8 miles N of the stone pier.

Two radio masts, 36.5m high, about 3.5 miles S of Rozi Mata, and Pratap Clock Tower, about 1.25 miles farther SE, are conspicuous.

**Pilotage.**—No pilots are available, but local guides are available; they are embarked N of Pirotan Island Light.

**Anchorage.**—Large vessels may anchor, in 15m, mud, about 1.75 miles N of Kalyan Beacon. A better berth is about 2 miles NE of Kalyan Beacon.

Small craft with local knowledge can anchor, in 5.5m, mud, about 0.5 mile NE of Kalyan Beacon, sheltered from W winds, which prevail from February through October. There is a white mooring buoy about 0.8 mile SE of Kalyan Beacon.

**Directions.**—Vessels approaching from the W should not alter course S until Kalyan Beacon bears 185°. This will avoid the reefs and shoals extending offshore between Pirotan Island and Rozi Island. Vessels entering or leaving the anchorage should keep N of Ranson Shoal.

**Caution.**—A submerged rock lies about 1.8 miles E of Kalyan Light, a dangerous wreck about 2 miles NNE, and another wreck 3 miles NE from the same light. A wreck with a 10m depth lies about 2 miles ENE of Kalyan Light; another dangerous wreck lies about 1 mile NE of the light.

Ranson Shoal, with a least depth of 1.5m, is located about 3.3 miles N of the stone pier. Depths of less than 5.5m extend about 0.7 mile ESE of the least depth.

## Bedi to Mungra Reef

**1.25** The coast between **Rozi Mata Temple** (22°33'N., 70°03'E.) and the village of Sachana (Sachara), about 7.5 miles E, consists of sand and mud flats, fringed with mangroves, and intersected by creeks.

A small range of rocky mounds, 12.2 to 15.2m high, fronts the coast about 3 miles NNE of Sachana. These mounds are isolated at HWS.

At Balachadi (Balachiri), about 2.8 miles NNE of Sachana, a range of hills about 30m high extends SE and terminates rather abruptly about 1.5 miles from the village. A small conical hill, detached from the mainland and isolated at HW, lies about 0.8 mile NNE of Balachadi; Aku Pir (Akria Pir), a Mohammedan building, lies on the summit of the hill.

**Balachadi Rocks** (Balachiri Rocks) (22°41'N., 70°10'E.), which dry, have been reported to give good radar returns at 9 miles.

The NW bastion, 24m high, of the fort at **Jodiya** (22°42'N., 70°18'E.), and a house close SE, are conspicuous about 7.5 miles NE of Aku Pir and 2.8 miles inland. These objects are unmistakably identifiable and can be seen 10 to 12 miles in clear weather.

About 2 miles NW of the fort a light is shown. A light is shown from the N extremity of the quay wall at Jodiya Bandar (Bandar).

Mungra Reef, at the W edge of the drying coastal reef, lies with its W edge about 6 miles WNW of Jodiya Bandar. About 0.8 mile within the W extremity of Mungra Reef lies a heap of sand and shells. This is the first part of the reef that dries, and the position of the remainder of the reef may be determined from it.

A light stands on a small detached drying reef close S of the W extremity of Mungra Reef.

**Anchorage.**—Balachiri Roads, NW of Aku Pir, may be approached with Aku Pir bearing 120°, on which bearing anchorage can be taken, in 5.5 to 9.1m, soft mud, according to a vessel's draft. The anchorage is protected from NE gales by the reefs N, but local knowledge is necessary for navigating this part of the gulf.

Anchorage may be taken, in 5.5m, mud, sheltered from strong NE winds, with the fort at Jodiya bearing 109°, and the

beacon off the W end of Mungra Reef bearing 003°, distant 1.5 miles.

## Head of the Gulf of Kutch

**1.26** Little Rann, which flows into the head of the Gulf of Kutch, is dry during the Northeast Monsoon from November to February. It is a great inland sea and quite impassable during the Southwest Monsoon, when the sea is driven many miles E by the wind.

This vast sheet of water is drained by Nakti Creek, Kandla Creek, and Hanstal Creek. These creeks are subject to the regular tides. The ebb current in Hanstal Creek, because of the large shallow area which it covers and uncovers, attains a velocity of 6 to 7 knots at its mouth; the ebb current flows longer than the flood, their durations being about 8 hours and 4 hours, respectively.

Between the mouth of Hanstal Creek and the coast on the S side of the head of the gulf, there is another rann resembling Little Rann. Its W edge is fringed with mangrove bushes; the ordinary HW mark extends from the mouth of Hanstal Creek toward Jodiya. At HW this area is like a large inland sea of only about 1m depth; in the Southwest Monsoon it is navigated by boats drawing from 0.9 to 1m.

About 4.5 miles NNE is Jodiya, a rocky islet, covered with bushes, lying about 1 mile E of the ordinary HW mark.

**Tides—Currents.**—In the W approach to Kandla Creek and Hanstal Creek, the tidal currents are very irregular and appear to be greatly influenced by a strong wind from any quarter. They are strong and gradually increase in velocity to within the entrance of Hanstal Creek. At Outer Tuna Fairway Buoy, the velocity is 2.5 knots at springs and 1.5 knots at neaps; at the entrance of Hanstal Creek the velocity is 7 knots at springs and 4 knots at neaps.

**Caution.**—The head of the Gulf of Kutch between Jodiya and the entrances of Kandla Creek and Hanstal Creek is encumbered with numerous changing shoals. Local knowledge is necessary while navigating in this part of the gulf.

**1.27 Nakti Creek** (22°56'N., 70°09'E.) has almost entirely silted up and can now be used only by small local craft at HW proceeding to Tuna Bandar, about 3 miles up the creek on its W side.

The W entrance point of the creek is very low and is covered with mangrove bushes which are nearly submerged at HW. Narrow ridges of coarse sand and broken shell, from 0.3 to 1.2m high, front the rann on the W side of the creek.

Tekra Islet, about 1.3 miles WNW of the W entrance point of the creek, consists of mud covered with mangroves. A similar islet lies about 0.5 mile SE of Tekra Islet.

**Tekra Light** (22°56'N., 70°07'E.) lies about 1.3 miles SW of the W entrance point of Nakti Creek. The light is shown from an iron column on a black masonry tower, 14m high, with white bands, situated on a sandy ridge on the S edge of a mangrove swamp.

Beacon G, painted black, surmounted by a rectangular topmark and 13.7m high, lies about 6 miles W of Tekra Light.

Beacon I, painted black and surmounted by a ball, lies about 3 miles E of Beacon G.

Beacon H, painted red, with a diamond topmark and 15m high, lies about 2.8 miles NE of Tekra Light.

The channel leading to Tuna Bandar is marked by range beacons.

### Kandla (23°00'N., 70°13'E.)

World Port Index No. 48630

**1.28** The port of Kandla, on the W bank of Kandla Creek, about 2.5 miles within its entrance, is a naturally-sheltered harbor in all seasons. The approach to Kandla leads W of Khara Dhada and Mid Shoals, through Sogal Channel, then N through a buoyed channel passing over Kandla Bar to the creek.

The Kandla port jurisdiction extends to Kalubhar Tapu marking its W limits, which include Pathfinder Inlet, Vadinar Offshore Oil Terminal, Rozi Anchorage, and Hantal Creek.

#### Port Authority of Kandla

<http://www.kandlaport.com>

**Tides—Currents.**—The tidal rise at Kandla is 6.6m at MHWS, and 5.7m at MHWN.

On Kandla Bar the flood current sets NE with a velocity of 2 to 3 knots at springs tides. The flood tidal currents in Kandla Creek attain maximum velocities of 3 to 4 knots at spring tides.

**Depths—Limitations.**—Kandla is a tidal port; entrance and departure depend on the tide. Vessels up to 225m in length, with a maximum draft of 9.2m at HW neaps and 10.1m at HW springs, can use the port. Maximum permissible drafts are issued quarterly by the Deputy Conservator.

The main cargo jetty has six berths, with a total quayside of 1,440m. Vessels up to 225.5m in length, with a maximum draft of 9.1m, can be accommodated. A seventh berth, 340m long, is under construction at the S end of the quay.

An oil jetty, with two berths, is situated on the W side of Kandla Creek about 1.5 miles N of the cargo jetty; tankers up to 40,000 dwt, with a maximum length of 213m and a maximum draft of 10.3m, can be accommodated. A tank farm stands close to the root of this jetty; a second oil jetty lies 0.2 mile S.

A deep-draft mooring in the harbor can accommodate vessels up to 225.6m in length and 11.3m draft.

Mooring berths close NE of the quay can accommodate vessels up to 152.4 and 183m in length and 7 to 8.8m draft.

The salt mooring in the N part of the harbor can accommodate vessels up to 183m in length and 8.8m draft.

Kala Dara Shoal (Kara Dhada Shoal), in the entrance to Kandla Creek, dries 2.7m and consists of hard dry sand.

Sogal Channel leads towards Kandala Creek between Khengarji Bet and Kala Dara Shoal. The channel is dredged and marked by lighted buoys conforming to the IALA Maritime Buoyage System (Region A); the buoys are moved frequently to meet changes in the channel.

Sathsaida Leading Lights lead through Sogal Channel; a second pair, lying close NNW, leads across the inner bar to Kandala Creek.

Kapoor Shoal, about 0.8 mile SE of and parallel to Kala Dara Shoal, has depths of less than 5.5m and a least depth of

1.2m; it consists of ridges and pinnacles of coarse sand, small stones, and broken shells.

Mid Shoal, which dries 0.7m, lies 0.3 mile N of the NE extremity of Kala Dara Shoal.

Kandla Bar, at the entrance to Kandla Creek, had a least depth of 4.3m in 1994. The depth over the bar is subject to constant change.

Flamingo Flat, a drying mud bank, extends about 2 miles S from the SW extremity of Sathsaida Bet.

The depths over the bar and in Kandla Creek are subject to constant change and the latest information should be obtained from the Deputy Conservator, Kandla.

The nature of the bottom throughout the creek is coarse sand, small stones, and broken shell, except in depths of less than 5.5m near the banks, where the bottom is mud.

Barry Shoal, on the W side of the harbor and about 0.5 mile N of the cargo quay, is a ridge with depths of 2.7 to 5.5m.

**Aspect.**—Kandla Creek is entered among mangrove bushes, between Khengarji Bet and Sathsaida Bet, both of which are typical rann ground of hard mud flats; it then extends N for about 7 miles, where the creek forks. Both sides of the creek are protected by steep mangrove-lined banks, which just cover at HWS.

Navinal Point and Bhadreswar Temple have been previously described in paragraph 1.14. Tekra Light, along with Beacon G, Beacon H, and Beacon I, have been previously described in paragraph 1.27.

**Outer Tuna Lighted Buoy** (22°51'N., 70°07'E.), painted red, marks the entrance of the channel to Kandla.

In 1980, less water was reported in the entrance to the channel between Kala Dara and Kapoor Shoals. It is cautioned that the buoys and channels are liable to be moved due to frequent changes in depths.

Beacon A, painted black, with a cone topmark and 18m high, lies about 0.8 mile WNW of the W entrance point of Kandla Creek.

Beacon B, painted black, with a ball topmark and 12m high, is situated on Sathsaida Bet, about 1.8 miles ENE of Beacon A. Beacon C and Beacon E, situated about 1.8 and 3.3 miles, respectively, SE of Beacon B, are similar to Beacon B, except they are surmounted by an inverted cone and a rectangle, respectively, and Beacon E is 9m high.

A black masonry radar tower, 29m high, lies close N of the cargo quay. A water tower, 24m high, lies about 0.5 mile S of the radar tower.

Two framework water towers, each 26m high, are situated about 0.6 mile WNW and 1.4 miles N, respectively, of the radar tower.

**Pilotage.**—Pilotage is compulsory; it is available during daylight hours only for tankers and 24 hours for all other vessels. The pilot boards at Tuna Buoy at the mouth of Kandla Creek. Requests for pilots should be sent to the ship's agent 12 hours in advance. Vessels should contact Kandla Tower via VHF channel 16.

**Regulations.**—Vessels berth at HW only. Tankers or vessels with an overall length exceeding 183m, with a draft of more than 8.2m, or with a speed capability of less than 9 knots, may not enter or leave the port during darkness nor may ships at moorings be berthed or unberthed except in daylight.

It was reported (1993) that berthing is restricted to daylight hours only due to the small number of pilots available and the poor condition of the lighting on the jetty. The movement of tankers is also restricted to daylight transit of Sogal Channel.

Kandla lies in a controlled area where special security regulations are in force; photography of shore installations is forbidden.

**Signals.**—The port signal station is situated near the radar tower. Communication may be made with the signal station by semaphore and the International Code of Signals by day, and by flashing light at night. The port is also equipped with VHF.

Storm signals are displayed; the General System is used. Further information on these storm signals may be found in Pub. 160, Sailing Directions (Planning Guide) South Atlantic Ocean and Indian Ocean under "India—Signals."

Signals used in the port are given in the Kandla Port Rules issued by the port administration.

A black ball displayed at the masthead of the signal station indicates a vessel is about to enter or leave the harbor.

In the event of an outbreak of fire in the port area or on a ship alongside a berth, a blue square flag by day and two green lights shown vertically by night will be displayed from the yardarm of the signal mast. In addition, eight short blasts followed by one long blast will be sounded on the port siren and repeated at short intervals.

**Anchorage.**—Good anchorage can be taken, in 8.2m, coarse sand, small stones, and broken shell, about 0.4 mile NE of the oil pier in the N part of the harbor.

Vessels liable to quarantine regulations will remain in the quarantine anchorage, about 1 mile S of Outer Tuna Lighted Buoy until pratique is granted. Vessels suspected of having minor infectious diseases on board may be brought into the harbor and anchored or berthed in a suitable quarantine area.

### Hanstal Creek (22°56'N., 70°24'E.)

World Port Index No. 48640

**1.29** Hanstal Creek (Hansthal Creek) is entered about 8 miles ESE of the entrance to Kandla Creek. The width of the entrance has doubled by erosion in the last 50 years, and is now about 1.5 miles wide between Sathsaida Bet and the coast S. The S side of the approach is formed by a coast fringed with ridges of coarse sand and broken shell, 0.3 to 0.9m high.

**Tides—Currents.**—The flood and ebb currents in Hanstal Creek attain a velocity of 5 knots in the channel between the mangrove bushes; during freshets, the velocity may sometimes increase to 7 knots.

The tidal rise at Navlakhi is 7.2m at MHWS and 6.2m at MHWN.

**Depths—Limitations.**—The approach channel to Hanstal lies between Kapoor Shoal and Singare Shoal to the N, and Baptista Shoals to the S. Kapoor Shoal was previously described in paragraph 1.28 with Kandla. Singare Shoal (Singari Shoal), with depths of less than 5.5m, extends up to 1.5 miles off the S side of Flamingo Flat and has a least depth of 2.4m on its S edge. Baptista Shoals, similar in composition to Kapoor Shoal, dry 1.2m, and lie about 0.8 mile SE of the E end of Kapoor Shoal.

Navlakhi Bet lies on the N side of Sui Creek, at its junction with Hanstal Creek, about 4 miles NE of the entrance to the latter creek. The alongside facilities for **Navlakhi** (22°58'N., 70°27'E.), a lighterage port, are situated on the S side of Navlakhi Bet. Cargo is worked at the anchorage. The largest vessel accommodated was 24,600 dwt.

**Aspect.**—Murga Bet (Murga Island), consisting of several islets covered with mangroves, lies in the middle of Hanstal Creek, about 0.8 mile NW of Navlakhi Bet.

Beacon F, painted black, with a ball topmark and 12m high, is situated near the SE extremity of Sathsaida Bet.

Beacon D, painted black, with a diamond topmark and 12m high, lies about 3 miles W of Beacon F at the S extremity of Sathsaida Bet.

A wooden beacon, with a triangular topmark and 3m high, lies on the SW extremity of Murga Bet.

A light is shown from a conspicuous steel framework tower, 23.5m high, on the NW extremity of Navlakhi Bet.

**Pilotage.**—Pilotage is not compulsory, but if requested, local pilots can be provided by the Port Authority; the pilot will board in position 22°44'N, 70°05'E. The vessel's ETA should be provided 24 hours in advance. Pilot activities are during daylight hours only.

**Anchorage.**—The holding ground in Hanstal Creek is not good, as rock lies a little way beneath the mud, and the strong tidal currents cause a vessel to drag anchor easily.

Vessels over 2,000 grt should anchor, in 9m, about 0.8 mile NW of the entrance of Moti Patar Creek, which lies on the SE side of Hanstal Creek. The holding ground here is fairly good, and the directions of the tidal currents are fairly steady.

Small vessels can anchor farther N, but cross currents from the creeks cause excessive yawing and a great strain on the anchor cable.

**Caution.**—A wreck, with a depth of 3.7m, lies S of Kapoor Shoal, in the approach to Hanstal Creek. Local knowledge is necessary for navigating Hanstal Creek and its approaches.

### The Gulf of Kutch to Porbandar

**1.30** The coast of Kathiawar from Humani Point, the S entrance point of the Gulf of Kutch, to Kachchigadh, about 11.5 miles SW, is composed of low sandhills. Between Kachchigadh and Dwarka Point, about 5.5 miles S, the coast is cliffy, and thence to Madhi, about 12 miles farther SE, the coast is again composed of low sand hills. The above coast forms the W side of a very low peninsula. At HWS tides and during the South-west Monsoon, this peninsula is separated from the mainland by Okha Rann, which extends from Madhi in a NNE direction for about 12 miles to Pindara Bay.

A light, with a racon, is shown from a white round concrete tower with red bands at Kachchigadh.

A 30m sand hill with bushes on it lies about 2 miles N of Kachchigadh.

Warwala, about 2.5 miles SSE of Kachchigadh and 1 mile inland, is a large walled town. A square tower in the town is conspicuous and visible several miles to seaward.

**Dwarka Point** (22°14'N., 68°57'E.) is the W extremity of the promontory on which the town of Dwarka is situated. A light is shown from a white, square stone tower, 37m high, on the

point. Three chimneys, the tallest being 70m high, are conspicuous near the point.

**Caution.**—A dangerous wreck lies 4.5 miles offshore about 8 miles S of the light.

**1.31** Dwarka Temple (Jagat Mandir), a stone structure, 51m high, carved with figures from base to summit, lies within Dwarka Fort on high ground close to the sea. In clear weather this temple is conspicuous and can be seen from 17 to 18 miles. A column lies close to the edge of the cliff a short distance W of the temple.

Rupen Bandar, the port for Dwarka, is shallow and obstructed by rocks at its entrance, about 1 mile N of Dwarka. The cliffs between Rupen Bandar and Dwarka are about 12m high and covered with cactus bushes.

Tidal currents abreast Rupen Bandar set N with the flood, at a velocity of more than 2 knots, and SSE with the ebb, at about the same velocity. Farther N, the tidal currents are stronger.

Anchorage for large vessels can be taken, in 20 to 22m, sand, with Dwarka Temple bearing 069°, distant 1.5 miles. The bottom is rocky in the approach to the Gulf of Kutch; several vessels have lost their anchors.

Madhi, about 12 miles SE of Dwarka, is a village with a small dark temple and an old tower lying on elevated rocky land near the coast. About 4.8 miles NW of Madhi, a freshwater current flows into the sea during the rainy season. There are many such streams along the Kathiawar coast, which cause breaks in the coral reef that fringes the coast, furnishing good landing places where small boats can lie aground in the mud.

The coast between Madhi and Meda Creek, about 22 miles SE, consists of a high sandy ridge, with dispersed gaps. The only conspicuous objects on this coast are two small conical hills about 3 miles SE of Madhi. A prominent radio mast, marked by a red obstruction light, is situated 4.5 miles SE of Madhi.

Meda Creek, the estuary of a river, dries. Miani, a small village with a fort, lies on the E bank of the creek. On the W side of the creek, abreast the village, is a pagoda or temple on a hill about 56m high. Meda Creek has been reported to give good radar returns at 15 miles.

The coast between Meda Creek and Porbandar, about 16 miles SE, is low but rises gradually NW.

### Porbandar (21°38'N., 69°36'E.)

World Port Index No. 48680

**1.32** Porbandar is the largest town on the coast of Kathiawar. The principal imports are fertilizers, tiles, timber, fresh dates, and petroleum products; exports include cement, groundnut oil, and cotton.

**Tides—Currents.**—Tidal currents are not perceptible in the offing. In the entrance of the shallow creek, the ebb current runs very strongly and continues for some time after LW.

**Depths—Limitations.**—The indentation of the creek is shallow as the coastal bank, with depths of less than 5.5m, extends about 0.8 mile offshore.

An S-shaped breakwater, 2,560m in length, extends S from the point on which lies Kadar Pir and provides shelter for a port which is in operation throughout the year.

A light is situated at the head of the breakwater.

On the E side of the breakwater, about 0.8 mile S of Kadar Pir, there is a quay 235m long with depths from 9.5 to 11m alongside; the deck of the quay is a 5m above MHHW. The quay provides one berth for vessels up to 183m long with a draft of 8.5m. It was reported that the breakwater S of the berth had been breached in two places.

An anchor berth E of the breakwater is used for lighterage operations.

There is a mooring buoy about 0.25 mile E of the quay, in a depth of 7m. This buoy, and an anchor berth E of the breakwater, are used for lighterage operations.

**Aspect.**—The **Barda Hills** (Barda Range) (21°48'N., 69°44'E.) are conspicuous and make a good landfall; in clear weather they are visible from 25 or 30 miles.

Porbandar lies on the E side of the entrance to a narrow creek, which flows out between the town and a point on which lies Kadar Pir, a conspicuous mosque with an elevation of 8m. A conspicuous pillar is situated on the coast 0.5 mile NW of the mosque.

Porbandar Light is shown from a tall round stone tower with black horizontal bands lying on the coast in front of the town.

Conspicuous chimneys are situated 1 mile N and 0.5 mile ESE of New Hazur Palace. In addition, the towers of the water works, 1.5 miles N of the palace, are prominent.

The Rajah's old palace, a white square building with a red roof, lies 0.5 mile ESE of New Hazur Palace.

**Pilotage.**—Pilotage is compulsory for vessels proceeding to a mooring buoy or an alongside berth within the breakwater. Vessels requiring a pilot should anchor 0.3 mile S of the breakwater.

**Anchorage.**—The outer anchorage is 2.3 miles SSW of Porbandar Light, in a depth of 17m. Small vessels can anchor closer inshore according to draft. An examination anchorage is established and is centered about 1.5 miles WNW of the head of the breakwater.

**Caution.**—During the Southwest Monsoon, a 0.6m swell is generated within the breakwater; heavy fore and aft springs are essential for ships berthed alongside.

### Porbandar to Veraval

**1.33** The coast between Porbandar and Navibandar, about 15 miles SE, consists of sandhills with clumps of trees near the villages. Inland there is an extensive swamp, which is flooded during the rainy season. At Tukda (Tunkra), about 10 miles SE of Porbandar, there is a conspicuous temple.

**Navibandar** (21°27'N., 69°47'E.) is a walled town close to the coast. A light is shown from the sea-face wall of the center bastion at Navibandar from September to June. The Bhadar River enters the sea about 0.8 mile NW of the town; its entrance is shallow and rocky.

**Anchorage.**—Good anchorage can be taken, in 9.1m, off the entrance of the Bhadar River, with the light structure at Navibandar bearing 099°.

**Gorakhanath** (21°32'N., 70°32'E.), 1,116m high, lies about 53 miles NNW of Diu Head and about 35 miles inland. The mountain is an enormous granite rock, conical, isolated, and bare, upon which there are numerous temples and monasteries.

In clear weather, it is prominent from Porbandar to abreast Diu Head, but farther NW it is obscured by the Barda Hills.

Madhavpur, about 15 miles SE of Navibandar, is a small walled town on the coast. The town of Mangrol, about 12 miles farther SE and 1 mile inland, has a high tower which is conspicuous from 10 or 12 miles. Mangrol Light is shown from a square house at Mangrol Bandar. There is a pier, 122m long, on the coast SW of Mangrol.

The Megal River, about 11 miles SE of Mangrol, flows into the sea during the Southwest Monsoon, but, like most rivers on this coast, its mouth is generally choked with sand.

## Veraval (20°54'N., 70°22'E.)

World Port Index No. 48690

**1.34** The town of Veraval shows up well from seaward, as many of the houses rise up abruptly from the surrounding countryside. Somnath, a town of about the same size as Veraval, is situated on the coast about 1.8 miles ESE of Veraval.

**Tides—Currents.**—Tidal currents are not perceptible in the roadstead, but there is sometimes a surface drift of about 0.5 knot, depending on the wind

**Depths—Limitations.**—Veraval is an open roadstead where vessels load and discharge by lighters working to quays in the inner harbor. The inner harbor, close SE of the customhouse, is sheltered by a breakwater extending SE from the coast. The port is closed to shipping from May 15 to September 15.

A shoal, with a least depth of 10m, lies about 1 mile SSE of the breakwater head.

A dangerous wreck, marked by a white can buoy, lies about 0.2 mile ESE from the breakwater head.

A detached rocky shoal, with a least depth of 4.6m, lies about 0.2 mile SE of the breakwater head.

There are depths of 3 to 4m in the inner harbor. There are two basins in the inner harbor; two of the quays have depths of 4m alongside. The channels leading to the quays are maintained by dredging.

**Aspect.**—The customhouse, a large white building facing the sea, is the most conspicuous landmark.

A chimney, 51.5m high, is conspicuous about 1 mile NW of the customhouse.

Veraval Light (20°54'N., 69°23'E.) is shown from a white masonry tower, 33.5m high, with black bands, situated near the coast about 1 mile WNW of the custom house.

Deni Barra, a cliffy point, 9.1m high, with a temple, 7.6m high, is conspicuous about 0.5 mile NW of Veraval Light.

Bhirbhanjan Temple (Bhirria Temple) is conspicuous about 0.8 mile E of the custom house. Lighted Beacon A is shown from a white square masonry structure, 6.1m high, close SW.

Somnath, about 1.8 miles ESE of Veraval, is surrounded by a wall of dark-colored stone. A conspicuous temple, 56m high, lies on the seaward side of the town.

Two buoys, both of which are removed when the port is closed, mark the entrance to the inner harbor.

**Pilotage.**—Pilotage is not compulsory. Vessels should send their ETA messages through Mumbai or Kandla.

**Signals.**—There is a signal station at Veraval which vessels may communicate with by the International Code or Morse Code.

Storm signals are displayed from the mast above the customhouse; the General System is used. Further information on these storm signals may be found in Pub. 160, Sailing Directions (Planning Guide) South Atlantic Ocean and Indian Ocean under "India—Signals."

**Anchorage.**—Good anchorage can be obtained, in depths of 12 to 18m, sand, with the customhouse bearing 343°, the temple on Deni Barra bearing 315°, and with Bhirbhanjan Temple in line bearing 040° with Lighted Beacon A close SW.

In fine weather anchorage can be obtained farther inshore, in 10 to 12m, coral rock, with the customhouse bearing 348°, the temple on Deni Barra bearing 313°, and Bhirria Temple bearing 058°.

## Veraval to Diu Head

**1.35** The coast between Sutrapara, about 7.5 miles ESE of Veraval, and Mul Dwarka, about 11 miles farther ESE, is low and sandy with patches of cliffs at intervals.

**Mul Dwarka** (20°45'N., 70°40'E.) is below a small bluff point with a temple on its summit which has an elevation of 24m. The point can be identified by the white sand on the top of the cliffs and the dark building of the temple.

The port contains a 250m long private jetty used for unloading cement. The depth alongside the jetty is 9.5m.

The Surmat River flows into the sea about 1.5 miles W of Mul Dwarka; the Singavado River empties about 0.5 mile E of the point. The latter river has very little water in it except during the rains.

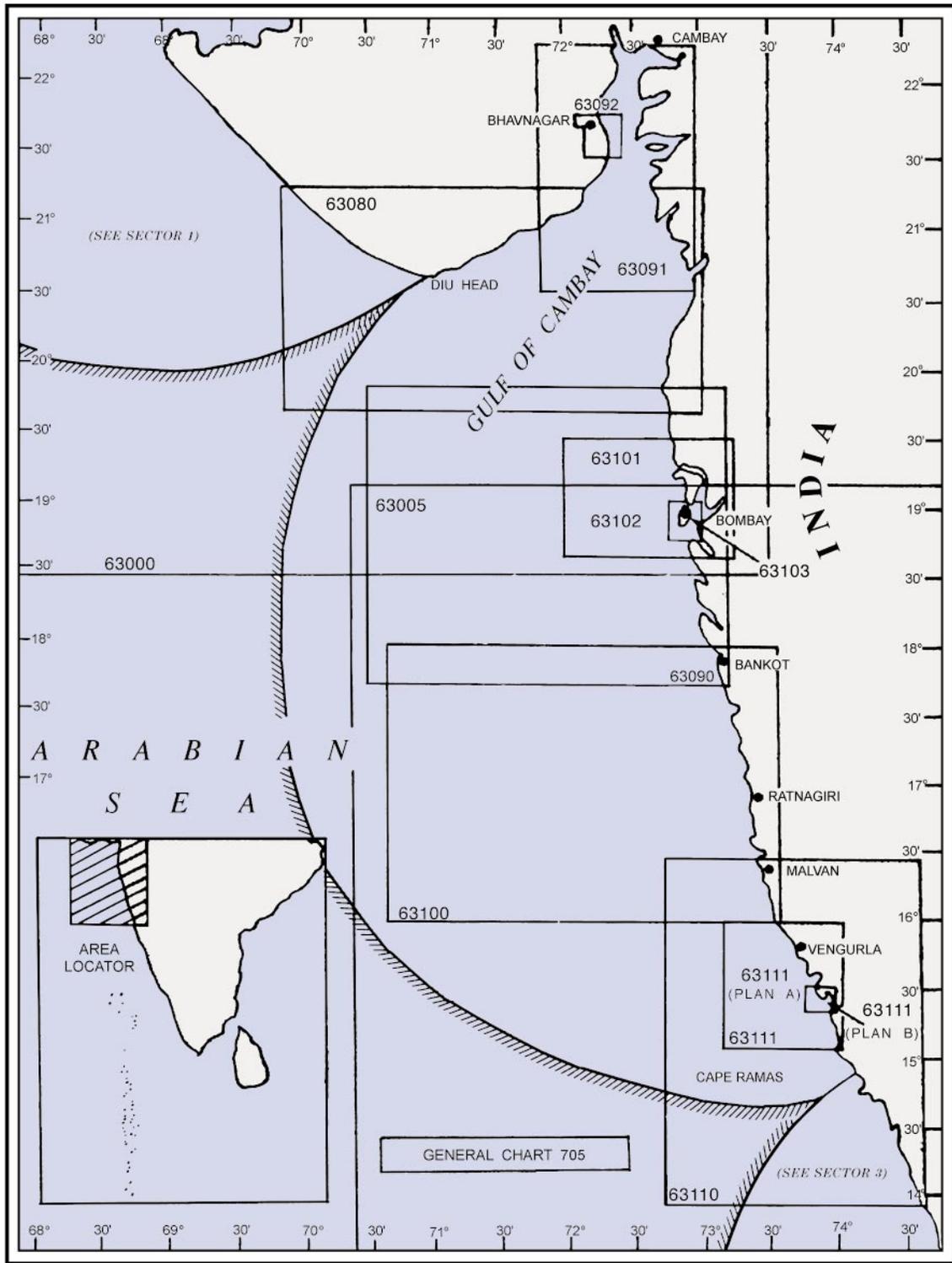
Kodinar, a town about 3 miles NE of Mul Dwarka, is just visible among the trees.

The coast between Mul Dwarka and **Diu Head** (20°41'N., 70°50'E.), about 10 miles ESE, consists of rocky points with sandy bays between and some cliffs 9m to 12m high. A submerged rock, with depth of 2m or less, lies about 2.5 miles W of Diu Head Light.

Chara is a village near the coast, about 3 miles ESE of Mul Dwarka. The coast is more densely wooded here and the trees are larger than elsewhere on the coast. A white tomb lies close to the coast about 0.8 mile W of Chara.

**Tides—Currents.**—Between Sutrapara and Diu Head, the ebb current sets WNW and the flood ESE at a velocity of 1 to 1.5 knots, but they are subject to irregularities. In December and January, with the current setting up the coast, the W tidal current is increased, while the E tidal current is weakened and may at times be imperceptible.

**Caution.**—The coast between Mul Dwarka and Diu Head is fronted by a rocky shoal lying about 1.5 miles offshore, with a least depth of 3m. A vessel should not approach it to a depth of less than 24m.



Additional chart coverage may be found in NGA/DLIS Catalog of Maps, Charts, and Related Products (Unlimited Distribution).  
**SECTOR 2 — CHART INFORMATION**

## SECTOR 2

### INDIA—WEST COAST—DIU HEAD TO CAPE RAMA (INCLUDING THE GULF OF CAMBAY AND BOMBAY)

**Plan.**—This sector describes the W coast of India between Diu Head and Cape Rama, including the Gulf of Cambay. The sector includes the port of Bombay, the largest seaport on the W coast of India. The arrangement of the sector is from N to S.

#### General Remarks

**2.1** An extensive offshore area, bounded approximately by the parallels of 18°00'N and 19°50'N, and the meridians of 71°00'E and 72°40'E, is being developed for oil production. Numerous oil derricks, oil production platforms, single point moorings, etc., obstruct navigation within the area.

Recommended routes have been established by Indian authorities to aid traffic transiting the area, as well as vessels bound to or from the port of Bombay. The Indian government requests that vessels remain 1 to 2 miles to starboard of the tracklines shown on the chart, consistent with safe navigation, and the International Regulations for Preventing Collisions at Sea, 1972 (72 COLREGS).

The extent of the development area and the recommended routes are best seen on the appropriate chart.

#### Diu Head to Diu Harbor

**2.2 Diu Head** (20°41'N., 70°50'E.), a rocky bluff about 30m high, can be identified by the lighthouse, two long buildings, and a small temple lying near its summit. From this summit the land slopes gradually E, terminating in a rocky point, on which there is a cairn, 8m high.

The Gir Hills, about 25 miles N of Diu Head, extend about 40 miles in an E-W direction and attain an elevation of about 640m, but cannot be seen from any great distance from the SW. Nandivela, 529m high, the SE peak of the range, lies about 27 miles NE of Diu Head and is conspicuous from the S.

**Madhwad Bay** (Mandwa Bay) (20°42'N., 70°56'E.) lies between the E extremity of Diu Head and Nagwa Point, the SW extremity of Diu Island, about 3.5 miles E. The bay affords shelter from NW winds, and the holding ground is good, but there is frequently a swell setting into it. The anchorage should not be used with S or E winds.

The coast at the head of the bay between Diu Head and Brancavara Creek, about 2.3 miles ENE, consists of low sand hills backed by marshy land, which is partly submerged at HW springs. Between Brancavara Creek and Nagwa Point, the coast consists of sand dunes which extend inland to a thick unbroken belt of palm trees.

Madhwad Creek, which dries, is entered about 0.9 mile NNW of the E extremity of Diu Head.

**Nagwa Point** (20°42'N., 70°54'E.) is a dark bluff, with cliffs 9.1 to 12.2m high, rising to a 20m summit marked by a bush. Shoal water, over which the sea breaks occasionally, extends about 0.3 mile WSW from Nagwa Point.

A conspicuous temple lies on the E entrance point of Brancavara Creek. Another prominent temple is situated about 0.5 mile farther NE.

**Caution.**—Rocky Shoal, with a least depth of 1.4m, lies in the middle of the entrance of the bay. The E end of this steep-to shoal, over which the sea occasionally breaks, lies about 1.3 miles WSW of Nagwa Point.

**2.3** Madhwad Bainsla, a rock 2m high, lies about 0.2 mile E of the E extremity of Diu Head. Foul ground, over which the sea breaks heavily, extends about 0.1 mile N and 0.3 mile E from this rock. At springs, strong tide rips and overfalls occur E of Madhwad Bainsla.

Kachbi Reef (Khasbi Reef), which dries from 0.6 to 0.9m, lies about 0.5 mile E of the SW entrance point of Brancavara Creek.

**Anchorage.**—Anchorage can be taken on either side of Rocky Shoal. At the anchorage E of this shoal, vessels usually lie across the wind and tide when the ebb current sets out of Brancavara Creek. There are depths of 10 to 12m, sand and mud, at this anchorage.

Moderate-sized vessels can anchor, in 8m, sand and mud, about 1 mile ENE of the E extremity of Diu Head, and about 0.6 mile offshore.

Vessels are not advised to anchor midway between Madhwad Gainsla and the W end of Rocky Shoal because of the strong tidal currents and the exposed position.

Small craft can anchor, in 7m, between Nagwa Point and Kachbi Reef, sheltered from E winds and out of the influence of the tidal currents. Dhows, usually without lights, may be found here at night, as it is a favorite anchorage for sailing craft waiting for the flood current to proceed up the Gulf of Cambay.

**Directions.**—Vessels intending to anchor E of Rocky Shoal should approach with the conspicuous temple on the E entrance of Brancavara Creek bearing 322°, and anchor when the S extremity of Nagwa Point bears 077°, distant 0.9 mile, in 11m, sand and mud.

Vessels approaching from the E and intending to anchor NW of Rocky Shoal should steer with Madhwad Bainsla, or the E extremity of Diu Head, bearing more than 283°, and open well N of the light structure on Diu Head. This course leads S of the S extremity of Rocky Shoal. Course should be altered N for the anchorage about 1 mile ENE of the E extremity of Diu Head, when the E of two distant sharp peaks bears 005°. Steer for this peak on this bearing, taking care to avoid a 4.9m patch about 0.5 mile NW of Rocky Shoal. Vessels can anchor when the cliffs on the S side of the entrance of Madhwad Creek bear 270°, with the S entrance point of the creek about 1.25 miles.

When approaching this latter anchorage it should be remembered that the flood current sets strongly toward Rocky Shoal and the ebb current toward Madhwad Bainsla.

**Diu Harbor (20°43'N., 71°00'E.)**

World Port Index No. 48710

**2.4** Diu Harbor, between the E end of Diu Island and the mainland N, is open E and somewhat encumbered by shoals.

**Tides—Currents.**—The flood current S of Diu sets ENE, with a greatest velocity at springs of 1.5 knots. It often runs for 2 hours after the time of HW by the shore. The ebb current sets WSW at a velocity of 2 knots at springs, and often runs for 2.5 hours after the water along the shore has begun to rise. These irregularities of tides will account in some measure for the eddy currents off Diu Head.

**Aspect.**—Diu Island is separated from the mainland by Sesalkhada Creek, which runs through the middle of a large swamp. The seaward side of the island is composed chiefly of sandstone cliffs; the hills on its W part are about 30.5m high. The citadel of Forte do Diu, at the E extremity of Diu Island, is conspicuous from seaward.

A light is shown near the center of Forte do Diu; Couraca Light is shown periodically from the NE extremity of the same fort. The town of Diu, close W of the fort, is enclosed by a wall which is breached in many places on its W sides. There are several prominent buildings in the town.

Forte do Mar is situated about 0.2 mile N of Forte do Diu, on the N side of the entrance to Sesalkhada Creek; it lies at the SE edge of a spit and is periodically marked by a light.

A temple, about 0.7 mile NNW of Forte do Mar, is conspicuous in the N part of the village of Ghoghla.

A guard house, with a red roof and a palm tree, are conspicuous about 1.3 miles NNE, and 2 miles N of Forte do Mar.

**Signals.**—Storm signals are displayed from a flagstaff in Forte do Diu; the Brief System is used. Further information on these storm signals may be found in Pub. 160, Sailing Directions (Planning Guide) South Atlantic Ocean and Indian Ocean under "India—Signals."

**Anchorage.**—Diu Harbor affords no protection from the E; vessels should not anchor in the harbor during strong E winds, the holding ground, sand and rock.

The safest and best anchorage, in 14 to 16m, mud, lies with the light structure near the center of Forte do Diu bearing 315°, distant 0.5 to 0.6 mile. This anchorage is used by local vessels and affords protection from W winds.

There is anchorage, in 5 to 7m, about 1 mile E of Ghoghla. To reach it, vessels should steer for the temple N of Ghoghla, bearing 298°, passing between the dangers ENE of Forte do Diu, and anchoring when Couraca Light bears 240°.

**Caution.**—A rock, with a depth of 1.3m, lies about 0.5 mile E of the E extremity of Diu Island. A 3m rocky patch lies about 0.8 mile farther ENE. A 4.7m depth lies about 1 mile ENE of the E extremity of Diu Island.

A reef, which dries in places, extends about 0.5 mile ENE from the E extremity of Diu Island.

From October to the end of January large fleets of fishing vessels based at Brancawara, at the W end of Diu Island, and also based at Diu, Nawabandar, and **Simar** (20°46'N., 71°10'E.) will be found from 4 to 8 miles offshore; these vessels leave barrel buoys and logs to mark the fishing grounds, and it is advisable to give them a wide berth.

**Diu Harbor to Pipavav Bandar**

**2.5 Nawabandar** (20°44'N., 71°05'E.) is a promontory situated 2 miles E of Diu Harbor; the intervening coast is high, with deep water close to it. A light is shown from a white circular building on the promontory. The town of Delvada, about 2.5 miles NW of Nawabandar, has a large conspicuous temple with twin minarets.

Storm signals are shown at Nawabandar; the Brief System is used. Further information on these storm signals may be found in Pub. 160, Sailing Directions (Planning Guide) South Atlantic Ocean and Indian Ocean under "India—Signals."

**Anchorage.**—Good anchorage can be obtained, in 9.1m, mud, with the light structure at Nawabandar bearing 254°, distant 1 mile.

Panikota Islet, about 4.5 miles ENE of Nawabandar, is connected to the mainland W by a drying reef, which also extends about 0.3 mile ENE from the islet. Simar Fort (Simbor Fort), a white flat-topped structure with a flagstaff, is situated at the N end of the islet; a light is shown seasonally from the fort.

Close W of Panikota Islet, a range of cliffs extends about 2 miles W and attains an elevation of 13m; the W end of these cliffs appears as a sharp bluff when seen from E. A temple, 11m high, is situated on the mainland, about 0.3 mile SW of Simar Fort (Simbor Fort).

Bhesla Rock, a rocky islet 8m high, lies about 10.3 miles E of Panikota Islet and is fringed by a drying reef, except on its SE side. A detached drying reef lies from 0.2 to 0.3 mile WSW of Bhesla Rock.

There is good anchorage for small vessels about 0.4 mile N of Bhesla Rock, in 8.2m, mud, in Simar Anchorage (Simbor Anchorage).

Vessels should approach the anchorage from the SE and pass at least 0.2 mile E of Bhesla Rock. The flagstaff on Simar Fort (Simbor Fort) should be brought in line bearing 250° with Khar Beacon, about 1 mile WSW; the vessel should proceed on this range to the anchorage.

The channel between the reef W of Bhesla Rock and the reef projecting ENE of Panikota Islet is not recommended, for although there is plenty of water, there are no navigational aids.

The village of Rajpura (Rajvla) lies on a point about 3.5 miles ENE of Panikota Islet; a light is shown seasonally from this point. There is high ground, with steep cliffs, close W of the village. A shoal, with a least depth of 4.2m, lies about 0.8 mile SW of the point, and about 0.3 mile offshore.

Murex Bluff, 25m high, lies about 5 miles farther ENE. Murex Reef, which dries from 1.8 to 2.7m, extends about 1 mile E of the bluff.

**2.6 Jafarabad** (20°52'N., 71°23'E.) is an open roadstead affording little protection during the Southwest Monsoon. The harbor is shallow and a ledge of flat rocks extends nearly 0.5 mile W from the E side of the harbor entrance. Jafarabad is a walled town, with several round towers, on the highest of which there is a flagstaff, 35m high. The town, situated on high ground, can be seen from the S and E over the intervening rising ground, about 1 mile inland on the W bank of the river of the same name.

Jafarabad Harbor is situated in a shallow bay about 1 mile across, at the entrance to the Jafarabad River. A breakwater ends with an L-shaped jetty extending about 0.5 mile W from the shore near the cement factory on the E side. A second breakwater extends ENE about 0.3 mile from the W entrance point of the bay. A light shows from the W breakwater head.

**Tides—Currents.**—Outside the harbor, the tidal current sets E with the flood and W with the ebb along the coast.

At springs, the E current continues to run for about 1 hour after the time of HW, and the W current continues to run until 4 hours before the time of the following HW. Both currents attain a maximum velocity of 4 knots after running for 3 hours.

At neaps, the E current continues to run for 30 minutes after the time of HW, and the W current continues to run until 4.5 hours before the time of the following HW. The maximum velocity of the flood is 1.8 knots and of the ebb 1.5 knots.

At neaps, the current changes from ebb to flood in a clockwise direction and the flood to ebb in a counterclockwise direction.

**Depths—Limitations.**—A channel about 40m wide, being dredged to a depth of 5.5m in 1986, leads to a dredged basin of the same depth having a diameter of 300m, around the L-shaped jetty. Range lights, in line bearing 222°, lead to the jetty.

**Aspect.**—Barman Hill, 106m high, is conspicuous about 6.5 miles NNW of Jafarabad. Lor Hill, 146m high, about 3 miles W of Barman Hill, is also conspicuous.

A chimney, 90m high, and a conspicuous tower, 102m high, are situated close together at a cement factory on the E entrance point of the river.

Lights are shown from the SW and NE entrance points of the harbors. A white beacon marks the W edge of the ledge of flat rocks extending from the E side of the harbor entrance.

Vararup Temple, 29m high, is situated close to the coast, about 2 miles W of the W entrance point of Pipavav Anchorage, and is conspicuous from S.

**Anchorage.**—In fine weather, good anchorage can be taken, in 14m, with the light structure on the SW entrance point bearing 260°, and with the light structure on the NE entrance point bearing 036°.

**Caution.**—A dangerous wreck lies about 0.8 mile E of the SW entrance point of the harbor.

The coast between Jafarabad Harbor and the W entrance point of Pipavav Anchorage, about 5 miles ENE, is cliffy with precipitous points, and fringed by a coastal reef. Inland the country is undulating and partially cultivated. Small watch towers, about 1.8m high, lie on most of the hilltops on the coast.

## Pipavav Bandar (20°54'N., 71°31'E.)

World Port Index No. 48730

**2.7** Pipavav Bandar is the principal port for Dongar, about 6 miles N, and the principal town on this part of the coast. West Channel, the recommended channel to Pipavav Anchorage, leads between the W entrance point and **Shiyal Bet** (20°54'N., 71°31'E.). East Channel, passing N of Shiyal Bet, should only be used by light-draft vessels with local knowledge, and only at low water.

Pipavav Bandar lies on the NW shore of the West Channel. It is being developed as an all-season port. It imports and exports bulk cargo including coal, cement and fertilizer, break bulk, and LPG.

Chanch Island, the W extremity of which is located about 2.3 miles NNE of Shival Island, fronts the coast for about 4.5 miles. There is an extensive mangrove swamp close inland, which is submerged only at very high spring tides. A heavy swell occurs during the Southwest Monsoon.

### Port Authority of Pipavav Bandar

<http://www.pipavav.com>

**Tides—Currents.**—The mean spring tide range is about 2.7m. The mean neap tide range is only 1.2m.

The ebb current, which sets SW from S of Chanch Island, divides N of Bhensla Rock. One branch sets W through East Channel and then SW through West Channel, attaining a velocity of 2 knots at springs and 1 knot at neaps. The other branch sets toward Savai Bet Reef and then W along the coast at a velocity of 2 to 2.5 knots at springs and 1.5 knots at neaps.

The flood current sets across the S approach to West Channel and there divides. One branch sets N through the channel and then NE toward Chanch Island at a velocity of 1.5 to 2.5 knots at springs and about 1 knot at neaps. The other branch sets ENE past Savai Bet Reef, and then toward Bhensla Rock at a velocity of 3 knots at springs and 2 to 3 knots at neaps.

Strong eddies form in West Channel at HW and LW.

**Depths—Limitations.**—Only small vessels with local knowledge can proceed to Pipavav Bandar, as there is only a depth of 2.1m in the channel leading to it. The controlling depth for Pipavav Port was reported (2001) to be 9.5m. It was reported that a vessel 225m long was handled at Pipavav Port.

The main jetty is 725m in length, with a depth of 9.5m alongside. It provide three berths. A spur, 300m in length, provides an LPG berth that can accommodate vessels to 45,000 dwt.

A cement factory, situated 1.5 miles WSW of Chacuda Temple, is served by a jetty. The jetty is L-shaped, with a berth 400m in length and a charted depth of 11m alongside.

**Aspect.**—The shores of the islet are composed of rocky cliffs, 10.4 to 16.5m high, with the exception of the NE side and the shore of a small bay on its NW side, which are low and sandy. Remains of old fortifications are on the N and E sides of the islet. The greater part of the islet is covered with ruins of what must have been extensive buildings and temples.

Savai Bet Reef, a drying reef, steep-to on its E edge, extends about 0.4 mile E from Savai Bet.

Bhensla Rock, a bluff rocky islet, 15m high and nearly steep-to on its E side, is located 1 mile ENE of Savai Bet.

Montapat Creek, separating the NW and N sides of Chanch Island from the mainland, is the outlet for waters that cover an immense tract of marshy land at high water.

A circular tower, 9m high, is conspicuous at the W edge of a reef extending about 0.3 mile WSW from the W extremity of Chanch Island.

One Tree Hill, at the W extremity of Chanch Island, is 14m high.

Spit Sand, which dries 0.3m, extends nearly 1.8 miles SW from the SW edge of the above-mentioned reef. The SW edge of Spit Sand is called The Spit and has a least depth of 1.9m.

A palace, 26m high, about 2 miles ENE of the circular tower, is a good landmark from the SE and S.

Beacons on the mainland, in line bearing 019°, and about 2 miles N of Shiyal Bet, lead through West Channel. Beacons stand on drying reefs on each side of the entrance to West Channel.

Chachuda Temple, 24m high, is conspicuous on the mainland, about 1.5 miles WSW of Shiyal Bet.

**Pilotage.**—Pilotage is compulsory. Vessels should send their ETA 72 hours, 48 hours, 24 hours, and 12 hours in advance to the Harbormaster. Vessels should call Port Control for pilot boarding and anchoring information. The pilot boards at the anchorage in position 20°53'N, 71°30'E.

**Anchorage.**—There is good anchorage, sheltered from the Southwest Monsoon, in a depth of 9m, mud and sand, between the N end of Shiyal Bet and The Spit. Vessels may also anchor with Chachuda Temple bearing 161°, 1.4 miles distant, in a depth of about 10m.

**Directions.**—Vessels should enter West Channel with the beacons on the mainland in line bearing 019°, and steer in on this bearing until Chachuda Temple bears 275°, when course can be shaped to the anchorage.

## Pipavav Bandar to Gopnath Point

**2.8 Islet Point** (21°00'N., 71°41'E.), about 10 miles NE of Shiyal Bet, is prominent and hilly. Several islets front the point and are connected with each other and the coast by a drying reef of rocks. The S islet, about 0.8 mile S of the point, is 15m high and nearly steep-to. A spit, with a depth of 4m, extends about 0.8 mile ESE from this islet.

Patva Bay, between Islet Point and a bluff point, 15m high, about 2.5 miles WSW, is shallow and mostly dries.

The bight between Islet Point and Gadhada, about 4 miles ENE, is filled with the coastal reef, which extends about 1.3 miles offshore in places. Gadhada, a village, is situated on the edge of a cliff, 20m high. A detached 7.3m patch lies about 3 miles SW of Gadhada, and about 1.8 miles offshore.

The coast between Gadhada and the SW entrance of Mahuva Bay is composed of limestone cliffs and is fringed by a steep-to oastal reef extending about 0.2 mile offshore.

**Mahuva Bay** (21°02'N., 71°47'E.) nearly dries and shows a mass of rocks and stones. Its SW entrance point is a bluff, 24m high; the NE entrance point, which is the SW extremity of Jegri Island, is similar, but 18m high.

Jegri Island, sparsely cultivated, has bold rocky cliffs on its S and E sides, and its W part consists of sandhills from 18 to 23m high. A drying reef extends about 0.2 mile E from the SE extremity of Jegri Island, which is marked by a light.

Mahuva Bandar is situated at the head of Mahuva Bay, and is approached through a creek which nearly dries. Mahuva, a walled town with a conspicuous temple near its center, lies about 2.8 miles N of Mahuva Badar, from which it is separated by an extensive swamp, submerged at HW.

Anchorage can be taken by small vessels, in about 13.1m, mud, with the light structure on Jegri Island bearing 040°, distant 0.6 mile.

Jegri Bay (Katpur Bay), between Jegri Island and Cave Point, about 2.3 miles NE, is a shallow bight, the head of which, consisting of sand and mud, dries to a distance of about 0.7 mile seaward; the depths increase gradually to seaward. Bhawani Temple, on top of a sandhill at the head of Jegri Bay, is conspicuous.

Tidal currents S and W of Jegri Island set in the direction of the line of the coast, with the flood setting E and the ebb setting W; at springs, the flood current attains a velocity of 2.5 knots and the ebb current a velocity of 1 knot.

**Kotada Bluff** (21°07'N., 71°58'E.) is 26m high and conspicuous. During W winds, boats can land on the NE side of the bluff.

Methla Point, about 2 miles farther ENE, is a low rocky projection, 7.6m high, rising about 0.5 mile N to the average elevation of the undulating land in this vicinity of more than 30.5m.

Bhensla Rock, 27m high, lies on the drying coastal reef about 2.5 miles NE of Methla Point.

Jhanjhmer is a walled town on the coast about 4 miles NE of Methla Point. The remains of a square and conspicuous old fort are situated close S of the town. A light is shown about 0.2 mile S of the fort.

Anchorage for small vessels can be obtained, in 10m, sand and mud, about 0.9 mile SE of the fort.

About midway between Jhanjhmer and Gopnath Point, there is a projecting point, 27.4m high, with a tower close inland.

## The Gulf of Cambay (The Gulf of Khambhat)

**2.9** The Gulf of Cambay is about 30 miles wide at its entrance between **Gopnath Point** (21°12'N., 72°07'E.) and **Suvali Point** (21°05'N., 72°38'E.). Malacca Banks, with deep channels to the W and E, lie in the fairway of the approach. Grant Channel and Sutherland Channel are safer to use than the channels between the banks, as the mariner is able to accurately fix his position from the objects on the coast; Sutherland Channel should be used only by those with local knowledge.

The S part of the gulf is deep, but the N part is encumbered with sand banks, which frequently change because of the force of the bores and freshets from the rivers.

Deep-draft vessels can proceed up the gulf as far as Piram Island, about 28 miles NNE of Gopnath Point. Local knowledge is necessary for vessels navigating above Gogha, about 6 miles NW of Piram Island.

**Caution.**—Considerable shoaling is reported in the entrance of the Gulf of Cambay and mariners should navigate with caution in this vicinity.

The sand and banks in the upper part of the gulf are subject to great alterations. Any directions for navigating this area must be considered as general only; local knowledge is necessary.

Malacca Banks is the general name for four long narrow shoals lying in and obstructing the entrance of the Gulf of Cambay, between the parallels of 20°20'N and 21°20'N. These shoals, named in order from W, are Western Bank, Narbada Bank, Breaker Bank, and Eastern Bank.

Deep channels are between these shoals, but they are narrow at their N ends, and it is inadvisable to use them.

Western Bank dries in places.

Grant Channel, between Western Bank and the coast NW, is steep-to on both sides, with general depths of 11.3 to 27m. bottom is sand toward the bank and mud toward the Channel off the N end of Western Bank

Depths in Grant Channel between Gopnath Point and Western Bank, 6 miles SSE of Gopnath Point, were reported (2002) to be 1 to 1.5m less than charted.

Narbada Bank has a large area of drying sand near its center.

Breaker Bank has a long sand bank near its center, which may be seen a long distance from the masthead when the sun shines on it at high-water neaps, but it is submerged at high-water springs. Depths of 2.7 to 3.3m lie at the N end of Breaker Bank, about 16 miles ENE of Gopnath Point; a drying patch was reported (1954) in this vicinity. A dangerous wreck lies about 5 miles SW of Breaker Bank.

Eastern Bank has several shoal patches, some of which dry. Because the depths are deep within 0.2 mile of these shoal patches in many places, soundings give little warning of the approach to these dangers.

Sutherland Channel, between Eastern Bank and the coast E, is about 2.5 miles wide at its narrowest part, WNW of Suvali Point. Two lighterage areas, one for general cargo and one for chemical and LPG cargo, which are best seen on the chart, are located about 5 miles W of Suvali Point.

**2.10 Hazira Offshore Terminal** (21°09'N., 72°34'E.) is situated about 6 miles NW of Suvali Point, at the head of Sutherland Channel. The pilot, which boards at the Surat Roads Anchorage, can be contacted on VHF channel 67.

The terminal is an SPM and is approached through Sutherland Channel. Tidal currents set N and S in the channel at rates of up to 6 knots at springs. Vessels between 15,000 and 50,000 dwt, with a maximum draft on arrival of 13m, can be accommodated.

Vessels are berthed only during daylight hours during slack water.

**Caution.**—The N end of Malacca Banks should not be approached with an ebb tide, because, being nearly steep-to, soundings do not give sufficient warning. This area also has not been closely examined. Tapani Oil Development Area is located in the W approach to the Gulf of Cambay. Unlit structures are situated on the Malacca Banks, Surat Roads, and the Sutherland Channel, as best seen on the chart.

## The Gulf of Cambay—West Side

**2.11 Gopnath Point** (21°12'N., 72°07'E.), the W entrance point of the Gulf of Cambay, is moderately high, with a conspicuous light structure and bungalow on it. A temple, 23m high, lies near the coast, about 0.8 mile N of the point.

Gopnath Point Light is shown from a white masonry tower on a hillock close within the point.

A reef, which dries 2.7m, extends about 1.5 miles ENE from Gopnath Point.

Gopnath Shoals, nearly steep-to on the E side, extend about 3.5 miles NNE from about 2 miles ENE of Gopnath Point. The shoals consist of a reef, which dries from 1.2 to 2.7m, and several patches with depths of less than 5.5m.

Sultanpur Shoals extend about 4 miles NNE from the N end of Gopnath Shoals to about 9 miles NNE of Gopnath Point, then W to the coast. These shoals consist of drying rock, sand and clay, and numerous patches with depths of 0.6 to 5.5m.

**Tides—Currents.**—Within Gopnath Shoal and Sultanpur Shoal the flood current at springs does not turn until more than 1 hour after the time of HW, and the ebb current continues to run for more than 1.5 hours after the tide has commenced rising. At neaps the flood current turns 2 hours after the time of HW.

The coast between Gopnath Point and Kuda Point, about 28 miles NNE, is low and covered with sandhills for about 18 miles to Mitivirdi; then it is comparatively high, with several ravines close to the coast. The country is flat and cultivated, with many scattered villages mostly surrounded by trees; inland it is generally from 30 to 61m high.

Talaja Hill, rising from a level plain about 10 miles NNW of Gopnath Point, and 5 miles inland, is a steep conical hill, about 113m high, with a conspicuous temple on its summit.

Palitana Mountain, 596m high, is conspicuous about 12 miles WNW of Talaja Hill.

Khokhra Hills, the S end of which lies about 9.5 miles NNE of Talaja Hill, extends about 7.5 miles N. Its summit, 300m high, near the N end of the range, is conspicuous.

**2.12 Alang Shipbreaking Yard** (21°30'N., 72°20'E.) is located about 5 miles SSW of Piram Island Light. Vessels to be scrapped are normally run in to the beach on high tide (HW over 10m) twice a month. There are no size restrictions for vessels calling at Alang to be scrapped.

**Tides—Currents.**—Tide information is produced by the port department and can be attained by contacting local agents.

**Regulations.**—Masters are to send their ETA's 72 hours, 48 hours, and 24 hours prior to arrival. Vessels slated for demolition must arrive without any cargo on board.

**Anchorage.**—The primary anchorage is 5 miles S of Piram Island Light.

**Kuda Point** (21°38'N., 72°18'E.), 10m high, has a thick clump of trees and a white bungalow on it. The trees are conspicuous from N or S, and the bungalow shows well during the forenoon when seen from E.

Mallock Reef, about 1.5 miles SE of Kuda Point, lies on the W side of the channel between it and the reef extending NW from Piram Island.

Piram Island, 11m high and composed of sand, lies with its N end about 2.8 miles SE of Kuda Point. At the S end of the island there are a few trees and a little cultivation; the NE side is fringed by a few mangrove trees. The lighthouse is conspicuous near the middle of the island; a small village is situated close N of the lighthouse.

Reefs surround the island and extend about 2.5 miles NNE, 0.5 mile E, and 1.5 miles SSE from the island. Shoal water, with depths of less than 11m, extends about 7.8 miles SSW from the S end of the reef surrounding Piram Island.

The narrow channel between Mallock Reef and Piram Island should not be used without local knowledge as the tide runs through at a great velocity and there is very little slack water.

**Bhavnagar (21°46'N., 72°14'E.)**

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**2.13** The port of Bhavnagar consists of a tidal basin capable of receiving deep-draft vessels. The Kalubhar River (Bhaunagar Creek), entered about 3 miles farther N, is only accessible to small coasters. Large vessels wishing to communicate with the city of Bhavnagar (Bhaunagar), or discharge cargo in the stream, can anchor N of Perigee Rock.

The coast between Kuda Point and **Ghogha** (21°41'N., 72°17'E.), about 4 miles NNW, is low and marshy. It is fronted by reefs, parts of which dry, and shoalwater extends nearly 2.5 miles offshore. Abreast Ghogha, the foreshore is mud and shingle, drying to a distance of about 0.5 mile offshore.

Ghogha is a walled town and the land in the vicinity is inundated at spring tides.

The coast from Ghogha to Bhavnagar Point, about 9 miles NNW, consists of a mud flat overgrown by low mangrove bushes intersected by numerous small drying creeks.

**Tides—Currents.**—The tidal rise at Bhavnagar is 10.2m at MHWS and 8.3m at MHWN. At Piram Island, high tide is 40 minutes earlier, and the tidal rise is 8.9m at MHWS and 7.3m at MHWN.

The direction and velocity of the tidal currents are irregular between Gopnath Point and Bhavnagar and are affected by local winds, especially in Malcolm Channel. At the S of Channel Bank, the current divides.

At the N end of Bhavnagar Channel, the flood and ebb currents have a velocity of about 3 knots at springs and 2.5 knots at neaps. These velocities are likely to increase when freshets occur in the Kalubhar River. The general direction of the tidal currents is parallel to the coast.

The duration of SW at the N end of Bhavnagar Channel varies from 13 to 20 minutes at springs and from 12 to 22 minutes at neaps.

**Depths—Limitations.**—Vessels up to 152m long, with a maximum beam of 19.5m, can enter the port. The permissible draft is reported to be the height of the predicted tide less 5.2m.

The tidal basin of Bhavnagar New Port can accommodate two vessels of up to about 128m in length. The permissible draft varies between 7m and 9.1m, depending on the height of the tide. The concrete wharf on the S side of the tidal basin, near its head, is 269m long; the basin has depths of 7.6 to 9.1m. The entrance width of the lock gate is 21m, and vessels with a maximum beam of 19.8m can enter the tidal basin.

Vessels arrive and depart at about HW slack. They enter with a tug ahead; another is available in the turning basin, where they are usually swung and berthed starboard side-to.

On the S side of the Kalubhar River, and N of the city of Bhavnagar, there is a steel pier which can accommodate coastal vessels of medium draft. Vessels using the pier lie alongside with an anchor down, and can lie on the mud at LW.

**Aspect.**—A shoal, with a least depth of 8.8m, lies about 4.3 miles NNE of Piram Island. An 8.8m patch lies about 1.3 miles WNW of the shoal. A 5.1m patch lies about 5.5 miles N of Piram Island.

Perigee Rock, which dries 1.2m, lies about 2.3 miles NE of Ghogha; it shows three heads above water at the lowest ring tides.

Perigee Light Vessel is moored about 0.9 mile S of Perigee Rock. Depths E and SE of Perigee Rock, to a distance of about 4 miles, are irregular.

A shoal, which dries 2.1m, extends N from a position about 2 miles NE of Perigee Rock.

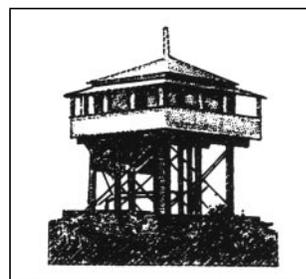
A stranded wreck lies 2.8 miles E of Perigee Rock.

Channel Bank, which dries 5.5m and is covered with grass, extends N from about 2 miles N of Ghogha.

Rhuk Bank, with its S end about 7 miles NNW of Ghogha, extends about 10 miles N, partially covers at HWS, and is covered with mangrove bushes.

Bhavnagar Channel lies SW of Channel Bank..

**Ruvapari Light** (21°47'N., 72°14'E.) is shown from a gray hut on piles, on the SW side of Bhavnagar Channel, about 1 mile NNW of Bhavnagar New Port.

**Ruvapari Light**

A tower, 25m high, is conspicuous about 0.8 mile S of Bhavnagar New Port, and 0.5 mile inland.

Lights, in line bearing 251°, situated at the head of Bhavnagar New Port, lead into the tidal basin.

Mariners are warned that due to frequent changes in the banks and channels N of Piram Island, local knowledge is necessary.

A light is shown on Bhavnagar Point and on Johnson Point, about 1.3 miles ESE. The above points are the W and E entrance points, respectively, of the Kalubhar River.

Beacons, in range, lead across the drying banks in the Kalubhar River. Due to the continual silting, the depths in the river and its approaches are liable to change, and the range beacons are liable to alteration. Dredging is continually in progress.

**Pilotage.**—Pilotage is compulsory. Pilots will board vessels about 4.5 miles NNE of Piram Island, not later than 2.5 hours before the time of HW at Bhavnagar for docking on the same tide. Prior notice of ETA and draft must be sent to obtain a pilot.

The pilot vessel is a tug with a black hull, buff superstructure, and a buff funnel with a black top. In addition to the usual signals for a pilot vessel, a searchlight is flashed from time to time at night. The pilot boat maintains radio watch on VHF channel 16 when on duty.

Vessels dock and undock during daylight hours only, except for special circumstances.

**Anchorage.**—Vessels anchor in the charted anchorage area E of Perigee Rock. Tidal currents have been reported to reach a rate of about 6 knots at springs.

To prevent yawing during spring tides, consideration should be given to the use of a second anchor and/or steering. The second anchor should be heaved up and dropped 1.5 hours

before and after the tidal current change to avoid fouling the first anchor. It is recommended that engines are kept on stand-by, to be available within 20 minutes, during spring tides.

**Directions.**—No directions are given due to the frequent changes in the channels and banks, and local knowledge is necessary.

A wide berth should be given the area around Perigee Light Vessel due to extensive silting.

Lock Gate Surge is unusual in that it is lifted vertically before being swung clear. Successive heights of tide at HW during springs can vary by up to 2m, resulting in unequal water levels. The initial lock gate lift, at any time between 2.5 hours and 0.5 hour before HW, can cause a surge within the dock basin and attention to moorings and gangways during this period is recommended.

## The Gulf of Cambay—East Side

**2.14 Suvali Point** (21°05'N., 72°38'E.), the E entrance point of the Gulf of Cambay, is fringed by the drying coastal reef which extends about 1 mile W of the point. Tapti Light is shown from a white circular stone column, 27m high, on the point; a tomb lies close SE of the light structure.

The coast from Suvali Point to the entrance of Tena Creek, about 8.3 miles N, is fringed by a drying coastal reef. About 5 miles N of Suvali Point there are some sandhills, known as Suvali Hills.

Between the entrance to Tena Creek and the entrance to Sena Creek, about 9 miles N, the coast is fringed with thick groves of palmyra trees. The Kim River, about 2 miles farther N, dries in its entrance.

Tena Bank-Outer Bhagwa Sand, one continuous narrow bank nearly parallel with the coast, lies between the entrance to Tena Creek and the S entrance of the Kim River. Tena Bank, the S part of which dries, is a continuation of Outer Bhagwa Sand, the N part of which dries in patches. Bhagwa Channel, E of the above bank, is used only by small vessels with local knowledge.

Dani Point Light is shown from a steel framework structure, 26m high, about 2.5 miles SE of the entrance to the Sena River.

Gulwala Bank, with depths of less than 11m, extends about 6.3 miles S from a position about 3.5 miles W of the S entrance point of the Kim River. There is a drying patch near its N end.

Between Gulwala Bank and Tena Bank and Outer Bhagwa Sand there are several shoals with depths of less than 5.5m. The intricate navigation required to pass through the channel E of Gulwala Bank, with its rapid tides, should not be attempted without local knowledge. At night, or in a large vessel, it is necessary to keep well W of Gulwala Bank.

The coast between the entrance of the Sena River and Luhara Point, about 18 miles N, is low and marshy. It is intersected by several streams and rivers, and is flooded at spring tides from 1 to 4 miles inland.

The Narmada River flows into the Gulf of Cambay, S of Luhara Point, through a wide estuary in which there are extensive sandbanks which dry and are subject to change. The river itself also contains many sandbanks with channels between them, which are mostly shallow and very intricate.

Alia Bet, low and covered with small scrub, lies in the middle of the estuary.

An oil derrick is situated in the S part of the estuary, about 8.5 miles S of Luhara Point.

Mariners should navigate with caution off the S part of the estuary of the Narmada River, as the depths have changed considerably.

**Tides—Currents.**—The tidal currents on the E side of the Gulf of Cambay set in a NE direction with the flood tide and in a SW direction with the ebb, except when their direction is altered by the sand banks.

**2.15 Luhara Point** (21°39'N., 72°33'E.), the N entrance point of the Narmada River, is the highest ground in the vicinity; the land is generally low, and consists of sand hills covered with trees. The highest sandhill, about 24m high, rises just within Luhara Point. Luhara Point Light is shown from a white tower with red diagonal stripes on the point.

The drying coastal bank extends about 2.5 miles SSW, and about 1.3 miles W of the point. Bar Sands, which dry, lie close S of the S edge of the coastal bank, and are marked W by a red conical buoy.

Bharuch Roads is the roadstead W of the entrance to the Narmada River. The anchorage is unprotected, but the bottom is good holding ground of sand and mud. At the anchorage the tidal currents set N with the flood and S with the ebb; the flood runs for about 1 hour after the time of HW.

Anchorage in Bharuch Roads can be obtained, in 16.5m, with the light structure on Luhara Point bearing 024°, distant 4.5 miles and the light structure on Piram Island bearing 272°.

The Narmada River, which is tidal for about 55 miles, can only be navigated by vessels drawing more than 1.8m between half flood and half ebb, and then only if possessing local knowledge.

Pilotage for the river can generally be obtained off the bar of the river.

Kerselea Bank, lying between Luhara Point and Alia Bet, is an extensive area of mud and sand, which dries up to 5.5m.

Bharuch Channel, the principal entrance of the river, leads W and N of Kerselea Bank. Vessels can pass either N or S of Bar Sands.

**Tides—Currents.**—The flood current entering the Narmada River flows until about 1 hour after the time of HW, and sometimes attains a velocity of 5 to 6 knots. The ebb sets out strongly and runs occasionally until 1 hour after the time of LW. During the flood tide there are heavy overfalls on the outer edge of the bar.

**2.16** The coast between Luhara Point and Ban Creek, about 4.5 miles N, consists of moderately high sandhills. Then to the entrance to the Dhadar River, about 7.5 miles farther NNE, the coast is low and composed of sand and mud.

Dahej and Gandhar, about 3.8 and 15 miles, respectively, NNE of Luhara Point, are the only large villages near the coast. They both have conspicuous buildings, which can be seen from a considerable distance. Dahej is an open roadstead, used for the unloading of bulk fertilizers to barges.

A drying flat extends from 1 to 3 miles offshore between Luhara Point and the S entrance of the Dhadar River. The S part of this flat is steep-to at its W edge.

Anchorage can be taken, in about 18m, with Luhara Point Light bearing 137°, about 5.3 miles.

The Dhadar River nearly dries about 1.5 miles within the entrance; local knowledge is necessary to enter the river.

Devjagan Light is shown periodically from a circular stone column, 13m high, on Tankari Point, the N entrance point of the Dhadar River. A pagoda lies about 0.5 mile NW of the light structure.

Makra Bank, which dries near its center, lies with its SE extremity about 6 miles NW of Luhara Point and about 4 miles offshore. The bank is narrow and extends about 10.3 miles N.

Mariners are warned that owing to frequent changes in the banks and channels in the upper part of the Gulf of Cambay, local knowledge is necessary.

Tankari Road, the roadstead off the entrance to the Dhadar River, can be identified by the light structure and pagoda on Tankari Point. Vessels can anchor with the light structure bearing 047°, distant about 3.8 miles, and the buildings at Gandhar bearing 086°.

The flood current in Tankari Road continues to run for about 1 hour after the time of HW. The greatest velocity of the tidal currents in the roadstead is 6 knots at spring tides.

## Head of the Gulf of Cambay

**2.17** The coast of the W side of the head of the gulf from **Johnston Point** (21°49'N., 72°13'E.) to the entrance of the Bhadar River, about 26 miles NNE, is composed chiefly of mangrove jungle, extending several miles inland. The sand bank fronting this coast dries and extends from 1 mile to 4 miles offshore.

Mal Bank, the S end of which lies about 7.5 miles E of Johnston Point, is a large sand bank lying in the middle of the head of the gulf, and extends about 4 miles N.

There are channels on the either side of Mal Bank, each about 1 mile wide in the fairway, but local knowledge is necessary. Malcolm Channel is the W channel.

Khambhat Channel leads NE into the estuary of the Mahi River from the N end of Mal Bank. **Khambhat** (22°18'N., 72°37'E.), the chief town in the area, lies on the N side of the estuary of the Mahi River.

Storm signals are shown at Khambhat; the Brief System is used. Further information on these storm signals may be found in Pub. 160, Sailing Directions (Planning Guide) South Atlantic Ocean and Indian Ocean under "India—Signals."

Bore Rocks, with depths of less than 1.8m, lie about 6.5 miles SE of the entrance to the Bhadar River, on the NW side of Khambhat Channel. They lie on the N entrance of a channel that leads between the banks at the entrance of the Sabarmati River.

The shores of the Sabarmati River are rather elevated and well-cultivated. **Sikotar Mata** (22°19'N., 72°24'E.) is a pagoda, 5.8m high, with a flagstaff, on the E entrance point of the Sabarmati River.

In the upper part of the Gulf of Cambay, the tidal current sets NE with the flood into the Mahi River, and SW with the ebb, with a velocity of 4.5 to 6 knots.

Tidal bores form near the entrance to the Sabarmati River; one travels up that river while another travels up Khambhat Channel and the Mahi River. Each sweeps through the channels as a line of disturbed and breaking water, and tends to alter the configuration of those channels.

In the Mahi River, the bore may be as much as 2.4m high, and attain a velocity of 10 knots at the highest spring tides. The magnitude of the bore varies with the range of the tide. The bore is not perceptible at neap tides, but becomes increasingly prominent as spring tides approach. The bore preceding the higher HW is greater than that preceding the lower of two successive HWs.

The bore in the Sabarmati River is similar but less pronounced.

The flood current commences at a great velocity with the passage of the bore, then decreases in strength for a time, and finally attains its full strength about 45 minutes after the passing of the bore.

## The Gulf of Cambay to Daman

**2.18** In the N part of the coast, between **Suvali Point** (21°05'N., 72°38'E.) and Daman, is an alluvial belt through which the Tapti River forms a deep and fertile delta. Along the S part of this coast are small hillocks of drifted sand; the coast in some parts is watered by springs and covered with a thick growth of creepers and date palms. Through the river mouths and inlets the tide runs up behind the sandhills and floods a large area of salt marshes. The rise of the tide renders these rivers and inlets accessible at HW, but local knowledge is necessary.

The Tapti River lies between Suvali Point, previously described in paragraph 2.14, and the N entrance point of the Mindhola River, about 3.5 miles E. The river and its entrance are encumbered with numerous sand banks, several of which are dry. The river is tidal for 15 miles, and small craft can ascend the river to Surat, about 14 miles above the entrance. A vessel of 1.8m draft can only navigate in the river at more than half-tide.

Directions for entering the river cannot be given, as the sands and channels are continually changing; the navigable channel can only be pointed out by local pilots. The bar dries, but there is a spring rise of about 6.1m, and off the city of Surat there is a pool with depths of from 3.7 to 5.5m.

Magdala is a lighterage port 5 miles within the Tapti River on the S bank, with a 107m long wharf.

Storm signals are shown at Magdala; the Brief System is used. Further information on these storm signals may be found in Pub. 160, Sailing Directions (Planning Guide) South Atlantic Ocean and Indian Ocean under "India—Signals."

Surat lies in a bend on the E bank of the river and extends about 1.5 miles along the river front. A splendid girder bridge spans the river at the city.

Surat Roads is the name given to the anchorage off the entrance of the Tapti River, about 2 miles SW of Suvali Point.

**Tides—Currents.**—The flood current sets N and continues to run for 1 hour after the time of HW. At the outer anchorage, during springs, the tidal currents are very strong, especially the ebb, which sets S at a velocity of 4 to 5 knots; nearer the bar the tidal currents are weaker. The tide frequently falls more than 1.8m before the tidal current turns S.

**Directions.**—Vessels bound for Surat Roads from the S should, from abreast Daman, set course for the roads, keeping in depths of 9.1 to 18.3m.

Between the Mindhola River and the Purna River, about 9 miles SSE, there is a low sandy plain with some scattered palmyra trees. A black beacon, 14m high with white bands, lies on the N entrance point of the Purna River.

Warsi Borsi Light is shown from a white, square, concrete tower with red bands 0.6 mile NNW of the entrance point of the Purna River.

A tomb, with a white dome about 3.5 miles farther SE, is conspicuous among the dark green trees, especially when seen from the SW.

The entrance to the Ambika River lies about 10.5 miles SSE of the Purna River. Kanai Creek lies just N of the entrance to the Ambika River. Kanai Creek Light is shown from a white, round, concrete tower with concrete tower with black bands 0.6 mile NW of the N entrance point of the creek. The **Auranga River** (20°38'N., 75°53'E.) flows into the sea through Bulsar Khari, a creek. A light is shown on the S entrance point of Bulsar Khari. Hills, about 31m high, are about 5.5 miles NE of the light structure and about 5 miles inland. Shoals, with depths of less than 1.8m, lie about 3.5 miles W, and 4.3 miles SW, respectively, of Bulsar Khari. A 5.8m patch lies about 9 miles WSW of Bulsar Khari.

Anchorage can be taken by large vessels, in 7.3 to 9.1m, about 8.5 miles W of the entrance to Bulsar Khari.

The Par River flows into the sea through Umaradi Creek, about 6 miles S of Bulsar Khari. Parnera Hill, 184m high with a fort on it, lies about 3.5 miles ENE of the creek entrance.

**2.19 Daman** (Damoā) (20°25'N., 72°50'E.) lies on both sides of the Damanganga River; it can be identified by the forts on either side of the river entrance and by two square steeples and its white buildings. Other landmarks are a 109m hill, with an idgah, or Mohammedan place of prayer, on its summit, about 2.8 miles NE of the river entrance; Indragad Hill, 108m high, with a fort in ruins on its summit, about 3.3 miles SSE of the river entrance; and Jogmari Hill, 231m high, about 2 miles farther SSE.

Daman Light is shown from a white masonry tower on the bastion of the fort on the S side of the entrance.

The bar at the mouth of the Damanganga River is flat, mostly hard sand, except N of the N point of the river entrance, where the rocky ground projects some distance offshore; the bar has 0.3m or less over it.

Vessels not exceeding 500 grt sometimes enter the river at HW in fine weather and moor abreast the forts, where there were depths of 4.1 to 5.2m, soft mud. Local knowledge is necessary.

Anchorage can be taken, in 9m, about 4.5 miles W of the river entrance.

## Daman to Bassein Creek

**2.20** The coast between Daman and Vadhavan Point, about 30 miles SSW, is bordered by extensive reefs and foul ground extending up to 4 miles offshore. Vessels should not approach this coast in depths of less than 18.3m when navigating in the vicinity.

Between Daman and Umbargaon, about 13 miles SSW, the coast is low, fringed with bushes, and backed by several conspicuous hills. Indragad Hill and Jogmari Hill were previously

described with Daman in paragraph 2.19. Dhodi Phar, 148m high, is conspicuous about 7 miles S of Daman. Patia Hill, 98m high, lies about 3.3 miles SW of Dhodi Phar.

A light is periodically shown from a white framework tower, 10.7m high, at Maroli, about 6 miles N of Umbargaon.

**Umargam** (Umbargaon) (20°12'N., 72°45'E.), a small town with a ruined tower, lies on the S side of the entrance of the Varoli River.

Umargam Light is shown from a white concrete tower with red bands, close SSW of the ruined tower.

Storm signals are shown at Maroli and Umargam; the Brief System is used. Further information on these storm signals may be found in Pub. 160, Sailing Directions (Planning Guide) South Atlantic Ocean and Indian Ocean under "India—Signals."

A partially-wooded range, the summits of which are conspicuous from seaward, lies from 7 to 12 miles inland, between Umargam and Mahim, about 34 miles S. High Land of St. John, a rounded mountain 540m high, slopes gradually N and S from its center about 9 miles SSE of Umbargaon. Muslia (Maha Luxmi), about 9.5 miles SE of the High Land of St. John, has a pointed summit, 458m high. Kaldurg Fort, about 6 miles NE of Mahim, is 468m high and resembles a castle when seen from NW.

The coast between Umargam and Gulur Point, about 8 miles S, is low and sandy. The latter point is low and covered with coconut trees. A detached 9.4m rocky patch lies 6.5 miles offshore, 6 miles NW of Gulur Point.

**Dahanu** (19°59'N., 72°43'E.) is a village on the N side of the entrance of Khonda Creek. A light is shown at Dahanu.

Vadhavan Point, about 4 miles farther SW, is low and covered with mangrove bushes. Foul ground extends nearly 2 miles W and about 2.8 miles SSW of the point.

**2.21 Tarapur Point** (19°50'N., 72°39'E.) is bordered by foul ground extending about 0.8 mile W; a narrow reef extends about 2.8 miles NNW from the N extremity of the point. A light is shown from a white square masonry tower, 23m high with black bands, on the N extremity of the point.

Tarapur Harbor, formed by the barrier reefs extending SSW from Vadhavan Point and NNW from Tarapur Point, is only accessible to small coastal vessels.

The coast between Tarapur Point and Satpati, about 7.5 miles S, is low, rocky, and densely wooded. Vessels should not proceed into depths of less than 14.6m off this part of the coast.

A light is shown at Satpati and at Nawapur, about 3.5 miles N. Storm signals are shown at Nawapur; the Brief System is used. Further information on these storm signals may be found in Pub. 160, Sailing Directions (Planning Guide) South Atlantic Ocean and Indian Ocean under "India—Signals."

The village of **Mahim** (19°39'N., 72°43'E.) lies on the coast, about 5 miles SSE of Satpati. Kelve, about 2 miles farther S, lies on the N side of the entrance of Danda Creek. A small detached rock, with a fort on it, lies just off the entrance of the creek. A light is shown at Kelve.

A detached 5.5m patch lies about 4 miles WSW of Mahim. Drying reefs extend about 2 miles off this part of the coast.

Ussapur Rock, 16m high, lies on the coastal reef about 4 miles S of Kelve, and about 0.5 mile offshore. Drying rocks extend about 1 mile W of the rock.

**2.22 Arnala Island** (19°28'N., 72°44'E.), 4m high with a fort on it, lies about 0.5 mile offshore, and is fringed by rocks on all sides. Shoal water, with depths of less than 5m, extends about 1 mile W of the island. Arnala Island has been reported to give good radar returns at 27 miles.

Arnala Light is shown from a white framework tower on the coast, abreast the S end of Arnala Island.

Agashi Bay, entered N of Arnala Island, is very shallow, encumbered by shoals, and can only be navigated by a small vessel at about the time of HW.

The coast between the low point abreast Arnala Island and the N entrance of Bassein Creek, about 8 miles SSE, is very low; shoal water, with depths of less than 5m, extends about 2 miles offshore.

### Bassein Creek to Bombay

**2.23 Dongri Point** (19°18'N., 72°48'E.), the S entrance point of Bassein Creek, is a bluff point as seen from seaward. It rises to an elevation of 94m about 0.5 mile S of the point, and then slopes gradually to level country about 2 miles farther S.

A light is shown from about mid-September to mid-June.

Poshipir, a rocky islet 13m high, lies about 3 miles NW of Dongri Point.

Drying rocks extend about 2 miles WNW of the same point. When there is no wind the sea does not break on the drying rocks and the sandbanks in the entrance to Bassein Creek, and there are no indications of their existence.

Depths of less than 5m extend about 3.5 miles W of the entrance to Bassein Creek.

North of Bassein Creek there are several landmarks conspicuous from seaward. Girij Hill, a small round hill 53m high, lies about 4.5 miles N of Dongri Point, and about 2 miles inland. Kamandurg, about 9 miles E of Girij Hill, is conical and 652m high. This mountain, with the high land of Salsette Island to S, cannot be mistaken by a vessel N of Bombay.

The conspicuous plateau of Tungar, about 2 miles long in a N-S direction, and attaining an elevation of 662m, is located about 4 miles NNW of Kamandurg.

Bassein Creek, entered between Dongri Point and a point about 1 mile NNE, is a tortuous stream which can be navigated only by small vessels with local knowledge and a draft of not more than 3.7m. The entrance of the creek is always difficult except at slack water, as both flood and ebb current set across the channel. The sea breaks heavily across the entrance during the Southwest Monsoon.

**Tides—Currents.**—Currents in Bassein Creek attain a velocity of 3 knots at springs, but about 5 miles above the entrance they decrease to 1.5 and 2 knots. In the creek the tidal currents continue to set about 1 hour after the times of HW and LW. Slack water lasts for about 15 to 25 minutes.

Vasai lies about 0.5 mile inland on the N side of the creek. A fort, with the citadel near the middle, lies S of Bassein near the landing place.

Storm signals are shown at Vasai; the Brief System is used. Further information on these storm signals may be found in Pub. 160, Sailing Directions (Planning Guide) South Atlantic Ocean and Indian Ocean under "India—Signals."

The village of Dongri lies on the S side of the creek, about 1 mile SSE of Dongri Point.

**2.24 Panju Island** (19°20'N., 72°51'E.) is connected to the mainland N and S by an iron railroad bridge; the island is low and swampy.

Salsette Island lies between Bassein Creek and Bombay. The mountain range on the island has several conspicuous peaks; the central and highest, **Kanheri** (Khanher Peak) (19°13'N., 72°55'E.), 462m high, lies about 9.5 miles SE of Dongri Point. From the W, Kanheri appears to have a flat summit. Shendur, about 3 miles NNE of Kanheri and the N peak of the island, is a sharp detached peak, 459m high.

An aviation light is shown from a 27m tower near the S end of Salsette Island.

The W side of Salsette Island is fronted by islands and islets, which are separated from it by creeks and drying flats. Foul ground extends about 1.5 miles W from these islands and islets.

Dharavi Island, the N and largest of the islands facing Salsette Island, extends from Dongri Point to Manori Point, about 7 miles S. The latter point is a bluff of dark bare rock, 30m high.

Utan Light is shown from a black and white square tower, 12m high, on a salient point about 2 miles SSE of Dongri Point.

Storm signals are shown at Utan; the Brief System is used. Further information on these storm signals may be found in Pub. 160, Sailing Directions (Planning Guide) South Atlantic Ocean and Indian Ocean under "India—Signals."

Gori Rock, a conspicuous sharp black pinnacle, 30m high, about 3.3 miles NNE of Manori Point, and about 1.5 miles inland, forms a good landmark. A temple, with a white dome, lies on the N summit of a round hill, 35m high, about 2.8 miles E of Gorai Rock; the dome is conspicuous from seaward.

High Rock, a sharp pinnacle, 9m high, about 2 miles SW of Dongri Point, lies on a drying reef. Outer Islet, 4m and composed of sand, lies at the S end of this drying reef, about 1 mile S of High Rock.

Green Islet, from 0.9 to 1.2m high, covered with short green scrub and surrounded by a ledge of rocks, lies about 3 miles NNW of Manori Point and about 0.8 mile offshore. Marva Island, low and covered with palm trees, lies close E of Manori Point. Reefs extend about 0.5 mile W of Madh Island.

**2.25 Ambu Islet** (19°08'N., 72°47'E.), at the SW edge of the reefs, is low, covered with palms, and has an old watchtower on it. Mehti Khada, a small rock, 4.3m high and steep-to on its W side, lies about 0.5 mile W of Ambu Islet.

Madh Island, about 36m high and well-cultivated with coconut and fruit trees, lies close S of Marva Island. There are some ruins on its summit; a fort in ruins stands on its SE point.

Harvey Patches (Hervey Patches), with a depth of 1.8m, about 1 mile S of Madh Island, are marked N by a buoy from October to May. The sea always breaks over Harvey Patches. A dangerous wreck lies about 4.5 miles W of Harvey Patches and is marked close W by a lighted buoy.

Juhu Island, with its S extremity about 4 miles SE of Ambu Islet, has a sandy coast and is covered with coconut and date palms. Andheri Hill, 61m high, isolated and bare, lies about 1 mile E of the N end of Juhu Island.

Uarashi, a reef, lies about 1 mile W of the S end of Juhu Island. A light is shown from October to May on the S end of

Uarashi. Some rocks, one of which is awash, lie about 0.8 mile NW of the S end of the reef.

Shoals, with a least depth of 4.6m and 4m, lie about 1.5 miles W and NW, respectively, of Bandra Point, the S extremity of Salsette Island.

The coast between Worli Point, the NW extremity of Bombay Island, and Malabar Point, about 5.3 miles SSW, is fringed by drying reefs and shoal water, with depths of less than 5.5m extending up to 1 mile offshore in the N part and about 0.5 mile off the S part.

A conspicuous TV tower lies at an elevation of 305m, 1.5 miles SSE of Worli Point.

## Bombay (Mumbai) (18°56'N., 72°51'E.)

World Port Index No. 48840

**2.26** The city of Bombay, on Bombay Island, is the largest city of India and the principal seaport on its W coast. Bombay Harbor lies between Bombay Island and Trombay Island to W and N, and Karanja Island and the mainland to E and S. It is the only natural deep-water port on the W coast of India. The harbor contains several islands, rocks, and shoals, with numerous bays and inlets indenting its shores.

The direction and management of the port, including pilotage, berthing, docking, and wharves under control of the trustees of the port, are vested in the Deputy Conservator.

The facilities of the port are mainly on the E side of Bombay Island. An oil terminal is situated on Butcher Island.

### Port Authority of Bombay (Mumbai)

<http://www.mumbaiporttrust.com>

**Winds—Weather.**—Visibility may be reduced by heavy rain during the Southwest Monsoon. A smoky haze frequently hangs over the area from November to March.

**Tides—Currents.**—The tidal rise at Bombay is 4.4m at MHSW, and 3.3m at MHW.

The velocity and direction of the tidal currents in the approaches to Bombay are generally as follows, but they are greatly influenced by winds and heavy rains.

Off the SW extremity of Prongs Reef the flood current at first sets ESE and, as the velocity increases, shifts to the NE. Eastward of this reef, as far as Sunk Rock, it sets between NNE and N by E.

Between Thal Shoal and a position about 4 miles WNW, the flood current sets between ESE and ENE, resulting in a more northerly direction as the velocity increases. In East Channel Swatch, E of Thal Shoal, it sets about NNE, taking a more easterly direction as it crosses the mouth of Dharamtar Creek.

On the N side of the entrance the ebb current sets SW from Sunk Rock to abreast the light structure on Prong Reef, where it shifts to between NW and SW, changing to about SSW as the tide strengthens.

On the S side of the entrance of the harbor, the ebb current sets WSW across the entrance of Dharamtar Creek altering to between SW and SSW on nearing Thal Shoal, and still more to the S as it continues S. Between Thal Shoal and a position about 4 miles WNW, it sets about WSW.

The tide does not set fairly through the channel, but the flood sweeps E over the foul ground of Thal Shoal. During rains in the Southwest Monsoon the ebb sets strongly W out of Dharamtar Creek.

The velocity of strong tides between Thal Shoal and Prongs Reef is from 2.5 to 3 knots and perhaps as much as 4 knots during the rains.

On the W shore of the harbor, from Sunk Rock to Cross Island, the flood current sets NE to NNE.

On the E shore of the harbor, the flood current sets NE along the W shore of Karanja Island. It sets NE between Butcher Island and Elephanta Island, and then NE toward Trombay Island.

The ebb current sets WSW from the S of the channel between Butcher Island and Elephanta Island and along the W coast of Karanja Island. Abreast Dharamtar Creek, the current sets WSW.

On the W shore, from Cross Island to inside Middle Ground Islet, the ebb current sets SSW, and then to Sunk Rock in a SW direction. From Cross Island to E of Middle Ground Islet, in mid-channel, the ebb current sets from SW to SSW; from there to Sunk Rock it sets SW, but at the first of the ebb the set is more W.

South of Dolphin Rock, the flood current at springs has a velocity of 2 knots and the ebb current 1.5 knots. In other parts of the harbor the velocity is from 0.5 to 1.5 knots.

The ebb current on the W shore of the harbor occur from 30 to 35 minutes earlier than on the E shore, and during strong tides from 40 minutes to 1 hour sooner.

Inshore and near the Indira Dock wall, during the Southwest Monsoon, the ebb current occurs about 45 minutes before the time of HW. This is important for vessels docking.

It has been observed that the flood current divides in the vicinity of Ballard Pier, causing a counterclockwise movement off the naval dockyard, the current taking a S direction near the breakwater pier. Vessels entering the dockyard with a flood current are advised to keep the rear range beacon slightly open N of the front beacon to avoid being set onto breakwater pier.

**Depths—Limitations.**—There is a least depth of 9.1m in the fairway of the entrance to Bombay Harbor until abreast Sunk Rock Light. A least depth of 9.6m was reported in the entrance channel and approaches to the tanker berths on Butcher Island. The shallowest bar extends from abeam the entrance buoys to abeam Middle Ground Islet. Less water than charted has been reported (1990) S of Sunk Rock.

The main channel, marked by range lights in line bearing about 085°, continues SE of Elephanta Island, and has maintained depths of 10.8 to 11m.

The maximum drafts for alongside berths are subject to change due to siltation and dredging. The Deputy Conservator of Bombay Harbor issues maximum drafts monthly.

**Indira Dock (Alexandra Dock)** has depths of 8.5 to 10.7m alongside. The entrance lock is 228m long and 30.4m wide, with a depth of 8.2m on the outer sill and 7m on the inner sill at LW. The maximum size ship that can enter Indira Dock at HW is 206m in length, with a draft of 9.5m. There are 21 berths inside the basin and five berths along the harbor wall. The dock has five berths equipped for container traffic, 16 multi-purpose berths, four general cargo/tanker berths, and one berth for heavy lifts.

In 2002, it was reported that an uncharted rock, with a depth of 7.6m, was located in the center of Indira Dock Approach Channel (18°56'N., 072°50'E.).

Vessels are not handled at night in Indira Dock except under special circumstances. When vessels are entering or leaving the dock by day, a blue flag is hoisted at the flagstaff on Bulls Nose.

**Hughes Drydock** is entered from Indira Dock. It has a maximum length of 304m, a breadth at the entrance of 30.4m, a depth on the blocks at the entrance of 6.3m below chart datum and a depth over the blocks at the entrance of 10.5m at MHWS.

**Ballard Pier**, the continuation of the W side of Indira Dock entrance lock, has a passenger berth, with a depth of 7.6m alongside, and a depth of 10m alongside the extension, but this is liable to vary due to silting. Since completion of the South Breakwater, tidal eddies have been reported by ships berthing at Ballard Pier. It has been reported (1994) that Ballard Pier has been dredged to accommodate vessels up to 228m long, with a maximum draft of 9.1m.

**Victoria Dock**, N of Indira Dock, has an entrance width of 24.3m. The maximum size ship that can enter the dock is 140m in length by day and 122m in length at night, with a draft of 6.1m and a width of 23.5m.

**Prince's Dock** has an entrance width of 20.1m; the width of the passage leading to Victoria Dock, close S, is 19.5m. The maximum size ship that can enter Prince's Dock is 152.1m in length, with a draft of 6.1m and a width of 18.4m. The dock is entered through a 20m wide, 6.6m deep channel.

Ships can be taken into Prince's Dock only from about 2 hours before the time of HW to 30 minutes after the time of HW. They cannot leave the dock after the time of HW because the ebb current commences in that vicinity about 90 minutes before the time of HW and sets directly down on to the reef N of Cross Island at about the time of HW.

Generally, vessels are only admitted 3 hours before HW. The maximum draft for entering the docks is subject to the tide.

There is a terminal facility situated on the E side of **Butchers Island (Jawahar Dweep)**. It consists of a concrete jetty about 520m long. The jetty has three pier heads, with dolphins at each end of the pier head. The jetty carries a roadway and pipelines and has berths for three vessels of various sizes. The berths are numbered from N to S as No. 1, No. 2, and No. 3, respectively. Each berth is provided with dolphins and mooring dolphins. Tankers up to 70,000 dwt, with a maximum length of 229m and a maximum draft of 11m, can be berthed. A fourth oil berth, lying S of Butchers Island, has been added for loading and discharging of crude oil. The maximum draft of a vessel mooring at No. 4 is 14.3m. Tankers up to 125,000 dwt can be berthed at this pier.

Loaded tankers are berthed at HW. It is compulsory to test astern power during the approach and before berthing at the terminal.

**Pir Pau Pier**, T-headed, at the S end of Trombay Island, is 174m long with a dredged depth of 6.8m alongside. Tankers up to 171m long, with a maximum draft of 5.5m, can be accommodated. Pir Pau Deep, dredged to 5.5m, leads W from W from the channel to the pier.

**New Pir Pau Jetty** has a depth of 11m alongside. Vessels up to 45,000 tons, with drafts of 10.6 to 11.1m and lengths of 97 to 197m, can be accommodated.

In addition to the berths mentioned above, there are a number of "Bunders" throughout Bombay. These open, shallow-draft wharves are used by local smaller vessels to load and discharge cargo.

**Jawaharlal Nehru Port** (18°57'N., 72°57'E.) (World Port Index No. 48845) is a new port on the mainland SE of Elephanta Island. The maximum draft in the approach channel is 12m for inbound vessels and 12.5m for outbound vessels. The container jetty is 680m long, the breakbulk jetty is 500m long, and the service jetty is 212m long; each jetty has a dredged depth of 13.5m alongside.

The port has been established as a satellite for Bombay and is administered by a separate port authority. The port provides three container berths, two bulk cargo berths accommodating vessels to 80,000 dwt, a ship repairyard, and a linkspan for ro-ro traffic.

**Offshore Oil Development Areas.**—An extensive area of producing oil fields and exploration areas lies off the Indian coast and the approaches to the port of Bombay. Numerous derricks, oil production platforms, wells, SPM, and other obstructions impede safe navigation of the area.

Indian authorities have established recommended routes to aid traffic transiting the area, or bound for the port of Bombay, which may be seen on the appropriate chart.

Vessels are advised not to approach within 2.5 miles of production platforms, and are prohibited from passing within 500m of any installation or structure.

Submarine oil and gas pipelines have been established from some producing fields to the entrance of Bombay Harbor. Vessels should exercise caution when navigating in this vicinity.

Well heads exist in position 19°20'N, 72°03'E and in position 19°44'N., 72°01'E., about 53 and 70 miles NW of entrance to Bombay Harbor. For further information consult Pub. 160, Sailing Directions (Planning Guide) South Atlantic Ocean and Indian Ocean.

Transshipment of petroleum products is carried out from large storage tankers moored in the vicinity of position 18°53'N., 72°26'E.

Any vessel in difficulty within 50 miles of any production platform or rig and likely to drift towards platforms or rigs should contact Bombay Radio and standby offshore supply vessels on VHF channel 16 for assistance.

The established development areas are, as follows:

1. **Bombay High Oil Field Development Area.**—This area is situated with its center about 90 miles WNW of the entrance to Bombay Harbor. The area extends 25 miles in an E-W direction and 47 miles in a N-S direction and contains numerous production platforms within. Three lighted tanker mooring buoys are situated close together in the N part of the area. Flares are lit from this vicinity. Another lighted tanker mooring buoy is situated 10 miles SSE of the above buoys. Oil and gas pipelines are laid ESE from the center of the oilfield to Bombay.

2. **Mukta Panna and Bassein Oil Field Development Area.**—This area is situated with its center 50 miles NW of the entrance to Bombay Harbor. The area extends 21 miles in an E-W direction and 33 miles in a N-S direction. Submarine

oil and gas pipelines from Bombay High Oil Field are laid passing through the center of Bassein Oil Field Area with a gas pipeline branching 115 miles NNE to Danti at the **Mindhola River** (21°04'N., 72°43'E.).

**3. Neelam Heera and Ratna Oil Field Development Area.**—This area is situated with its center about 40 miles SW of the entrance to Bombay harbor. The area extends 14 miles in an E-W direction and 40 miles in a N-S direction.

A circular lightering area, best seen on the chart, is located about 22 miles W of Malabar Point. All vessels are advised to maintain a continuous listening watch on VHF channels 6 and 19 and to give the area a wide berth.

Direction Bank, with its N end about 39 miles WSW of the SE entrance point of Bombay Harbor, extends about 27 miles in a S direction, and has depths of 37 to 64m, coarse sand and small shells. East of this bank, the depths decrease gradually from about 55m, off its E edge, towards the coast.

Vessels approaching Bombay from the N of Direction Bank will run a considerable distance before the depths will decrease from 73m to 55m, but the depths will then decrease rapidly to 37m, which depth is found about 15 miles W of **Khanderi Island** (18°42'N., 72°49'E.) or the light structure on Prongs Reef, about 10.5 miles farther N.

A vessel approaching this bank from the W will pass over Fifty Fathoms Flat, then gradually shoal to depths of 73m, and then suddenly to 55 and 42m over Direction Bank. After crossing the bank the depths will again increase to more than 55m over the greater part of the bank, and to about 50m at its S end.

Approaching Bombay from the SW, if the vessel is S of Direction Bank, the depths will decrease rapidly from 73m to 55m, and continue between 55 and 37m for some distance until the latter depth is obtained about 17 miles offshore.

**Aspect.**—In clear weather, the high peak of **Malangar** (19°06'N., 73°11'E.), 789m high, is conspicuous in the offing. On the summit of this peak is an enormous perpendicular cliff, topped by a fort in ruins.

On nearer approach Kanheri and Shendur, on Salsette Island on the N side of the harbor, and Kankeshwar and the Sagara-garh Range, on the S of the harbor, can be seen. Kanheri and Shendur were previously described with Salsette Island in paragraph 2.24.

Kankeshwar, a mountain 384m high, lies about 26 miles SW of Malangarh. It is separated by a valley from a thickly-wooded range of hills which extends along the SE side of the entrance of Bombay Harbor.

Thal Knob, 54m high with a conspicuous white beacon, 18m high on its summit, lies about 4.3 miles NW of Kankeshwar. False Knob, about 0.5 mile SSW of Thal Knob, is similar in appearance, but somewhat lower. In thick weather these hills, being detached from the more distant highland, stand out well among the coconut trees.

Ashuerra Hill, 243m high, about 3.5 miles ESE of Thal Knob, has two hummocks named The Paps. A black beacon, 24m high, lies on North Pap.

Sheva Beacon lies on a drying reef at the S end of the port. **Nhava Island** (18°58'N., 72°57'E.) lies close E of N break-water head.

**Gull Islet** (Kansa Rock) (18°50'N., 72°54'E.), 6.1m high and marked by a lighted beacon, 20.4m high, lies about 2.3 miles NNE of Thal Knob.

Karanja (Great Karanja), 302m high, is a long and flat-topped hill at the S end of Karanja Island, about 2.8 miles ENE of Gull Islet. The S side of this hill is steep and almost inaccessible, but the N side slopes gradually from its base to a peak on which there is a ruin. A conspicuous flare chimney lies at the SE end of the island; a conspicuous tower lies on the SW slope of Kharavli, a 214m hill near the NW extremity of the island.

Kharavli, 212m high at the N end of Karanja Island, about 2.8 miles NNW of Karanja, is formed by the junction of 4 ridges and has a very sharp summit.

Fifty Fathoms Flat, lying between 60 and 120 miles W of Bombay, is an extensive bank with depths of 82 to 92m, fine sand, although a muddy bottom has occasionally been found between this bank and Direction Bank.

Bombay Island consists of a low-lying plain, flanked by two parallel ridges of low hills. The city consists generally of well-built houses and broad streets, with many fine public buildings. The most conspicuous of these is the Taj Mahal Hotel, surmounted by a dome 70m high, about 2 miles NE of Colaba Point. Among the conspicuous buildings in the densely built tract known as The Fort, W of Indira Dock, are the cathedral and the municipal buildings, the tower of which is 71m high. Another tower, with a white dome 53m high, lies about 1 mile farther N.

A clock tower, 85m high, about 0.5 mile NNW of the Taj Mahal Hotel, is conspicuous among the prominent buildings on the esplanade on the E shore of Back Bay.

A conspicuous chimney, 54m high, and the spire of St. John's Church, 55m high, lie on the Colaba Peninsula, about 0.7 mile SSW, and 1.3 miles SW, respectively, of Taj Mahal Hotel. The Naval signal station, with a flagstaff, is prominent near the root of the S breakwater.

**Khanderi Island** (Khanhoji Angre Island) (18°42'N., 72°49'E.), S of the harbor entrance and about 2.5 miles offshore, has two hills, on the S and higher of which lies the light-house with a flagstaff NE of it. The island, sparsely covered with trees and scrub, is surrounded by the remains of a wall. A rock drying 3.8m, marked by a beacon 3m high, lies 0.2 mile NE of Khanderi Island. Leading lights are shown on the E side of Khanderi Island, 1.3 miles NE of the light; when in line bearing 168° they lead W of the drying rock and to the landing place.

**Bombay Lightship** (18°50'N., 72°44'E.) is moored nearly 5 miles SW of Prongs Reef Light; it is removed and replaced at irregular intervals. It has been reported that Bombay Lightship has been off-station for an extended period. A wreck area, best seen on the chart, lies S and SW of the lightship. A depth of 11m and a wreck, with a depth of 11m, lie 4.5 miles W and 2.8 miles S, respectively, of the lightship.

**Colaba Point** (18°54'N., 72°49'E.) is the S extremity of the Colaba Peninsula, a narrow peninsula extending SW from Bombay Island. The peninsula is covered with buildings which continue N in an unbroken line and connect with the more thickly settled part of the city. A spoil ground lies 4 miles WSW of Colaba Point.

Prongs Reef, which dries, extends about 1 mile SSW from Colaba Point. **Prongs Reef Light** (18°53'N., 72°48'E.), a prominent visual navigation aid, is shown from a round tower, 52.5m high, painted in red, white and black horizontal bands near the S end of Prongs Reef. Foul ground extends about 1

mile SW, SE, and E of the light structure. The light structure is reported to be a good radar target at 17 miles. A dangerous wreck, with masts above water, is situated 5.5 miles SW of Prongs Reef Light, with another dangerous wreck 0.4 mile NNE from it. The area is considered foul and dangerous to navigation.

Malabar Point, about 3 miles NNW of Colaba Point, and Malabar Hill, about 1 mile farther NE, have been reported to give good radar returns at 22 and 39 miles, respectively.

Khanderi Island Light, about 10.5 miles S of Prong Reef Light, is shown at an elevation of 47m from an octagonal tower, surmounting a flat-roofed house, 31.5m high, on the summit of Khanderi Island. It is connected by telephone with Bombay. If a vessel is seen to be lying into danger, a warning rocket signal is fired, and the International Code signal "U," (You are standing into danger) is displayed.

Khanderi Island has been reported to give good radar returns at 17 miles.

Foul ground and shoal water extend about 3 miles offshore between Khanderi Island and the SE entrance point of Bombay Harbor. Thal Shoal, about 6 miles N of Khanderi Island and 2.5 miles offshore, is composed of sand and rock, with several detached heads, and a least depth of 4.3m. A black conical buoy is moored off the W side of Thal Shoal.

Thal Reefs, SE of Thal Shoal, consists of numerous reefs and rocks extending about 1.5 miles offshore. Detached shoals, with depths of less than 5.5m, lie within 1 mile W of Thal Reef. A prohibited area, best shown on the chart, lies close N of Thal Shoal.

East Channel Swatch, with a least depth of 5.8m, lies between Thal Shoal and the detached shoals W of Thal Reef.

SW Prongs Lighted Buoy, moored about 1.5 miles SSW of Prongs Reef Light, marks the edge of the shoal water SW of Prongs Reef.

A lighted buoy moored about 1.5 miles SE of Prongs Reef Light marks the N side of the fairway into the harbor.

**Sunk Rock** (18°53'N., 72°50'E.), awash and marked by a light, lies about 1.3 miles E of Colaba Point. A stranded wreck, marked by a lighted buoy, lies 2.3 miles SE of Sunk Rock. Another dangerous wreck, marked by a lighted buoy, lies 1.8 miles S of Sunk Rock.

Oyster Rock, about 0.8 mile ENE of Sunk Rock, is flat and 21.5m high; a tower, with an elevation of 28m, stands on it. Fishing stakes extend about 0.5 mile E of Oyster Rock; care is necessary when navigating in this vicinity, as the stakes are often broken off just below-water.

Dolphin Rock, nearly steep-to on its E side and marked by a light, lies about 1.5 miles N of Oyster Rock.

Middle Ground Islet, rocky and about 12.5m high, lies about 0.8 mile ENE of Oyster Rock; two towers, with an elevation of 17m, lie on the islet. Shoal water extends about 110m SW and 0.2 mile NNE, respectively, from the islet.

Range lights, in line bearing 305°, on Ballard Pier, about 0.5 mile farther N, lead through the middle of the approach channel to the pier.

The Naval Dockyard lies about 0.5 mile NW of Middle Ground Island. South Breakwater, marked at its head and root by towers having an elevation of 58m, forms an enclosed area E of the Naval Dockyard. The Naval Signal Station, with a flagstaff, is conspicuous near the root of South Breakwater.

Cross Island, 19.5m high, lies about 1.8 miles farther N, and about 0.3 mile off Victoria Dock.

The N side of the harbor is occupied by an extensive coastal bank, with depths of less than 5.5m.

Tucker Beacon, about 1.8 miles ENE of Middle Ground Islet, marks the S edge of the bank. The beacon is a cylindrical structure, painted in red, white, and black horizontal bands, and shows a light.



*Courtesy of Mumbai Port Trust*

**Tucker Beacon**

Gull Islet (Kansa Rock) lies off the entrance to Dharamtar Creek, on a bank filling the SE part of Bombay Harbor. Gull Islet Light is shown from a framework tower on the summit of the islet.

Karanja Reefs, farther N, extend about 2 miles off the W side of Karanja Island. Karanja Beacon, a black steel structure, 8.5m high, surmounted by a cone, lies near the NW edge of the reefs, about 5 miles N of Gull Islet.

Two spoil grounds, the N marked approximately 0.5 mile NNW by a lighted buoy, are situated between South Karanja Buoy and Karanja Reefs.

A dangerous wreck, marked by a buoy, lies about 1.5 miles SW of Karanja Beacon.

**Butcher Island** (Jawahar Dweep) (18°58'N., 72°54'E.), 20m high, with an oil terminal on its SE side, lies about 5 miles NE of Middle Ground Islet. A conspicuous water tower, with an elevation of 31m, stands near the center of the island.

Butcher Rock, steep-to on its S and E sides, lies about 0.6 mile S of Butcher Island and is marked by Butcher Beacon, a

red stone beacon, 8m high, from which a light is shown. A breakwater, extending NNW from Butcher Rock, is 3m above chart datum and uncovers at half tide.

Elephanta Island, 174m high, about 1 mile E of Butcher Island, is wooded with two hills separated by a ravine.

Elephanta Patch Beacon, from which a light is shown, lies about 0.5 mile NW of Elephanta Island.

The channel leading ENE and NNE between Butcher Island and Elephanta Island is marked by ranges. Range lights, shown on the SW side of Elephanta Island, in line bearing 055°, lead between the shoals on either side of the channel. This range intersects with a lighted range leading NNE, which is in line bearing 203°, astern. The rear light of the latter range is shown from a lighted beacon on **Uran Shoal** (18°56'N., 72°54'E.).

Trombay Island, N of the harbor, attains an elevation of 305m at **Trombay Peak** (19°02'N., 72°55'W.). There are several oil refinery chimneys on the S side of the island; the flares from these chimneys are conspicuous and visible from seaward.

Pir Pau Tomb, a conspicuous mosque with a white dome, 24m high, stands on the S extremity of Trombay Island. A white dome, 42.5m high, and a chimney, 125m high, are conspicuous about 0.5 mile farther NNE.

Radio masts, each marked by red lights, stand on the SW end of Trombay Island.

**Pilotage.**—Pilotage is compulsory in Bombay for all vessels over 100 tons and is available 24 hours. The pilot boards about 1.5 miles S of Sunk Rock Light. Pilots can be contacted on VHF channel 12, 14, or 16.

Pilotage is compulsory in Jawaharlal Nehru for all vessels over 200 tons and is available 24 hours. The pilot boards about 1.5 miles S of Sunk Rock Light. Pilots can be contacted on VHF channel 13.

During monsoon conditions, pilots will board inside the channel.

If awaiting a pilot, vessels may anchor, draft permitting, SE of Sunk Rock Light.

**Regulations.**—A Vessel Traffic Service controls traffic to Bombay and the Jawaharlal Nehru Port. When arriving within a distance of 24 miles from Prongs Light, vessels must register their approach by contacting Bombay Vessel Traffic System on VHF channel 14. In addition, vessels bound for the Jawaharlal Nehru Port must contact that port on VHF channel 13.

Advance notification requirements for Bombay and Jawaharlal Nehru are given in the accompanying table.

A naval signal station at Colaba Point may call up vessels by signal lamp, which they are required to answer by the same system.

Vessels liable to quarantine or carrying certain types of dangerous cargo are required by Bombay Port Rules to make certain signals to Prongs Reef Light; these are answered by day by corresponding signals at the light.

The Port Signal Station is in a tower on the E side of Ballard Pier. The docking signal station is on Bull's Nose at the entrance to Indira Dock. The Naval Signal Station lies about 0.5 mile SW of the Port Signal Station.

Communication is by the International Code of Signals, by signal lamp at night, or by VHF radiotelephone.

Storm signals are displayed from the port signal station and from a flagstaff at the NE corner of Victoria Dock; the General System is used. Further information on these storm signals may be found in Pub. 160, Sailing Directions (Planning Guide) South Atlantic Ocean and Indian Ocean under "India—Signals."

**Anchorage.**—Vessels usually anchor on the W side of the harbor, abreast Bombay, in depths of 6.7 to 11.3m, but good anchorage can be obtained in other parts of the harbor.

Deep-draft vessels should anchor about 7 miles W of Prongs Reef, outside the 20m curve, in mud and shingle, reportedly good holding ground, awaiting berthing instructions.

As a general rule, vessels in the harbor should be moored in a SSW-NNE direction between October 1 and May 31 with 82m of cable each way, and between June 1 and September 30 with 109m on the S anchor, and 82m on the N anchor; vessels moored in the eddies off Middle Ground Islet should have 137m on the S anchor.

An area reserved for naval vessels lies between Sunk Rock, Middle Ground Islet, and the Naval Dockyard.

Vessels subject to quarantine may be instructed to anchor in a position convenient for the health officer to board.

Anchoring and fishing are prohibited in the vicinity of the pipelines. Anchoring is prohibited in an area in the harbor entrance extending approximately 5 miles E from Bombay Lightship. A dangerous wreck lies in anchorage A5.

**Directions.**—Vessels may approach Bombay from N to S through W, but attention must be paid to areas in which fishing stakes may be encountered, as indicated on the chart. In 1987, it was recommended for vessels to pass N of Bombay Lightship in order to avoid the spoil ground and fishing stakes lying W of Thal Shoal and the foul area.

**Advance Notification Requirements for Bombay and Jawaharlal Nehru**

Bombay	Jawaharlal Nehru
Vessels should send their ETA 7 days, 5 days, 3 days, 2 days, and 1 day prior to arrival, via the agent. The 5-day message should contain the following information:	Vessels should send their ETA 7 days, 5 days, 3 days, 2 days, and 1 day prior to arrival, via the agent. The 5-day message should contain the following information:
1. Master's name.	1. Vessel name.
2. Vessel's ETA.	2. Master's name
3. Present loaded displacement, draft, grt, and nrt.	3. Port of registry.
4. Ports visited in last 30 days.	4. Last port of call.
5. Distance of manifold from amidships.	5. Length overall.

Advance Notification Requirements for Bombay and Jawaharlal Nehru	
Bombay	Jawaharlal Nehru
6. Cargo quantities on board.	6. Gross tonnage.
7. Supplies and cash requirements.	7. Type of vessel.
	8. Maximum draft in meters.
	9. Class of dangerous cargo.
	10. Any defects.
The ETA should be confirmed on VHF channel 16, 14, or 12 at least 3 hours prior to arrival.	The ETA should be confirmed on VHF channel 16, 14, or 12 at least 3 hours prior to arrival.

The harbor entrance lies between lighted buoys moored N of Thal Shoal and SE of Prongs Reef, 2.5 miles NW of the shoal.

If approaching from the NW, keep North Pap Beacon (18°46'N., 72°56'E.) in line with Thal Knob Beacon, on a bearing of 121.5°, which leads close SW of SW Prong Lighted Buoy. If approaching from the S, pass W of the buoy marking Thal Shoal.

During the Southwest Monsoon, when it may be difficult to identify marks, or during the cold weather, when a smoke haze often reduces visibility, the best time to make Bombay is about 1 hour before sunrise, when the lights are still visible.

In the approaches to Bombay, recommended routes are charted to assist mariners to navigate safely in the vicinity of the previously-described Offshore Oil Development Areas. One route leads in an E-W direction, passing S of Bombay High Oil Field Development Area and Mukta Panna and Bassein Oil Field Development Area and N of Neelam Heera and Ratna Oil Field Development Area. Other routes lead in NNE-SSW directions, passing W and E of Neelam Heera and Ratna Oil Field Development Area.

Mariners are advised to keep 1 or 2 miles to starboard of the centerlines of these routes in the approaches or departure from Bombay, and to be consistent with the 72 COLREGS.

**Caution.**—In the approach to Bombay, either from N or S, lines of strong fishing stakes, surmounted by baskets, which project about 6.1m out of the water, may be encountered anywhere in depths up to 18.3m and sometimes up to 22m.

In the immediate approach to the harbor, within the area shown by dashed lines on the charts, no fishing stakes are permitted, but even within this area they are sometimes placed, and so may be encountered before the port authorities have been able to remove them.

Occasionally the heads of the stakes are broken off at the waterline and then they may not be seen above water.

All fishing stakes are normally removed each year for the duration of the Southwest Monsoon.

In 2001, it was reported that numerous fishing vessels were anchored directly in the inbound and outbound traffic lanes.

Numerous wrecks, best seen on chart, lie in the approaches, channels, and adjacent waters of the port of Bombay. Mariners should use caution while transiting these waters.

Heavy smog and haze may reduce the visibility in the harbor.

It was reported (2001) that heavy pollution and siltation in the harbor prevented the vessel's depth finder to give accurate readings.

A submarine exercise area is centered 67 miles W of the entrance to Bombay Harbor. Another submarine exercise area is centered between the Fifty Fathoms Flat and Direction Bank, about 75 miles offshore.

Numerous small fishing vessels, with buoyed nets, are likely to be encountered up to 25 miles offshore from Bombay.

A depth of 23m was reported in 1987 close W of the 200m depth contour in approximate position 19°00'N, 69°55'E.

Mariners are advised not to anchor or fish near the pipelines to avoid damaging them.

Submarine oil and gas pipelines are laid from the SW point of Karanja Island, WSW through the entrance to Bombay Harbor and then NW to Bombay High Field.

## Bombay to Cape Rama

**2.27** The coast between **Khanderi Island** (18°42'N., 72°49'E.) and Cape Rama, about 228 miles SSE, consists of sandy bays separated by bold rocky capes. There are a number of river estuaries and it is often bordered by tableland in the middle of its S part. The Western Ghats, which are generally from 609 to 904m high, with some peaks nearly 1,524m high, lie like a wall parallel to the coast at an average distance of 30 miles inland.

The Sagargarh Range, S of Kankeshwar, has a spur forming two narrow ridges extending W to about 2 miles ENE of Alibag. **Sagargarh** (18°39'N., 72°58'E.), 415m high, and the highest peak of this range, lies about 5 miles E of Alibag. It has a rounded summit and is faced on its S side by high conspicuous cliffs. At the NW end of this range, about 5 miles NW of Sagargarh and 2.5 miles from the coast, are three high bare, and conspicuous peaks. The S of these three is the sharp and conical Parhur, 313m high. Close SE of Sagargarh is a sharp rocky peak; farther S the range is lower and covered with jungle.

**Depths—Limitations.**—Depths in the approach to the coast between Bombay and Cape Rama are fairly deep and clear of dangers, with the exception of Angria Bank.

Angria Bank, with a least depth of 20.1m in position 16°43'N., 72°03'E., lies about 65 miles off the coast, and is composed of sand, shells, and coral. The bank is steep-to on all sides, with great depths surrounding it. The tidal currents set NE across the bank during the flood and SW with the ebb, with a velocity of about 1 knot in spring tides.

A volcanic disturbance was reported observed (1949) in an area about 100 miles SW of Angria Bank. Vessels should approach this area with caution.

**Caution.**—Between Khanderi Island and Boria Point, about 80 miles SSE, fishing stakes and logs are liable to be encountered in depths up to 22m.

### Khanderi Island to Murud-Janjira Harbor

**2.28** The coast from abreast Khanderi Island to Alibag, about 4 miles S, consists of a low ridge of sandhills backed by dense groves of palm trees. It is fringed by sandbanks and reefs extending in places about 1.3 miles offshore, and depths of less than 5.5m extend about 3.5 miles offshore. The inner reefs, which lie in narrow ridges parallel to the shore, are joined by low stone walls and are used as fish traps.

Alibag Creek, almost closed by sand, lies S of Alibag. Kolaba Fort, about 0.5 mile SW of Alibag, stands on a drying reef on the NW side of the entrance to the creek. The fort can be recognized by the cupola of a temple in the shape of a pogoda, which is conspicuous from seaward. A light is shown periodically from Kolaba Fort.

Alibag Outer Reef, with a depth of 1.8m, lies about 1.3 miles W of Kolaba Fort, and is marked SW by a red conical buoy from October to May.

Chaul Kadu Reef, a group of rocky patches with a least depth of 2.1m, lies about 2.5 miles farther S. The sea breaks heavily over these reefs at LW. A light is shown from a white round masonry tower, 19m high, on the NE extremity of the reef.

**2.29 Revadanda Port** (Port Chaul) (18°33'N., 72°55'E.), the estuary of the Kundalika River, is only available to vessels able to cross the bar. In the fairway over the bar there is a depth of 2.1m, but this may be subject to change. The tide flows over a considerable part of the low-lying land on either side of this moderately wide river at HWS. Local vessels call at the port.

Korlai Fort, on the S side of the river entrance, stands on the summit of a reddish-colored headland, connected to the mainland by a low, narrow, and sandy isthmus. The N part of this headland slopes gradually to the sea and terminates in a rocky point. A light is shown from the fort.

Chaul Knob, 255m high, round and conspicuous, lies about 1.8 miles ESE of Korlai Fort, and is the summit of a range of wooded hills.

Revadanda, an old fortress, stands on the N entrance point of the river. The tower of the Franciscan convent, 30.5m high, is conspicuous above the walls of the fort.

A prominent white temple stands 2 miles NE of Revadanda. Another temple is conspicuous on the summit of a 172m hill above the preceding temple. A Muslim tomb stands at a height of 128m, near a group of palm trees, about 0.8 mile NW of the latter temple.

Nine Foot Patch lies about 2.3 miles NW of Korlai Fort. Six Foot Patch lies about 0.8 mile farther S.

An offshore production platform lies about 33 miles W of the entrance to Murud-Janjira harbor.

**2.30 Murud-Janjira Harbor** (18°18'N., 72°57'E.), at the mouth of Rajpuri Creek, is entered between Vihur Point (Yeoor

Point) and Nanwell Point (Rajpur Point), about 4 miles SSE. The harbor affords good shelter to moderate-sized vessels from all winds except those from W and NW.

**Tides—Currents.**—The tidal rise is 3.9m at MHWS, and 3m at MHWN. Tidal currents have a velocity of 1 knot to 1.5 knots at springs.

**Depths—Limitations.**—Depths of less than 5m extend about 10.3 miles S of Kansa Fort.

Whale Reef, about 1.3 miles WSW of Nanwell Point, dries 3.3m. Shoal water, with depths of less than 5m, extends about 0.5 mile WNW, and 0.3 mile S of the reef.

Fishing stakes, consisting of large poles or stripped palm trees, may be met within the harbor, but they normally show well above HW.

**Aspect.**—The coast in the vicinity of the harbor is hilly and well-wooded, with high ranges behind the coastal hills.

A peninsula with two conspicuous peaks lies on the S side of the harbor. Conical Hill, 232m high and bare, and Round Hill, 231m high and thickly wooded, lie about 2 and 3 miles, respectively, SSE of Nanwell Point. Dighi Hill, about 1.5 miles SE of the same point, is 250m high and the highest point of the peninsula.

Dighi, a village on the S shore of the Rajpuri River, has a bight SE of it fringed with mangroves; a drying mud flat fills the bight. There is a jetty at Dighi and a small sugar exporting port is planned.

Nanwell Point Light is shown from a white masonry tower with red bands, on Nanwell Point, a wooded bluff.

A hill, 134m high, lies about 0.8 mile N of Vihur Point. Murud Hill, 306m high, is conspicuous about 2.5 miles E of the same point.

Janjira Fort, 37m high and conspicuous, stands on a rocky islet, about 2 miles NE of Nanwell Point and abreast the village of Rajpuri. A light is shown from the fort.

Bandar Hill, a small round headland 70m high, with a grassy summit, lies about 1 mile NNW of Janjira Fort. A light is shown periodically from the hill.

Kansa Fort, its walls about 6.1m high and partly in ruins, stands on a reef about 2.5 miles N of Nanwell Point.

The Nawabs Palace and flagstaff are conspicuous on a steep bluff, 33m high, about 1.3 miles NE of Kansa Fort.

The town of Murud, surrounded by a large grove of palm trees, is situated on the N side of the entrance between Bandar Hill and Nawabs Palace.

**Anchorage.**—Anchorage can be obtained, in about 5m, with Janjira Fort bearing 001°, about 0.7 mile. Anchorage with better shelter can be obtained, in about 5.5m, with the fort bearing 330°, distant about 1.75 miles and Sandy Point bearing 100°. Sandy Point lies about 3.5 mile E of Nanwell Point.

**Directions.**—A vessel bound for Murud-Janjira Harbor should keep in depths greater than 11m until Janjira Fort is identified. Then bring Fort Janjira to bear 090° and steer for it on that bearing until Nanwell Point Light bears 180°. Course is then altered SE into the harbor, or steer for Sandy Point bearing 116° to the anchorage, in a least depth of 4.4m.

Approach to the anchorage may be obstructed by lines of fishing nets and, from November to April, by fishing stakes.

## Muhud-Janjira Harbor to Port Bankot

**2.31 Kumbaru Point** (18°13'N., 72°56'E.), 70m high, lies about 3.5 miles S of Nanwell Point and is the N entrance point of Kumbaru Bay. The point fronts densely wooded hills rising to about 240m; there is a conspicuous bluff about 2.3 miles E of the point.

Shah Jehan Shoal, with a least depth of 4.2m, lies about 1 mile SW of Kumbaru Point. Depths are irregular for a short distance W of this shoal and vessels in the vicinity should keep in depths greater than 11m.

Anchorage, sheltered from NW winds, can be taken, in a depth of 4.5m, SE of Kumbaru Point.

Srivardhan Bay, about 5 miles SSE of Kumbaru Bay, is shallow and the village of Srivardhan lies at its head. A light is shown from the S end of the N entrance point of the bay from September to May.

Anchorage off Srivardhan for large vessels can be obtained, in 10m, mud, about 3 miles WNW of **Srivardhan Point** (18°01'N., 73°00'E.), the S entrance point of the bay.

## Port Bankot (17°59'N., 73°03'E.)

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**2.32** Port Bankot lies from 1 to 2 miles within the bar at the entrance of the Savitri River, which is entered between Devgarh Point, 55m high, and Rankuran Point, about 1.5 miles SSE. Bankot, a fishing village, extends some distance along the S bank of the river. The Savitri River becomes a narrow stream above the village.

**Tides—Currents.**—The tidal currents set over the bar NNE with the flood, and SSW with the ebb, attaining a velocity of 0.8 knot at springs.

Between the bar and the anchorage off Bankot the flood current sets slightly toward the sandbank on the N side of the channel, while the ebb follows the direction of the channel.

At the anchorage off Bankot the velocity of the tidal currents at springs is about 2.5 knots.

**Aspect.**—The entrance of the Savitri River may be identified by Hareshwar Hill, 109m high, dark, and conical, about 0.3 mile E of Devgarh Point. Hareshwar Donghur, 125m high, is conspicuous about 0.8 mile farther NE.

The high black walls of Fort Victoria, in ruins, stand at an elevation of 140m, about 0.8 mile ENE of Rankuran Point. A high pillar and large pyramidal headstone, both prominent from outside the bar, stand in a cemetery close under the walls of the fort. The hill from Fort Victoria slopes down to Panbruj Point, about 0.8 mile NE of Rankuran Point.

The entrance to the channel over the bar was 1 mile W of Rankuran Point, with a least depth of 2.1m in 1968. The N side of the entrance is marked by a red can buoy, and the S side by a black conical buoy. A drying sandbank N of the channel, over which the sea breaks heavily, is marked by a red can buoy. The existence of these buoys is doubtful.

Depths gradually increase within the bar, and off Panbruj Point there is a pool with depths of 13m.

**Pilotage.**—The services of a local unlicensed pilot can be obtained on application to the Customs and Port Officer.

**Anchorage.**—Outside the bar, anchorage can be taken, in a depth of 9m.

Off Port Bankot vessels may anchor, in about 10m, off the custom house, which lies about 0.3 mile ENE of Panbruj Point.

**Directions.**—The NW corner of Fort Victoria bearing 079° leads across the bar. The channel then leads 055° and passes close W of Panbruj Point.

The channel over the bar is liable to change and passage into the river should not be attempted without local knowledge.

**Caution.**—Caution is required in crossing the bar; during strong W breezes heavy breakers are raised over the bar and there is always a cross sea.

## Port Bankot to Port Dabhol

**2.33** The coast between the entrances of the Savitri River and the Vashishti River, about 25 miles SSE, consists of a series of plateaus at elevations of 150 to 210m.

Kanta, a peak 346m high, about 2.3 miles ESE of Bankot, and Gimona Peak, 306m high, about 10 miles farther SSE, are two conspicuous peaks along this coast.

The seaward slopes of the plateaus are generally abrupt, but in places there is a narrow strip of land between the plateaus and the beach. The vegetation consists of sparse bushes with very few trees.

A vessel proceeding between the two rivers will not encounter any shoals by keeping from 1.5 to 3 miles offshore and in depths of over 9.1m. Care must be taken to avoid the logs marking the fisheries, which may be met about 5 miles W of the entrance to the **Jog River** (17°50'N., 73°05'E.).

An islet, about 2 miles S of the entrance to the Jog River, lies close S of a promontory projecting from the coast at Harnai. Harnai Light is shown from a white masonry tower on the promontory.

Janjira Fort, a fortified islet, 19m high and covered with vegetation, stands about 0.5 mile NW of the above-mentioned islet. Janjira Fort, standing under a range of hills, is not easily distinguished from seaward.

Burondi Bay lies about 6 miles SSE of Janjira Fort. The bay affords anchorage, with some shelter from S winds, in a depth of 3.7m.

**2.34 Port Dabhol** (17°35'N., 73°10'E.) lies in the estuary of the Vashishti River, which is navigable at all times by vessels with a draft of 3m as far as Karbone, about 16 miles within the entrance, and thence, at HW only, to Chiplum, 10 miles farther up.

**Tolkeshwar Point** (17°34'N., 73°09'E.), the S entrance point of the river, is bold and faced with cliffs about 90m high; an ancient Hindu temple and a prominent clump of trees stand on its summit. Ranvi Point, about 0.5 mile S of Tolkeshwar Point, has a very large boulder and overhanging cliff N of it.

Sili Point, the N entrance point of the river, lies nearly 2 miles ENE of Tolkeshwar Point. Chirpulti Sand, which dries, extends about 1.5 miles WSW of the point.

**Tides—Currents.**—The tidal rise at Port Dabhol is 2.7m at MHHW and 2.2m at MLHW.

The tidal current sets NE over the bar with the flood and SW with the ebb, attaining a velocity of about 1.5 knots.

Inside the bar the flood current sets into Anjanvel Bay and the ebb onto Churpulti Sand.

The flood current continues for about 1 hour after HW and the ebb current for about 1 hour after LW. At neaps, the ebb current occasionally commences 1 hour before HW.

**Depths—Limitations.**—The bar, with a least depth of 2.7m on the entrance range, extends about 0.7 mile NW of Tolleshwar Point. Within the bar, the depths increase from 7.6m to 12.8m.

Churpulti Sand lies on the N side of the channel.

**Aspect.**—The land on both sides of this river is hilly and undulating; the hills, about 90 to 120m high, slope steeply to the coast and terminate in cliffs from 5 to 25m high.

Pir Balu, a conical hill 248m high, with a dome-shaped tomb on its summit, is located about 4.3 miles ENE of Tolleshwar Point and is a good landmark as it lies out above the flat rocky ridges in the vicinity.

Tolleshwar Point Light is shown from a white, square, masonry tower on Tolleshwar Point. This light may be occasionally obscured by clouds because of its elevation of 104m. The point has been reported to be a good radar target at 23 miles.

Anjanvel Fort, in ruins, is situated about 0.8 mile ENE of Tolleshwar Point. Anjanvel Bay, E of the fort, is shallow. Veldur Hill, 81m high, is located on the E side of Anjanvel Bay.

Range lights, on the S side of the river, in line bearing 081°, lead across the bar. The front light is situated close N of Anjanvel Fort and the rear light stands on the N slope of Veldur Hill, about 0.8 mile E.

A red can buoy marks the W end of the bar; another red can buoy is moored off the S side of Churpulti Sand. A red can lighted buoy is moored about 0.5 mile SW of Sil Point.

**Pilotage.**—The services of a local unlicensed pilot can be obtained on application to the Customs and Port Officer.

**Anchorage.**—Good anchorage may be obtained outside the bar, in calm weather, in 10m, clay, about 1.3 miles WNW of Tolleshwar Point.

Anchorage may also be obtained in midstream, S of the pier at Dabhol, in a depth of about 8.5m, mud.

**Directions.**—Vessels intending to enter the Vashishti River should not proceed into depths less than 9.1m until Tolleshwar Point Light bears 095°. When the light structure is on this bearing, distant 1.5 miles, bring the range lights in line bearing 081°. When Tolleshwar Point Light bears 180°, steer to pass about 137m N of Anjanvel Fort Light, the front range light. When the latter light bears 180°, steer a mid-channel course, keeping about 0.1 mile offshore to avoid the coastal reef which extends about 91m offshore near Veldur Hill.

Care must be taken to avoid fishing logs which are often moored both inside and outside the river.

**Caution.**—A dangerous wreck, best seen on the chart, is situated 6 miles WSW of Tolleshwar Point, the position of which is approximate. Another dangerous wreck lies 5 miles SW of the same point, along the 20m line.

## Port Dabhol to Jaigarh Bay

**2.35** A sandy beach extends about 3.8 miles SSE from a position about 3 miles SE of Tolleshwar Point. Guhagar, a large village, lies parallel to the beach close inland.

Cliffs, about 100m high inland near their N end, extend from the sandy beach to Palshet Bay, about 1 mile S. Palshet Light is shown from the N entrance point of the bay; the light is obscured by high land when bearing more than 141°.

**Boria Headland** (17°24'N., 73°10'E.), about 2 miles SW of Palshet Bay, attains an elevation of 118m. Boria Pagoda, a small conspicuous temple, stands at the NW end of the headland within a summit of the point. Boria Pagoda has been reported to be a good radar target at 18 miles.

Boria Bay lies SE of Boria Headland. Anchorage, sheltered from NW winds, may be obtained by small vessels, in a depth of 8m, mud.

The coast between Boria Headland and Bhandarawadi Point, 3.5 miles SSE, is composed of small, sandy bays divided by rocky points.

**2.36 Jaigarh Bay** (17°18'N., 73°13'E.) is entered between Jaigarh Head and Bhandarawadi Point, about 1.8 miles NE. The estuary of the Shastri River, which flows into the head of the bay, forms a sheltered, convenient harbor, fairly easy to access, even during the Southwest Monsoon, for vessels of about 3.4m draft with local knowledge.

**Depths—Limitations.**—The bar of the Shastri River extends NNE from close W of Jaigarh Fort to close E of Katane Reef, which dries 0.6m about 0.2 mile SW of Bhandarawadi Point.

A channel leads E across the S end of the bar about 0.2 mile offshore and had a least depth of 3.7m in 1964, but it is subject to change.

Mora Sands, which dry 1.2m, extend about 0.6 mile W of the NE entrance point of the Shastri River, leaving a navigable channel about 183m wide between Mora Sands and Jaigarh.

**Aspect.—Jaigarh Head** (17°18'N., 73°11'E.) has Karateshwar Point at its NW extremity; this point appears from seaward to be a level and almost barren plateau terminating in steep rocky cliffs. A Hindu temple stands on the steep face of the cliffs. Jaigarh Head has been reported to be a good radar target at 20 miles.

Jaigarh Head Light is shown from a tall, black iron tower with white bands, on the SW end of Jaigarh Head. Dhamankhol Light is shown from a white tower about 0.5 mile NE of Jaigarh Head Light.

Jaigarh Fort, an old fortress containing a few houses, is situated on a rocky point, about 2 miles E of Jaigarh Head Light; a light is shown from the NW corner of the fort. The town of Jaigarh extends along the coast for about 0.8 mile S of the fort.

Trize Kila, a ruined fort, is situated about 1 mile E of Jaigarh Fort. The NE side of Jaigarh Bay consists of ridges of bare hills, about 61 to 91.4m high, with steep cliffy sides and small sandy indentations.

**Anchorage.**—Anchorage can be taken in Dhamankhol Bay, in about 8m, about 0.4 mile E of Dhamankhol Light.

There is good sheltered anchorage E of Jaigarh, but the best anchorage, in 8.5m, lies about 0.8 mile SE of Jaigarh Fort.

**Caution.**—Vessels approaching Jaigarh Bay from the S should not close Karhateshwar Point within 0.3 mile to avoid foul ground.

A dangerous wreck lies 23 miles W of Jaigarh Head.

## Jaigarh Bay to Ratnagiri Bay

**2.37 Ambwah Bay** (17°16'N., 73°13'E.) lies E of Ambwah Point, the S extremity of Jaigarh Head. Anchorage, sheltered from NW winds, is available in 7.3m, mud and sand, ESE of Ambwah Point.

A 10m patch and an 8.8m patch lie about 0.5 mile SW and 0.8 mile SSE, respectively, of Ambwah Point.

Warori Bluff, about 4.5 miles SSE of Ambwah Point, is a conspicuous promontory, 70m high. A light is shown about 0.5 mile SE of the W extremity of Warori Bluff. Good radar returns have been reported from Warori Bluff at 17 miles.

**Anchorage.**—Small vessels can obtain sheltered anchorage during the Southwest Monsoon on the N side of Warori Bluff, in a depth of 5.5m.

Neori Point, about 5.5 miles SSE of Warori Bluff, is 64m high. The point has been reported to be a good radar target at 15 miles.

**Vada Mirya** (Mirya Donghur) (17°02'N., 73°16'E.), a high rocky headland, is lighter in color than the adjacent coast, and resembles an island when seen from the N or S. The W end of the headland terminates in steep cliffs. Mirya Peak, 142m high, the conspicuous summit of this headland, lies about 0.5 mile NNE of Miyet Point, the SW extremity of the headland. Tonkul Peak, 115m high, lies nearly 1 mile N of Mirya Peak.

Good radar returns have been reported from Vada Mirya at 16 miles.

Sookana Shoals, with a least depth of 9.4m, lie about 1 mile NNW of Sookana Point, the NW extremity of Vada Mirya.

Kalbadevi Bay is entered between Sookana Point and Kurne Point, about 2.5 miles NE.

Anchorage may be obtained, in 8m, about 0.7 mile E of Sookana Point and 0.3 mile offshore. Local vessels call here during the Southwest Monsoon.

Mirya Bay is entered between Miyet Point and **Galee Point** (17°00'N., 73°16'E.), the N extremity of The Fort, about 1.5 miles SSE. The shore at the head of this bay is covered with coconut palms and is fronted by a ridge of sand hills. A conspicuous temple stands on Galee Point.

Mudle Shoal (Taylor Shoal), with a least depth of 1.1m, and marked on its S side by a buoy, lies about 0.7 mile SE of Miyet Point. The sea breaks over this shoal at LW.

Bhagwati Bunder (Mirya Bay), a new port, has a breakwater 0.3 mile long extending N from Galee Point; it provides sheltered anchorage throughout the year in depths up to 9.1m, sand and mud. However, attention should be given to Taylor Shoal, which lies N of the entrance to the breakwater; a shoal, with a least depth of 3.4m, lies 0.4 mile ENE of N end of breakwater.

## Ratnagiri Bay (16°59'N., 73°17'E.)

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**2.38 Ratnagiri Bay**, entered between The Fort and **Kushipur Point** (16°57'N., 73°17'E.), about 2 miles S, affords no shelter during the Southwest Monsoon, when smooth-water anchorage can be found in Kalbadevi Bay.

The Fort, on the N side of the entrance, is an old structure which covers a bold, conspicuous, and rocky headland up to

91m high. It appears as an island from a distance, and is connected to the mainland by a sandy neck.

The Ratnagiri River, entered about 1.3 miles E of The Fort, is only navigable by small craft at HW. The town of Ratnagiri is situated on the N side of the river entrance, on the brow of a flat ridge, about 46m high. There is a Coast Radio Station at Ratnagiri.

**Depths—Limitations.**—In the N part of the bay, the depth in the entrance is about 11m, decreasing gradually E, but abruptly to the reef which extends from the N shore; the bottom is sand and mud.

About 0.7 mile ENE of the N entrance point, a reef, on which the sea breaks heavily in bad weather, extends about 0.4 mile SSW. Close S of the S edge of this reef is a depth of 8.7m.

Depths of less than 7m extend nearly 1 mile NW of Kushipur Point. Brum Mudle Rock, 3.5m high, which breaks heavily during the Southwest Monsoon, lies about 0.3 mile NNW of the same point.

**Aspect.**—Ratnagiri Light is shown from a tall black and white checkered, round, concrete tower on the S bastion of The Fort. A radiobeacon and a racon are situated at the light.

A palace, 83m high, is conspicuous about 2.3 miles E of Ratnagiri Light.

**Signals.**—Storm signals are shown at Ratnagiri Light; the Brief System is used. Further information on these storm signals may be found in Pub. 160, Sailing Directions (Planning Guide) South Atlantic Ocean and Indian Ocean under "India—Signals."

**Anchorage.**—At the beginning and end of the Southwest Monsoon vessels should anchor, in 11m, with Ratnagiri Light bearing 000°, distant about 0.7 mile.

Vessels can anchor, in 9.6m, with Ratnagiri Light bearing 315°, distant about 0.5 mile. Shallow draft vessels can anchor farther N.

## Ratnagiri Bay to Vijayadurg Harbor

**2.39** Between Ratnagiri and the Machkandi River (Muchkundi River), about 11 miles S, the land rises gradually from the coast in undulating hills reaching a height of 200m about 5 to 6 miles inland. **Chandralli** (Dhulia) (16°56'N., 73°26'E.), a round wooded hill 280m high, about 9.5 miles ESE of The Fort, is the only conspicuous feature.

Pavas Bay (Paos Bay) is entered S of **Pavas Point** (16°54'N., 73°17'E.). Golap Hill, 120m high, lies about 1 mile NE of Pavas Point.

Vessels can anchor in Pavas Bay, in a depth of about 8.5m, mud and sand, sheltered from NW winds.

The coast between Pavas Bay and Purangad Bay, about 5 miles S, consists of rocky tableland and sandy bays, and is free from dangers.

**Purangad Bay Light** (16°49'N., 73°18'E.) is shown, except during the strength of the Southwest Monsoon, from the N entrance point of Purangad Bay. About 1 mile farther E, a ruined fort stands on a bare hill on the N side of the entrance to the Machkandi River. Khavri, a mountain 346m high, lies about 10 miles E of the river entrance.

The coast between Purangad Bay and Wada Vetye (Yetia), a village about 6 miles S, consists of a rocky tableland; thence to Ambolgarh Point, about 3 miles farther S, it is sandy and

backed by a range of hills 84 to 97m high. A conspicuous hill, 103m high, lies about 0.5 mile NW of Wada Vetye.

Ambolgarh Bay lies between Ambolgarh Point and Musakazi Point (Musargagi Point), about 1 mile SSE. There is a sandy beach at its head, and the ruins of a large salt works stand in a valley on the S side.

Ambolgarh Reef, with a small drying patch at its center, lies about 0.4 mile SW of Ambolgarh Point; the sea breaks heavily over this reef. A black conical buoy is moored near the SW extremity of the reef.

**2.40 Rajapur Bay** (16°37'N., 73°20'E.) is entered between Musakazi Point and Wagapur Point, about 1 mile SW; each point is about 21m high. A light is shown from September to May from Musakazi Point. A light is shown from a tall, white, square, concrete tower with black bands on Wagapur Point; foul ground extends about 0.1 mile WNW of the point.

The coast between Wagapur Point and Vijayadurg Harbor, about 2 miles S, consists of cliffs about 21m high. Holi Hill, 85m high, about 2.3 miles E of Wagapur Point, is a round sloping conspicuous hill on the E side of Rajapur Bay. It presents the same appearance from all directions, and lies out from the tableland in this vicinity which is faced with steep cliffs.

The Rajapur River flows into the head of Rajapur Bay at its NE end. The bar of the river has depths of 1.8 to 2.3m; abreast the village of Jaitapur, which lies on the S bank of the river about 1 mile within its entrance, there are depths of 4.6 to 7.3m.

**Anchorage.**—Rajapur Bay affords anchorage, in a depth of 8m, protected from NW winds which may blow strongly, but the anchorage is not safe during W winds, which raise a heavy short swell in the bay.

**2.41 Vijayadurg Harbor** (Viziadurg Harbor) (16°34'N., 73°20'E.) is entered between **Burmana Point** (16°33'N., 73°19'E.), 24m high, and a point about 1.5 miles NNE. Burmana Reef, over which the sea breaks, extends about 0.2 mile WNW and 0.2 mile NNW of Burmana Point. An 8.2m shoal lies about 0.2 mile NW of the same point.

A conspicuous fort stands on a projecting rocky point, about 26m high and 0.8 mile ENE of Burmana Point. This point forms the W side of the entrance to the Vaghotan River. The fort is obscured from the S by the higher land in that direction.

Vijayadurg Light is shown from a white steel tower with red horizontal bands on the NE corner of the fort. Vijayadurg, a small village, is situated about 0.8 mile S of the light.

**Depths—Limitations.**—Depths in the harbor decrease regularly from about 12m in the entrance to the E shore of the bay. Depths in the fairway between the point on which the fort lies and a cliff, 19m high, about 0.7 mile ENE, are about 6.5m, but decrease sharply farther within the river to 3.7m.

**Anchorage.**—Anchorage can be taken anywhere in the harbor, according to draft, during good weather. A convenient position is about 0.5 mile NNE of Vijayadurg Light, in 8m, mud.

## Vijayadurg Harbor to Malvan Bay

**2.42** The coast between Vijayadurg Harbor and Devgarh Harbor, about 10 miles S, is fairly regular, although entered by numerous streams and creeks. Steep, abrupt cliffs are fronted by sandy beaches and coves. The land behind the cliffs is flat, but farther inland it rises to bare rocky hills with no vegetation except in the rainy season.

**Devgarh Harbor** (16°23'N., 73°22'E.) is entered N of Fort Point, which lies at the N end of a rocky peninsula, 37m high. The peninsula appears like an island, but its S end is connected to the mainland by a narrow sandy neck. The town of Devgarh lies NE of the sandy neck. Depths in the harbor restrict its use to vessels of comparatively shallow draft.

An old fort, from which a light is shown, stands on Fort Point. Two towers, 41 and 36m high, stand about 0.4 mile and 0.7 mile, respectively, S of Fort Point; another tower stands about midway between the two towers. The town of Devgarh has a post office and a hospital.

Storm signals are shown at the light tower using the Brief System. Further information on these storm signals may be found in Pub. 160, *Sailing Directions (Planning Guide) South Atlantic Ocean and Indian Ocean* under "India—Signals."

Round Hill, 108m high, and Saddle Hill, 140m high, lie about 2.5 miles NNE and E respectively, of Fort Point.

**Tides—Currents.**—Outside the harbor the tidal currents are irregular, both in strength and direction, being much influenced by the wind; on several occasions they were observed to set NW on the flood and SSW with the ebb, with a velocity of up to 1.5 knots.

At the entrance to the harbor the currents attain a velocity of 1 to 1.5 knots with the spring ebb.

**Anchorage.**—The recommended anchorage is with Devgarh Harbor Light bearing 203°, distance 0.3 mile, and the N entrance point of the harbor bearing 306°, in a depth of 6m. Farther in depths shoal gradually; small vessels can find more sheltered anchorage SE of Fort Point, in depths of 3 to 4m.

**Directions.**—Vessels proceeding into Devgarh Harbor should approach with Saddle Hill in line with the N side of the fort on Fort Point, bearing 090°; when 1 mile from Fort Point, and when Mumbri Point bears 153°, steer 080° to pass 0.2 mile N of Fort Point. Foul ground and depths of less than 5m extend 0.3 mile SW from the N entrance point of the harbor, and 160m N from Fort Point, the fairway between being about 0.3 mile wide.

**2.43** The coast between Devgarh Harbor and Achra Point, about 12 miles SSE, is similar to the coast N of Devgarh Harbor to Vijayadurg Harbor.

Devgarh Hill, 95m high, lies close to the coast, about 5 miles SSE of Fort Point. Devgarh Hill has been reported to give a good radar response at 14 miles.

**Achra Point** (16°12'N., 73°26'E.), 41m high, is the N entrance point of the Achra River, which is only accessible to boats. A light is shown during good weather from the point.

The coast from the mouth of the Achra River to the entrance of Kalavali Creek, about 7 miles SSE, is sandy and fringed with coconut palms. A range of hills of moderate height, with no conspicuous peaks, about 4 miles inland, extends roughly parallel with the coast.

Kura Patches, with a least depth of 9.6m, lies about 2 miles SSW of Achra Point.

**Kura Islet** (16°06'N., 73°27'E.), 9m high and the largest of three rocks, lies in the center of a group of rocks, about 1.3 miles NW of the entrance of Kalavali Creek. A 10.5m patch lies about 2 miles NNW of Kura Islet and about 1.5 miles offshore. A 5m patch lies about 0.7 mile S of Kura Islet.

**2.44 Malvan Bay** (16°06'N., 73°28'E.) is entered between Fort Rajkot and Sindhudrug Janjira, about 0.5 mile S. The entrance is much encumbered by rocky shoals, and the bay is accessible to shallow draft vessels but only during good weather. A conspicuous radio tower, with an elevation of 220m, stands 5.5 miles ENE of Malvan Bay.

Sindhudrug Janjira is a low, fortified island on the coastal reef, which is connected to the mainland E by a drying reef. A light is shown from the W end of the island during good weather.

Fort Rajkot, on the N side of the entrance, has foul ground extending S and SE of it. A flagstaff, 21m high, is situated at the SW end of the fort. The town of Malvan is situated on the N side of the bay almost hidden by coconut palms.

Johnston Castle Rock, consisting of two rocky heads with depths of less than 1.8m, lies about 0.4 mile W of the N end of Sindhudrug Janjira.

Rajkot Rock, with a depth of 3.7m, lies about 0.3 mile SSW of Fort Rajkot.

Range lights, in line bearing 075.5°, at the head of the bay, lead through the buoyed fairway into Malvan Bay. The range lights and buoys are only in operation during good weather.

**Anchorage.**—Vessels can anchor off the entrance to Malvan Bay, in 15m, mud, with the N end of Sindhudrug Janjira bearing 095°, about 0.9 mile.

Shallow draft vessels can anchor in the bay in depths of 4m, on the range line, and with a small fort, situated about 0.2 mile NE of Sindhudrug Janjira, bearing 163°.

## Malvan Bay to Vengurla Roads

**2.45** The coast is sandy between Malvan Bay and a point about 7 miles SSE, on which is situated the ruins of Niuti Fort. Then to Vengurla Point, about 8 miles farther SE, the coast forms a bight with several rocky capes and sandy bays.

A prominent hill, 159m high, lies about 2 miles N of Niuti Fort. Bhubra Rock, awash, lies about 0.3 mile SW of the fort; the rock is marked SW by a buoy, which is unreliable, and in position only during good weather.

**Malvan Rock** (16°02'N., 73°26'E.), with a swept depth of 2.5m, lies about 1.5 miles WSW of Sindhudrug Janjira.

**Caution.**—When passing Malvan Rock at night Vengurla Rocks Light (15°53'N., 73°28'E.) should not be brought to bear more than 158°, nor should a vessel approaching this rock proceed into depths of less 27m.

Mandel Rock, 7m high, about 1 mile S of Sindhudrug Janjira, lies at the W edge of a group of shoals, some of which are

awash. There are detached shoal patches, with depths of less than 5.5m, about 0.7 mile SSE and SW and nearly 0.9 mile WSW of Mandel Rock.

**2.46 Square Rock** (15°59'N., 73°27'E.), 11m high, lies about 4.3 miles NW of Niuti Fort, and provides a useful mark to avoid the dangers N and S of it, and the foul ground extending E of it to the coast. A 6.4m patch lies about 0.8 mile SSW of the rock.

Chaldea Rock, awash, lies about 2.5 miles WNW of Niuti Fort; it lies at the S end of foul ground between it and the shore NE. A buoy is moored about 0.5 mile WSW of the rock during good weather.

Vengurla Rocks (Burnt Island) is a group of islets and rocks in dangerous foul ground extending about 3 miles S of **Karil Rock** (15°56'N., 73°28'E.), which is 14m high and the N of the group.

Some above-water rocks, steep-to on their N side, extend about 137m NW of Karil Rock. A rock, awash, lies about 0.3 mile E of Karil Rock.

Vengurla Rock, 44m high and conical, lies about 2.3 miles S of Karil Rock and is the highest of the group.

**Vengurla Rocks Light** (15°53'N., 73°28'E.) is shown from the NW point of an islet about 0.3 mile SSW of Vengurla Rock.

Tapti Rock, the S danger of the group, lies about 0.8 mile SSW of Vengurla Rock, and consists of two rocky heads with less than 1.8m; it is steep-to on its S side.

An islet, with a disused lighthouse near its SE extremity, lies about 0.3 mile NNW of Tapti Rock.

Vengurla Rocks have been reported to give good radar returns at 18 miles.

**Anchorage.**—Anchorage, with good protection from NW winds can be obtained, in a depth of 21m, mud, 1 mile ESE of the S end of Vengurla Rock.

**Caution.**—Between Malvan Rock and the S extremity of Vengurla Rocks, except in the N end of Karil Kachal Channel, the bottom is sand and rock and there are sudden overfalls. No vessels should proceed into depths of less than 18.3m in this vicinity. Karil Kachal Channel leads from seaward between Chaldea Rock and Karil Rock, about 1.3 miles SSW. A depth of 7.2m lies about 0.3 mile ENE of Karil Rock. A similar depth lies about 0.3 mile S of Chaldea Rock.

Vessels coming from the N should approach this channel with **Wagh-Giri** (15°53'N., 73°42'E.) bearing 105° and well open S of the point on which Niuti Fort stands. When the fort bears 093°, steer through the fairway on that bearing which leads N of Karil Rock, in charted depths of about 9.6m.

When Vengurla Rock bears more than 186°, a vessel will be E of the rock awash lying E of Karil Rock. Course may then be gradually altered SE to pass SW of Bhubra Rock, and then to Vengurla Roads.

Vessels should not use this channel at night, but should pass W of Vengurla Rocks in depths of 31 to 37m.

**2.47 Vengurla Roads** (15°51'N., 73°37'E.) lies S and SW of Vengurla Point, 79m high. Vengurla Point Light is shown from a hexagonal masonry tower on the point; a flagstaff stands on the point.

Wagh-Giri, a conspicuous wooded mountain, 322m high, lies about 5 miles ENE of Vengurla Point.

**Tides—Currents.**—Currents between Vengurla Point and the N entrance to Karil Kachal Channel set N on the flood current and S on the ebb, with a velocity of about 1 knot in spring tides.

**Anchorage.**—Large vessels can anchor, in 10m, with the flagstaff on Vengurla Point bearing 036°, distant 1 mile, or closer inshore, in similar depths on the same bearing with the flagstaff distant about 0.4 mile.

Small vessels with local knowledge can anchor, in about 4m, in the bight on the E side of Vengurla Point.

**Caution.**—South West Point Rock, with a least depth of 1.2m, and marked SW by a buoy, lies about 0.3 mile W of Vengurla Point.

South Rock, with a depth of 3.2m, lies about 0.4 mile S of Vengurla Point; shoal patches lie W and SW of it. A buoy, moored about 229m NW of South Rock, marks these dangers.

East Rock, with a depth of 1.8m, and marked W by a buoy, lies about 0.3 mile SE of Vengurla Point.

## Vengurla Roads to Marmugao Bay

**2.48** Machlimar Point, 85m high, lies about 3.5 miles SSE of Vengurla Point. The entrance of the Talavda River lies about 1 mile SSE of the point.

**Port Redi** (15°45'N., 73°39'E.) is an open roadstead off Redi Point. Vessels load ore at the anchorage from lighters working to jetties near the ore mines. The port is protected from N winds and currents by cliffs which almost encircle it. It is closed during the Southwest Monsoon from mid-September to mid-May.

Redi Point is a flat rocky projection, 15m high at its W end. Redi Rock (Rairi Rock), 11m high, lies about 1 mile S of the point, at the S end of foul ground extending W and SSW of the point. Redi Fort (Rairi Fort), with an elevation of 34m, stands about 1 mile NE of Redi Point.

**Pilotage.**—Pilotage at Port Redi is compulsory. The vessel's ETA should reach the Port Office Redi (Ratnagiri) 24 hours prior to arrival. The pilot boards 1 to 1.5 miles W of Redi Point; vessels should anchor here to wait for the pilot. Port authority is exercised by the Port Officer, who also acts as pilot.

**Signals.**—Storm signals are shown at Port Redi; the Brief System is used. Further information on these storm signals may be found in Pub. 160, Sailing Directions (Planning Guide) South Atlantic Ocean and Indian Ocean under "India—Signals."

**Anchorage.**—Anchorage can be obtained, in about 13m, off Redi Rock by vessels loading ore.

The Terekhol River (Tirakul River), about 2.5 miles SE of Redi Point, is fronted by a bar with depths of about 2.5m, but subject to change. Terekhol Fort lies on the brow of a hill on the N side of the river entrance.

Havelock Rock, a sharp pinnacle awash, lies about 2 miles W of the river entrance. Another rock, awash, lies nearly 0.5 mile farther ENE.

**Anchorage.**—Anchorage can be obtained, in 9.1m, mud, about 0.8 mile SE of Havelock Rock.

**Chapora Fort** (15°36'N., 73°44'E.), about 7 miles SSE of the Terekhol River, is easily identified by its black walls, and stands on a high bluff on the S side of the entrance of the Chapora River.

A conspicuous church is situated on Baga Point, about 2.5 miles farther S.

**2.49** **Aguada Bay** (15°29'N., 73°47'E.), entered between Aguada and Kabo Rajniwas, about 1.8 miles SSE, affords anchorage to moderate-sized vessels during the Northeast Monsoon. The bay is free from dangers, but strong W winds produce a heavy swell.

**Panaji** (15°30'N., 73°50'E.), the capital and seat of government of the State of Goa, Daman, and Diu is situated on the S bank of the Mandavi River, which enters the head of the bay. The city is well built, with prominent buildings along the waterfront. A bridge spans the river at the E end of the city.

**Tides—Currents.**—The tidal rise at Panaji is 2m at MHHW and 1.9m at MLHW.

The ebb current sets strongly out of the Mandavi River, but is weak at the anchorage off Aguada, where the flood current is barely perceptible.

**Depths—Limitations.**—Depths in the entrance of Aguada Bay are about 7.6m, decreasing gradually to the head of the bay.

Outer Patches, with a least depth of 0.9m, lies about 0.8 mile W of Kabo Rajniwas.

The bar of the Mandavi River, which is subject to frequent change, has a depth of 2.1m during good weather. During the Southwest Monsoon, heavy breakers extend across the entrance and render it impassable.

The main channel, less than 183m wide, lies between sand banks extending about 0.8 mile SW of Raj Magus, the N entrance point of the river, and about 0.3 mile W from Gaspar Dias, the S entrance point of the river. Raj Magus Light is shown from mid-August to mid-June from a white, round tower 0.3 mile NNE of Raj Magus Point.

In 1987, a shoal depth of 2m existed about 0.5 mile SW of Gaspar Dias.

Raj Sand, which dries, lies in the fairway W of Panaji.

The dangers in the channel are not marked.

**Aspect.**—Aguada is a bold, bluff headland, 80m high, which appears from seaward to have a flat summit. The headland is fortified on its N side, and a fort with a flagstaff lies on its S side, with a disused white round tower.

Aguada Light is shown from a white rectangular tower close N of the fort, and a tower lies close SE in the N part of the fort. A racon is situated at the light. Another light is shown about 183m S of the tower.

A chapel, with an elevation of 74m, stands about 0.5 mile E of Aguada Fort Light.

The coast close N of Aguada is low and a heavy surf always runs along the foreshore.

Kandoli Hill (Candolim Hill), about 2 miles N of Aguada, is easily recognized by three conspicuous banyan trees, with an elevation of 101m, which lie on it.

Kabo Rajniwas, at the W extremity of the island of Goa, is a prominent headland, 55m high. A conspicuous church spire is situated near the seaward end of the headland.

A group of radio masts, with an elevation of 86m, stand near the summit of Panaji Hill, S of Panaji. A conspicuous water tower, with an elevation of 82m, is situated about 0.5 mile farther SE.

Lights in line, bearing 054°, lead close W of Outer Patches and across the bar at the entrance to the Mandavi River, to the 191° Tejo leading line. Leading lights are shown at Tejo, bearing astern 191°, which lead through the channel W of Raji Sand. These lights are extinguished during the Southwest Monsoon when the bar is closed to navigation. A dangerous wreck lies in a position close NE of Outer Patches, about 183m S of the lead.

**Pilotage.**—Pilotage is not compulsory in the Mandavi River, but it is advisable to employ a local guide who may be engaged by telegram or fax to the Captain of the Port, Panaji.

**Anchorage.**—During good weather large vessels can anchor, in about 14m, mud, about 2 miles W of Aguada.

Vessels of moderate size can anchor, in 6.4m, mud, with Aguada Fort Light bearing 333°, distant 1 mile.

**Caution.**—Vessels approaching from the N should give the W extremity of Aguada a berth of at least 1 mile. A dangerous wreck lies in about 4.5 miles NW of Mormugao Head.

Vessels approaching from the S should take care to avoid the dangers in the entrance to Marmugao Bay and the foul ground extending W from Kabo Rajniwas.

### Marmugao Bay (15°26'N., 73°48'E.)

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**2.50** Marmugao Bay (Mormugao Bay) is entered between Marmugao Head and Kabo Rajniwas, previously described with Aguada Bay in paragraph 2.49, about 3 miles N. The entrance to the bay is encumbered with shoals. The Grandi Islands lie in the S approach to the bay.

The port of Marmugao, protected by a breakwater, lies on the N side by Marmugao Head. It is an important port for the exportation of iron and manganese ore.

#### Port Authority of Marmugao

<http://www.mptgoa.com>

**Winds—Weather.**—Occasional strong NE winds from about the middle of February to the end of March cause a heavy swell in Marmugao Bay. These winds usually last from 3 days to a week and decrease in strength from sunset to sunrise. However, it has been cautioned by the local authorities that the weather deteriorates without warning.

**Tides—Currents.**—The tidal rise at Marmugao is 2.1m at MHHW and 1.8m at MLHW.

Tidal currents in the outer anchorage off Marmugao Bay are weak.

**Depths—Limitations.**—The port is approached through a dredged channel entered between Lighted Buoy No. 1 and Lighted Buoy No. 2, moored 2 miles W of Marmugao Point. The channel, which leads to the inner anchorage and the berthing area, is 250m wide. The channel was maintained to a depth of 13.7m along its centerline over a width of 150m, although lesser depths have been reported (1998). The remaining outer 50m of the channel width on each side may have depths of up to 3m less than charted.

Vessels up to 70,000 dwt, with a maximum draft of 12m, can berth alongside. Vessels up to 275,000 dwt can be accommodated in midstream.

The port authority applies an underkeel clearance of 1.2m and a swell allowance of 0.5m.

A quay extends 1.5 miles E and SE from the root of the breakwater and affords ten numbered berths, including berths for tankers and ore carriers at the SE end.

Limitations at these berths are given in the table below:

Draft limitations for the above berths are subject to frequent change in conjunction with the state of tide, underkeel clearance, prevailing sea, and weather conditions. Details of changes can be obtained from the local pilot or the Port Officer.

It has been reported (1995) that depths alongside the wharves are 3m less than charted.

Berth 5A and Berth 6A are ready for the discharge of coal. The fair season draft (September 16 to May 20) is 14m and is designed for vessels up to 150,000 dwt. During the monsoon season (May 21 to September 15), the draft is expected to be reduced by 1.5m.

A floating dock extends NE from Berth No. 1. A breakwater extends NE from between Berth No. 2 and Berth No. 3. Both structures are best seen on the chart.

Vessels requiring to top-off to their seasonal mark may be permitted W of the breakwater during fair weather season.

Several mooring buoys are situated NE and E of the head of the mole. Five finger piers for small vessels and barges lie within 0.2 mile SE of the ore berth.

It was reported (1991) that the swell conditions associated with the Southwest Monsoon often close the port to shipping and can significantly reduce the limiting draft for vessels using the port.

Foul ground borders Grandi Island up to 0.3 mile offshore. A 5m patch lies about 0.5 mile NE of the E end of the island and other patches, with depths of 3.9m, lie 0.7 mile N and 0.6 mile NNW of the same position.

Saint Georges Reef, which dries 1.5m, lies about 0.3 mile E of Grandi Island.

Sail Rock, 14m high, lies about 0.5 mile S of the W end of Grandi Island; this pillar rock can easily be mistaken for a sail. A reef, which dries 1.2m, lies about 0.2 mile NE of Sail Rock.

Murmagoa Bay—Berth Limitations

Berth No.	Length	Depth	Remarks
1	84m	1.8-3.0m	Barge loading.
3	134m	7.0m	Collapsed. Not used.

Murmugao Bay—Berth Limitations			
Berth No.	Length	Depth	Remarks
4	139m	8.5m	Collapsed. Not used.
5	159m	8.5m	General cargo.
6	223m	6.0m	General cargo
7	100m	3.5m	Barges.
8	260m	12.5m	Oil berth. The berthing length is 260m between mooring dolphins. The maximum length allowed is 260m. The maximum draft allowed is 12.5m. During the Southwest Monsoon, the maximum draft allowed is 10.4m, while the maximum length allowed is 198m.
9	222m	13.0m	Ore berth. The berthing length is 335m between mooring dolphins. The maximum length allowed is 305m. The maximum draft allowed is 12.3m, although 13m may be allowed according to conditions.
10	250m	11.0m	General, bulk, and container cargo.
11	300m	11.0m	General, bulk, and container cargo.

Saint Georges Bank, with a least depth of 6.5m, lies about 0.8 mile WNW of Grandi Island.

Martha Patches, a group of rocky shoals with a least known depth of 2.7m, lie about 1 mile N of Grandi Island.

Marmugao Rocks, with a least depth of 6.1m, lie about 0.5 mile N of Marmugao Point, and are marked on their S side by Lighted Channel Buoy No. 6.

An 8.2m patch and a 7.9m patch lie about 0.5 mile NNW and 1.3 miles W of Marmugao Point.

Ameo Shoals, close N of Marmugao Rocks, lie in the middle of the entrance to Marmugao Bay, and is a group of shoals, with a least depth of 1.8m.

Sunchi Reefs, about 1 mile S of Kabo Rajniwas, are rocky shoals one of which dries 0.9m. Marivel Patches, with a least depth of 1.5m, lie close NE.

Kambariam Islet (Buffalo Rock), 7m high, lies about 1 mile SW of Marmugao Point, the NW extremity of Marmugao Head. Foul ground extends about 0.2 mile N of the islet.

Sawyer Patches, with depths of 5.5m, lie about 0.5 mile N of Kambariam Islet.

**Aspect.—Marmugao Head** (15°24'N., 73°48'E.), about 61m high, is a tableland peninsula with steep sides, especially W. It is connected to the mainland SE by a narrow neck of low ground.

The S side of Marmugao Bay is bold and rocky, rising to the tableland of Marmugao Head.

The N shore of the bay between Kabo Rajniwas and Saint Nazaret Point, about 4.5 miles ESE, consists of alternating stretches of sand and rock. The land within is covered with jungle and rises to an elevation of 45m.

A radio mast, with an elevation of 175m, is conspicuous about 2 miles NNW of Saint Nazaret Point.

A conspicuous water tower, with an elevation of 96m, is situated about 0.5 mile SE of Marmugao Point.

Lights, in line bearing about 101°, on the S side of the bay, lead through the entrance channel. The front light is shown from Chikalin Point, about 3 miles E of the breakwater. The rear light is shown from Saint Jasintu Island, about 1.3 miles farther E.

North Head Breakwater Light is shown from a white concrete tower at the N point of the breakwater.



North Head Breakwater Light

A mole extends E about 0.1 mile from E side of the breakwater; Breakwater East Head Light is shown from a squat masonry tower at the head of the mole.

The **Grandi Islands** (15°21'N., 73°46'E.) consists of three islands about 2.5 miles SSW of Marmugao Head, and is the collective name of the two S islands, which are connected by a narrow reef of rock and shingle. The W of the two islands, 76m high and conical, is bold, rocky, and covered with trees towards its summit. The E island rises to a 73m summit at its E end, which, with the N side of the island, is covered with jungle.

Pikene Island, 60m high and the third of the Grandi group, lies about 10.3 miles NE of Grandi Island. This circular island is flat-topped, precipitous, and covered with trees.

Grandi Island Light is shown from a four-sided metal tower on the summit of the W island. In 1974, an obstruction was reported 1.5 miles WSW of Grandi Island Light. A prohibited anchorage projects 1.8 miles W and 1 mile S, from the W end of Grandi Island.

**Pilotage.**—Pilotage is compulsory and vessels should give advance notice of their ETA. During fair weather the pilot boards 0.5 mile W of the fairway buoy. Vessels awaiting a pilot anchor 1 mile W of the light structure at the head of the break-

water, and hoist the pilot signal 30 minutes before the pilot is required to board. During the Southwest Monsoon, when pilots cannot board, a launch will guide vessels from the breakwater head to a suitable anchorage.

It was reported (1994) that night pilotage in good weather is available only to vessels using Berth No. 8 or Berth No. 9. Vessels over 280m long using Berth No. 9 are berthed during daylight hours only.

**Signals.**—The quarantine signal of the International Code of Signals must be shown by all vessels entering the port, and kept flying until pratique has been granted. The health official boards either at the anchorage or alongside the quay. Radio pratique may be granted.

A signal station is near the NW extremity of Marmugao Head

**Anchorage.**—Large vessels can anchor S of Grandi Island, with shelter from NW winds, in about 18m, mud, about 0.4 mile SW of the SE extremity of Grandi Island. Smaller vessels can anchor, in about 17m, about 0.1 mile ESE of the above point.

Anchorage can be taken in Marmugao Bay, in 7m, about 0.6 mile NE of the head of the breakwater.

Anchorage is prohibited between Searle Patch (15°27'N., 73°48'E.) and Ameer Shoals, 1 mile SW.

**Directions.**—Vessels bound for Marmugao Bay from the S should pass about 2 miles W of Grandi Island and about 1 mile W of Kambariam Islet, then steer NE to enter the buoyed channel.

Vessels approaching from N should steer to pass about 2 miles W of **Aguada Head** (15°29'N., 73°46'E.), then keep Kambariam Islet in range with the E end of Grandi Island, bearing 168°; this leads W of all dangers in the entrance to Marmugao Bay.

When Chikalin Point Light, shown from a white round tower 3 miles E of the breakwater, is in line with Saint Jasintu Island Light, shown from a similar structure, bearing about 101°, alter course to keep them thus aligned, and then steer as necessary to anchor or to enter harbor: except on the leading line the near leading light is difficult to identify among trees. Alternately, the buoyed channel may be used.

**Caution.**—At night do not proceed into depths less than 13m when between Aguada Head and the Saint George's Islands.

The sea breaks heavily on the dangers in the entrance during the Southwest Monsoon.

During the Southwest Monsoon, in presence of heavy swell at the approach to the port, good steerage should be maintained while rounding the breakwater to avoid being set E; ensure there is sufficient underkeel clearance to allow for the swell and maneuvering.

A spoil ground lies 2 miles WNW of Marmugao Point.

Dangerous wrecks lie 1.3 and 0.8 miles from the fairway buoy.

Submarine Exercise Areas are centered 30 miles and 45 miles W and 20 miles SW of Marmugao Head.

A channel, marked by lighted and unlighted buoys, leads S of the spoil ground and N of Marmugao Head to the harbor.

## Marmugao Bay to Cape Rama

**2.51** The coast between **Cola Bay** (15°22'N., 73°53'E.) and the Sal River, about 14 miles SSE, consists of low cultivated land with several churches on small hills.

Anchorage, sheltered from NW winds, can be taken, in a depth of about 7m, in Cola Bay.

The Sal River, entered close N of **Betul Point** (15°08'N., 73°57'E.), may only be used by small vessels and local knowledge is required. Cargo is handled by lighters from the wharf at Betul, on the S side of the river entrance.

Chandranath Temple stands on a hill with an elevation of 349m, about 7 miles NE of the entrance to the Sal River.

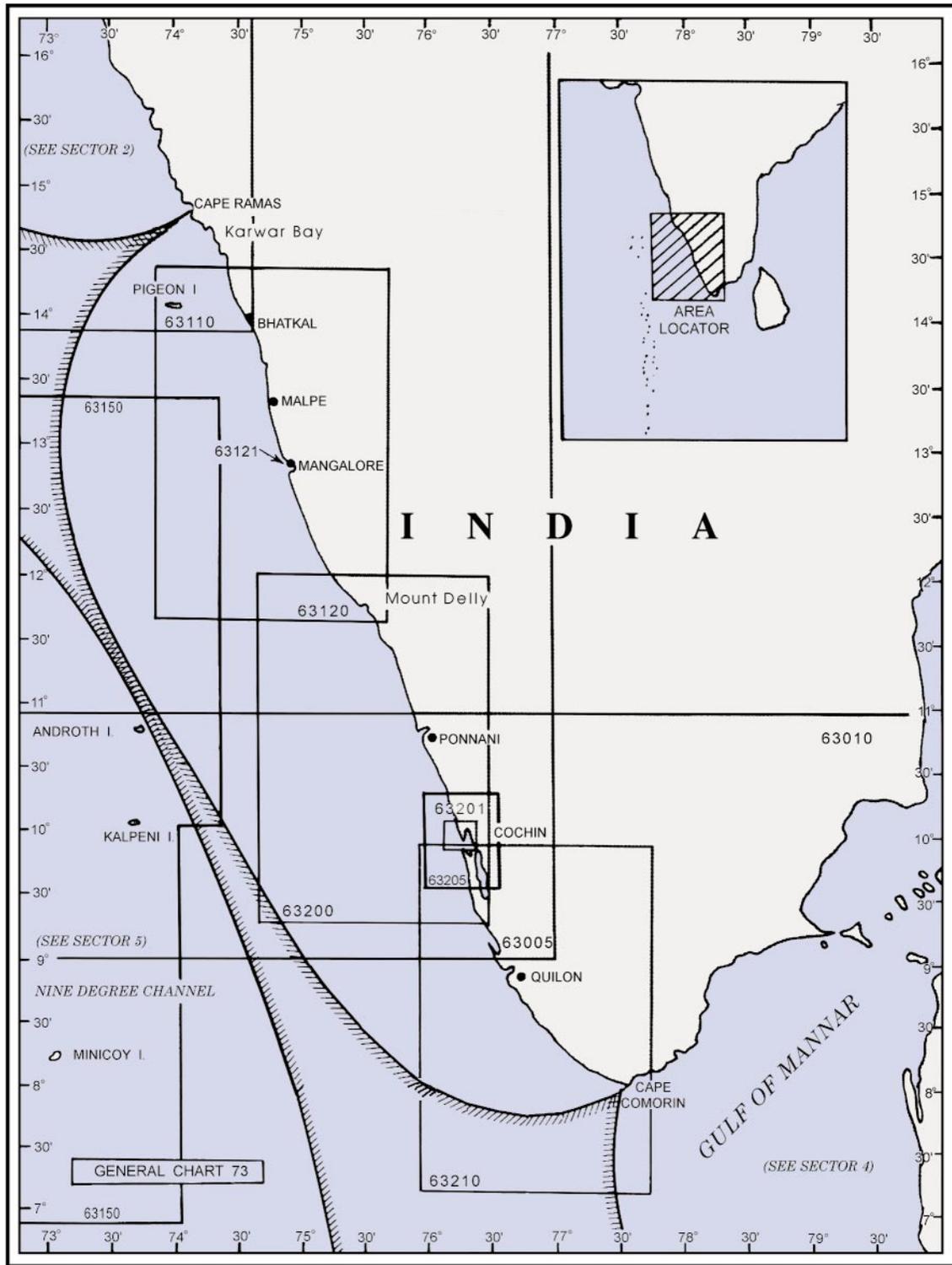
Anchorage can be obtained, in about 10m, mud, from 1.3 to 2.3 miles W of Betul Point.

Canaguinim Bay is entered between Canaguinim Point, about 1 mile SW of Betul Point, and Moliem Point, about 2 miles SW. Two rock patches, each drying 1.2m, lie about 0.1 mile and 0.3 mile, respectively, SW of Canaguinim Point. Cliffs, about 38m high, lie on the E half of the bay. A rocky islet, 0.9m high, lies at the head of the bay.

Anchorage can be taken, in 9.1m, 0.5 mile NNE of Moliem Point.

Rama Bay lies between Moliem Point and Cape Rama, about 1.3 miles SSW. Cliffs at the head of the bay rise to elevations of 40 to 61m. A small islet lies close W of Moliem Point.

Anchorage can be obtained, in about 11m, mud, 0.5 mile NNE of Cape Rama



Additional chart coverage may be found in NGA/DLIS Catalog of Maps, Charts, and Related Products (Unlimited Distribution).

**SECTOR 3 — CHART INFORMATION**

## SECTOR 3

### INDIA—WEST COAST—CAPE RAMA TO CAPE COMORIN

**Plan.**—This sector describes the W coast of India from Cape Rama to Cape Comorin. The arrangement of the sector is from N to S.

#### General Remarks

**3.1** The Western Ghats continue parallel to the coast at distances of 5 to 25 miles inland. These mountains have general heights of 750 to 900m, and attain heights of 1,800m. Palghat Gap, a striking feature on this coast, lies between the parallels of 10°52'N and 10°35'N. This break in the Western Ghats is about 16 miles wide; its S side is formed by Kollengode Bluff, which lies about 48 miles NE of Cochin at the NW end of the Anamalai Mountains. North of Palghat Gap, gentle slopes and gradually widening valleys succeed the forest-clad uplands, until near the coast, where the low tablelands shelve into rice plains and backwaters fringed with coconut palms. South of the gap is an extensive hill area, which includes some mountains, almost detached and precipitous on their W sides, which are connected with lower hills diminishing in height towards the coast. The coastal belt, extending about 10 miles inland, is flat and covered with an almost unbroken belt of coconut and areca palms; high white sand dunes and areas of red sand along the coast form good landmarks. Tortuous rivers flowing into lagoons and backwaters are connected in places by canals and, between **Alleppey** (9°29'N., 76°19'E.) and Ponnani, 85 miles NNW, form a continuous line of smooth water.

#### Cape Rama to Karwar Bay

**3.2 Cape Rama** (15°05'N., 73°55'E.) projects 1 mile W from Rama False Bluff, which rises abruptly E of the tableland of Cape Rama to a height of about 200m. The land then rises gradually E in a succession of hills for a distance of 4 miles and terminates in East Peak, 448m high. Kankon Peak (Kanakona Peak), 646m high, about 9 miles ESE of Cape Rama, is the W summit of a range of hills extending E, and is separated from East Peak by a gap.

Cape Rama is prominent and has a fort on it, but during the thick weather of the Southwest Monsoon, no part of this coast is visible for more than 4 or 5 miles. Good radar returns have been reported from Cape Rama at 16 miles. Pandigat Point (Paidegal Point), about 5.5 miles SE of Cape Rama, is a steep projecting headland rising to an height of 192m; a village is situated on its N side. Kankon Islet, fringed by a reef, lies about 2 miles farther SE.

**3.3 Karwar** (14°49'N., 74°07'E.) (World Port Index No. 48990) is a lighterage port on the SE side of Karwar Bay.

**Depths—Limitations.**—Ore carriers, with a maximum size of 35,000 dwt, call at Karwar. The offshore loading of iron ore is carried out by the use of ore barges and ship's gear. The average loading is reported to be about 4,500 grt per day for

35,000 dwt carriers, and it takes more than a week to fully load such a carrier. The port is closed from May 16 to September 15 during the Southwest Monsoon. In Baitkal Cove is a 355m long all-weather quay containing two general cargo berths. Berth No. 1 is 122m long and Berth No. 2 is 172m long; the depth alongside both berths is 7m.

A channel, 110m wide and dredged to depths of from 9.1 to 10.6m, leads to the wharf; the channel is marked by ranges.

**Aspect.**—**Loliem Point** (Lolien Point) (14°55'N., 74°03'E.), in the N approach to Karwar, attains an elevation of 175m about 0.2 mile inland, and is steep, rocky, and well-wooded. Loliem Rocks, awash at LW springs, lie about 1 mile S of Loliem Point; a rock, with less than 1.8m over it, lies about 0.2 mile N of the rock. Black Rock (Kumbae), 19m high and fringed with rocks, lies about 1.8 miles SE of Loliem Point. Kangiguda Island, 51m high, lies about 4 miles SE of Loliem Point and about 0.2 mile offshore.

**Oyster Rocks** (14°49'N., 74°04'E.) consist of a prominent group of islands and rocks. Devgad Island, 44m high to the tops of the trees, is the largest and highest island; it is bold, rocky, and steep-to on its W side.

Oyster Rocks Light is shown from a white round masonry structure, with red bands and a red cupola, on the summit of Devgad Island.

**Pilotage.**—Pilotage is compulsory and available 24 hours. Pilots are contacted on VHF channels 16, 10, and 12.

**3.4 Karwar Bay** is entered between **Badchidhar Point** (14°48'N., 74°06'E.), the NW extremity of Karwar Head, and the entrance to the Sadashivgarh River, about 2.5 miles NE. Karwar Head, with an elevation of 207m, is covered with dense jungle. The Sadashivgarh River entrance, leading to Kalinadi Creek, is much encumbered by sand banks and the channels are subject to frequent change.

**Directions.**—Vessels approaching or entering Karwar Bay, either by day or night, should have no difficulty after having made Oyster Rocks Light.

The SW extremity of Kurmagad Island, bearing 131° in range with Guddehalli, leads SW of Loliem Rock.

Approaching from N, pass on either side of Sunghiri Island according to draft.

At night, steer for Port Karwar Light, bearing 124°, if proceeding to the inner anchorage.

The E end of Mogueraguda Island in range with the W end of Anjadip Island bearing 154.5°, leads clear of the dangers E of Oyster Rocks.

If approaching from S, pass between Oyster Rocks and Karwar Head. The summits of Kurmagad Island and Ramnathguda in range, bearing 036°, lead clear of the dangers E of Oyster Rocks; a white framework tower stands on the summit of the island.

Mandal Island, 26m high, lies about 0.2 mile SW of Devgad Island; a 5.2m patch lies about 183m E of the island.

Karkal Island, 30.5m high and covered with jungle, lies close E of Devgad Island. East Island, a bare rock, lies about 0.3 mile farther E. A 0.6m patch lies between Karkal Island and East Island.

A rock, which dries 1.2m, lies about 183m E of East Island; the sea breaks over this rock at HW. A detached shoal, with a depth of 2.1m lies about 137m SE of this rock.

Parker Rock, with a least depth of 5.2m, rock, sand, and shell, lies about 2.5 miles NW of Devgad Island. A detached 10.7m patch lies about 183m E of the rock.

**Anjadip Island** (Angeediva Island) (14°45'N., 74°07'E.), in the S approach to Karwar, lies about 3 miles S of Karwar Head. A flagstaff lies at an elevation of 89m near the NW end of the island, with a church about 183m ENE of it. A shoal patch, with a least depth of 1.8m, lies about 0.2 mile SE of the SE extremity of the island. Round Island, 26m high and fringed by reef, lies about 0.7 mile ENE of the same extremity. Guddehalli (Godhulli Peak), 550m high and conspicuous, lies about 3.5 miles NE of Anjadip Island, and with the adjacent summit, appears from the S as a saddle-back hill.

**3.5** Golikodlu Peak, a sharp peak 547m high, lies about 3 miles E of Guddehalli. Mogeraguda Island, 56m high, rocky, and covered with jungle, lies about 0.5 mile SE of Karwar Head. A 4.3m patch lies about 0.3 mile SSW of the island. Gudsar Sunv, with a least depth of 2.4m, lies about 0.5 mile WNW of Mogeraguda Island. The channel between Mogeraguda Island and Karwar Head is free from dangers, with a least charted depth of 7.6m in the fairway. Kurmagad Island, encircled by fortifications, and with its summit rising to a height of 75m to the tops of the trees, lies about 2.5 miles N of Karwar Head. The island is surrounded by foul water, but there is a safe channel, with charted depths of about 7m, between Kurmagad Island and Sunghiri Island, 53m high, about 0.2 mile SW. Leading lights are shown from two framework towers; the rear, painted red, is on Kurmagad Island and the front, painted white, is on Sunghiri Island. Baitkal Cove lies in the SE part of Karwar Bay. Bing Bay lies between Arge Cape and Bing Point, 2.5 miles NW. In 1986, construction of a major naval base started, which included shipbuilding and repairs facilities in the bay.

**Anchorage.**—During the Southwest Monsoon, anchorage can be obtained NE of Karkal Island, in 11m, mud, with Oyster Island Light bearing 248°, distant about 0.8 mile, and with East Island bearing 186°.

Anchorage can be taken off the NE side of Anjadip Island, in 9.1m, mud and sand. The island forms a good breakwater and vessels have ridden out the Southwest Monsoon here. A strong current sets SE during this season. Anchorage, sheltered from NW winds, can be obtained by small vessels with local knowledge, in about 6m, in Bing Bay, ENE of Anjadip Island.

Anchorage can also be obtained off the N side of Karwar Head, in a depth of about 7.3m, about 0.3 mile offshore, moored bow and stern, facing the WNW swell. Vessels moored here will be sufficiently sheltered from the Southwest Monsoon to work cargo.

Vessels can anchor closer in with Port Karwar Light bearing 104°, about 0.3 mile, in 5.5m. Wharves in Baitkal Cove can accommodate small vessels in depths up to 2.4m. Anchorage

may also be taken, in a depth of 8m, about 1 mile N of Bachidhar Point.

**Caution.**—A submarine pipeline is laid from a position ashore between Biuge and Baitkal Points, in a SW direction for about 0.5 mile, then for 1.5 miles in a WSW direction. Vessels are advised to avoid anchoring in the vicinity.

## Belekeri Bay to Honavar

**3.6 Belekeri Bay** (14°42'N., 74°15'E.) lies between Kwada Point and Kusuldiva Gudda, about 6.5 miles SE. Belekeri is a small ore landing port on the S side of the entrance to Belekeri Creek. It has ore loading facilities of 3,000 tons per day. Cargo is handled by lighters between the pier at Belekeri and the anchorage. Pilotage is available on application to the Port Officer at Karwar.

**Depths—Limitations.**—Belekeri Bay has depths of less than 5m. Foul ground extends about 0.7 mile W of **Belekeri Point** (14°42'N., 74°15'E.), a low, flat, and rocky point at the head of the bay. Several small islets lie close N and about 0.2 mile WSW of the point.

**Aspect.**—Kwada Guda, about 0.8 mile NW of Kwada Point, is the conspicuous summit of a steep, rocky headland, 216m high.

Arge Cape, about 3 miles WNW of Kwada Guda, has a summit close within the cape, 168m high. Arge Island, 52m high, lies about 0.2 mile S of the cape. Button Rock, small and black, lies about 1.5 miles SSW of Arge Cape. Kukra Islet, 55m high and wooded, is conspicuous about 1.3 miles W of Belekeri Point. A light is shown, from September to May, from a white tower with black bands on Kukra Islet. Belekeri Hill, 474m high and prominent from S and W, lies about 3.5 miles ENE of Kwada Point, at the SW end of a range which rises near the coast N of Belekeri Creek.

Dauglish Peak, 610m high, about 3 miles farther NE, is the summit of the range. Aversa Hills, about 1.5 miles SE of Belekeri Hill, has two conspicuous peaks, the higher being 125m high. Kandani Halla, a low valley terminating in a creek ENE of Belekeri Point, extends NE for several miles and shows in striking contrast to the high land on either side. Tulsi Parwat, a conspicuous black peak 521m high, lies about 6.5 miles NE of Kusuldiva Gudda. Conical Hill, 374m high and cone-shaped, lies about 2 miles NW of Tulsi Parwat.

**Kusuldiva Gudda** (14°38'N., 74°16'E.) is a table-topped hill 46m high; cliffs extend about 1.8 miles SE to the N entrance of the Gangavali River. A rock, 3m high, lies about 0.5 mile N of Kusuldiva Gudda.

**Anchorage.**—Anchorage for medium-draft vessels can be obtained, in about 11m, with Kukra Island bearing 080°, distant 2.5 miles. Vessels with shallower draft can anchor, in about 8.2m, with Kukra Island on the same bearing, distant 1.5 miles.

**3.7 The Gangavali River** (Gangavali River) (14°36'N., 74°18'E.) is shallow, and the channel is rendered tortuous by sandbanks. Handegadda, 310m high, about 4.5 miles ENE of the river entrance, is a well-defined isolated summit. The coast from the Gangavali River to Gokarn, about 3.5 miles SSE, is a low sandy beach fringed with coconut palms; a few miles in-

land several hills rise to elevations of up to 140m. The town of Gokarn has several large temples.

The **Aghnashini River** (Tadri River) (14°31'N., 74°20'E.) is navigable for a short distance only, and local knowledge is necessary to cross the bar; it is subject to constant shifting and has a least depth of 2.4m. Tadri River Light is shown from mid-September to mid-June from a stone tower painted black and white at the NW entrance to the Aghnashini River. Rajaman Drug, a fort, lies at an elevation of 91m at the SE entrance point of the river.

Kudaini Hill rises to an elevation of 135m about 0.7 mile NW of Tadri River Light. A promontory, 66m high, lies about 1.3 miles W of Kudaini Hill.

Anchorage can be obtained, in 8m, mud, about 1.5 miles SW of the bar, with the range beacons lying well up on a hill about 0.5 mile NE of Rajaman Drug, bearing 070°.

The coast between the Aghnashini River and Kumta Point, about 6 miles SSE, is backed by several conspicuous landmarks.

Achuvi Moti Gudda, 835m high, is a prominent sugar-loaf summit, about 10.5 miles NE of the entrance to the Aghnashini River.

**3.8 Parvat Gudi** (Danson Peak) (14°32'N., 74°27'E.) is 581m high and conspicuous; Spike Hill, about 90m lower, lies about 0.8 mile NW. Kudi Gudda, 321m high, about 3.5 miles WNW of Parvat Guddi, is dome-shaped and prominent from W. Gudeangdi Temple, about 3 miles N of Kumta Point, is conspicuous from the N and lies on the summit of a 39m hill close to the coast.

**Kumta Point** (Kumpta Point) (14°25'N., 74°23'E.), marked by a light, shown from mid-September to mid-June, lies at the N entrance to a creek, with the town of Kumta about 1.5 miles E. Snail Rock, 7m high, lies about 1.8 miles NW of the point, and 0.8 mile offshore; it resembles a snail when seen from N. A rock, awash, lies 0.5 mile N of Snail Rock.

**Anchorage.**—Small vessels may anchor, with some shelter from NW winds, in a depth of 6.1m, S of Kumta Point.

Ravana Gundi, a rocky headland with 2 summits 103m and 120m high, lies about 3.5 miles S of Kumta Point. This headland appears saddle-shaped from the W, and shows up well at night. A 124m wedge-shaped reddish hill lies about 2.5 miles NNE of Ravana Gundi.

**Basavrajdrug Island** (Baswaraj Drug) (14°19'N., 74°24'E.) is 51m high and conspicuous. It is the site of an old fort, in ruins, and is covered with trees and bushwood.

Indravati Patch, about 0.6 mile W of Basavrajdrug Island, is a rocky shoal with a depth of 4.6m; a 5m patch lies midway between the rocky shoal and the island. Kalti Gudda, 675m high, about 9 miles ENE of Basavrajdrug Island, is the highest peak of a range extending ENE; it is a conspicuous landmark in clear weather.

**3.9 Honavar** (14°17'N., 74°27'E.) (World Port Index No. 49020) is an open roadstead port which enjoys some importance with a considerable export of iron ore, timber, tiles and betel nuts; local vessels call regularly. The town lies on the N side of the extensive estuary of the Sharavati River, about 0.8 mile E of the river entrance. The bar of the river is dangerous and constantly changing; the least depth over the bar was 1.8m

in 1974. At LW, there are heavy breakers, but at HW vessels of up to 3m draft can enter. There are no port operations during the summer months.

**Aspect.**—A conspicuous monument lies on a hill, 43m high, behind Honavar and about 1.5 miles NE of the river entrance. Honavar Light, shown about 0.7 mile SW of the monument, from mid-September to mid-June, is obscured by trees when bearing less than 035°.

Haravalli, a peak 532m high, about 7 miles E of Honavar, is isolated and easy to identify. A 126m hill, about 3.5 miles S of the monument, is also easy to identify.

**Anchorage.**—Good anchorage can be obtained, in 9m, sand and mud, with the conspicuous monument bearing 082°, about 3 miles. Small vessels may anchor, with shelter from NW winds, between Basavrajdrug Island and the coast E, in about 5m; local knowledge is necessary.

## Honavar to Bhatkal

**3.10** The coast between Honavar and the entrance to the Bhatkal River, is low and sandy with some rocky points. A ridge, reaching an elevation of about 150m, extends about 2 miles along the coast from a position about 3 miles S of Honavar. The ridge is covered with brushwood and contrasts strongly with the sandy shore; the cliffs, 46m high at its base are prominent. Murdeshvar, an islet 32m high, lies about 6.5 miles S of the above ridge. A rocky island, 9m high, lies about 0.8 mile SW of Murdeshvar at the W end of foul ground extending from the coast. Hawkins Reef, awash, lies with its SW extremity about 1 mile NW of Murdeshvar and about 1 mile offshore. Dart Rock, with a least depth of 2m, lies about 1.8 miles WSW of Murdeshvar. Kota Gudde, 430m high, is a conspicuous saddle-shaped summit about 3 miles NE of Murdeshvar. It is connected at lower levels with a long sharp ridge farther inland, which extends about 2 miles SE and is very noticeable from the S. Huddelgudda, 525m high, about 6 miles ESE of Kota Gudde, is easily identified by its long flat summit. Kerekund, a rocky islet 19m high, lies about 4 miles S of Murdeshvar and on the W edge of the coastal reef. A rock, 3m high, and a rock, 7m high, lie about 0.5 mile NNE and SE, respectively, of the islet. Between Kerekund and Bhatkal Fort, about 4.5 miles SE, the low and sandy coast is fringed by foul ground extending up to 1.8 miles offshore. Shirali (Hog Island), about 1 mile S of Kerekund, is a peaked island 109m high. Two rocks, each drying 1.2m, lie close W and 0.2 mile SE, respectively, of the island. When in the vicinity of this island do not enter into depths of less than 18m.

**Netrani** (Pigeon Island) (14°01'N., 74°20'E.), about 9 miles W of Shirali, is wooded and flat-topped with a conspicuous summit, 101m high. It is steep-to except for a rock, 16m high, off its S end, and a rocky shoal close E of the island.

Anchorage, with some shelter from NW winds, may be found, in 27m, mud, off the SE side of the island. Netrani has been reported to give good radar responses at 17 miles.

**3.11 Bhatkal Fort** (13°58'N., 74°32'E.), in ruins, lies on a rocky point, 46m high, at the entrance to the Bhatkal River. Bhatkal Light is shown from a square masonry tower with red bands on the fort, and is obscured by Shirali on bearings between 129° and 132°. The town of Bhatkal lies on the N bank

of the river, about 1.5 miles NE of the fort. The channel over the river bar is very narrow and dangerous for ship's boats.

Anchorage may be obtained, in 10m, with Bhatkal Light bearing 075°, distant 1 mile. Small vessels may anchor, in 7m, sand and shell, with Bhatkal Light bearing 014°, distant 0.3 mile.

**Caution.**—When approaching the port of Bhatkal, do not proceed into depths of less than 18.3m unless local knowledge is available. When approaching from the S, pass W of a 3m rocky shoal which lies about 1 mile SW of Bhatkal Light. Take care to avoid other rocky patches in the approach to Bhatkal, including two 5m patches and a 4m patch which lie about 1.3 miles WSW, 1 mile S, and 0.8 mile W, respectively, of Bhatkal Light. When approaching from the N, keep the summit of Shirali bearing not less than 006°, and alter course for the anchorage when Bhatkal Light bears 090°. The inner anchorage should be approached on a course of 087° from the outer anchorage, passing about 0.2 mile S of the previously-mentioned 4.3m patch.

### Bhatkal to Coondapoor

**3.12** The coast between Bhatkal and Huddi Point, about 1.3 miles SE, consists of cliffs up to about 60m high. Huddi Point is a cliffy promontory, rising to a height of about 52m about 0.5 mile inland; a small rounded hill, 35m high, lies on the extremity of the point. The coast is then low and sandy to Coondapoor, about 20 miles SSE.

**Baindur Head** (13°52'N., 74°36'E.), about 6 miles SSE of Huddi Point, is 61m high and cliffy. It is conspicuous from seaward, being the W point of a table and extending some distance inland. Kodachadri, an impressive sugar-loaf peak 1,343m high, is isolated and conspicuous about 16 miles E of Baindur Head. When bearing more than 090°, it is obscured by Male Gudda, 900m high, about 9 miles W and prominent. Madalbare Gudda, 1,015m high, is prominent about 2 miles N of Male Gudda.

Yademale Gudda, 843m high, is prominent about 5.5 miles farther NNW. Two White Rocks (Double White Rocks), 5m high and close together, lie about 4 miles WNW of Baindur Head, and are very prominent when the sun shines on them. Single Rock, 3m high, lies about 2 miles N, and a rock awash lies about 0.8 mile SSE, respectively, of Two White Rocks.

**Caution.**—Although the area inside the above dangers has been examined and dangers found, it is possible that others may exist. It is recommended, therefore, that vessels should not attempt to pass inside them, and they should keep in depths of more than 20m between Hog Island and Coondapoor.

**Nancowry Rock** (13°48'N., 74°33'E.) consists of two rocky shoals; the W shoal has a depth of 3m. A rock, 3m high, lies between Nancowry Rock and the coast.

**3.13 Coondapoor** (Kundapur) (13°38'N., 74°41'E.) is an open roadstead off the common entrance of the Haladi River and the Chakranadi River. The coast N of the river entrance consists of low hills up to about 37m high. The coast S of the entrance is flat, sandy, and fringed with coconut trees up to 24m high. A wreck, best seen on the chart, lies almost 4 miles W of the harbor entrance. A shoal patch of 7.4m lies 2.1 miles W of Coondapoor Light.

**Depths—Limitations.**—Foul ground, with rocks above and below-water, extends for about 3.5 miles N of the entrance to Coondapoor to a distance of about 1.3 miles offshore. Pate Rock, which dries about 1m, lies at the SW edge of this foul area. A rock, 4m high, lies about 0.2 mile NE of Pate Rock. A 4.6m patch and a 4.9m patch lie about 0.3 mile SSE and SE, respectively, of Pate Rock. Gangoli Shoals, with a least depth of 5.2m, lie about 3.5 miles WNW of the port entrance. A 6m shoal lies about 2.8 miles WSW of the entrance. It is marked W by a red and white striped barrel buoy from October to May. A 6m depth and a 7m depth lie about 1 mile NW and 1.5 miles WNW of the 6m shoal. The bar across the entrance to Coondapoor had a least depth of 2.5, and is constantly changing. Steering for the entrance, bearing 055°, leads over the bar in the deepest water. A dangerous wreck lies 3.8 miles W of the harbor entrance. Another wreck lies about 1.5 miles S of the above wreck.

**Aspect.**—Coondapoor Light is shown from a steel mast, about 0.8 mile S of the entrance, from September 16 to May 15. It is difficult to distinguish from other white lights nearby. Tippu Sultan Gudda Light is shown from September 15 to May 15, about 1.5 miles NNW of the entrance. Two conspicuous objects are a white house is close NE and a gray chimney, 40m high, 1 mile E of the entrance.

Anchorage can be taken, in about 13.5m, with Coondapoor Light bearing 076°, distant about 3.5 miles, and about 1 mile WSW of the 6m patch.

**Caution.**—The bar across the entrance to Coondapoor is perpetually changing. Continuous surf breaks across the entrance with W winds, and it is advisable to enter only with the aid of local pilots.

### Coondapoor to New Mangalore

**3.14** The coast between Coondapoor and Malpe, about 17.5 miles S, is fringed by coconut trees and broken only by the mouth of the Sita Nadi River. The Saint Mary Isles consist of Coconut Island, Middle Rock, Entrance Rock, and the Darya Bahadurgarh Islands. Passage between the islands is obstructed by numerous rocks and should not be attempted except by small craft with local knowledge.

**Coconut Island** (13°23'N., 74°40'E.), about 2.5 miles NW of Malpe, is well-wooded, with trees about 26m high. Foul ground surrounds the island and extends about 0.8 mile WNW to a rock which dries 2m. A rock, 2m high, lies about 2 miles NW of the island and a chain of rocks, above and below-water, extend about 3.5 miles farther NNE. Middle Rock, 4m high, lies about 1 mile SSE of Coconut Island. Foul ground extends up to 0.2 mile W and NW of Middle Rock. Entrance Rock, 1.2m high, lies at the S end of a rocky ridge extending about 0.2 mile S of Middle Rock.

The Darya Bahadurgarh Islands consist of three islands. North Island, 15m high at its SE end, is marked by Malpe Light, shown from a conspicuous square tower on the summit of the island. Darya Bahadurgarh Island, 16m high, lies about 183m SE of North Island.

**South Island** (13°20'N., 74°42'E.) lies about 0.2 mile SE of Darya Bahadurgarh Island and has a rock, with a least depth of 3.7m, about 0.2 mile SSE of it.

Anchorage can be obtained, in 9m, mud, about 1 mile WNW of the light structure on North Island. Small vessels can anchor, in 6m, sand and mud, with the light structure bearing 185°, distant 0.5 mile. Small vessels can anchor, in 6.1m, mud and sand, about 0.5 mile E of the summit of South Island.

**Malpe** (13°21'N., 75°42'E.), a town of some importance to coastal vessels, lies on the N side of the entrance to the Udiyavara River. A white house is conspicuous on the N side of the entrance about 0.2 mile inland. Malpe has four small jetties, accommodating vessels up to 33m long with a draft up to 3.7m. The open roadstead W of Malpe is afforded some protection by the Saint Mary Isles. The coast between Malpe and New Mangalore, about 26 miles SSE, is straight and fringed with coconut trees. Black Rocks, 13m high and conspicuous, lie about 4 miles S of Malpe. Two rocks, 3m high, and two rocks, 5m high, lie about 0.5 mile NW and 0.2 mile WSW, respectively, of Black Rocks. Outer Rocks, 13m high and prominent, lie about 1 mile SW of Black Rocks.

**Caution.**—Vessels in the vicinity of Black Rocks and Outer Rocks should not enter depths of less than about 15m by day or 22m by night. The port is closed during the Southwest Monsoon due to heavy swells.

**3.15 Kap Light** (13°13'N., 74°44'E.), about 8 miles SSE of Malpe, is shown from a white tall masonry tower with black bands standing on a rock near a battery in ruins. Kap Rock, 13m high, is prominent about 1.5 miles NNW of the light. A rock, 1m high, with a drying rock close NE, lies about 1 mile SSW of Kap Rock.

Mulki Rocks, some of which are 13m high and of black basalt, lie about 4 miles WSW of Kap Light.

**Caution.**—Vessels in this vicinity at night should keep in depths of not less than 24m. A 4m depth lies about 3 miles SW of Kap Light. Kunjar Gudda, 105m high, is a prominent landmark about 4 miles NE of Kap Light. Valkunji (Buffalo's Hump), 1,041m high, a peak of the Western Ghats about 18 miles farther ENE, is well-defined and shaped like a buffalo's hump. The town of Mulki, with a church on high ground, lies about 8.5 miles SSE of Kap Light, and about 1 mile NE of the entrance to the Mulki River. A dangerous wreck lies approximately 1.5 miles W of the entrance to the Mulki River. Another dangerous wreck lies about 5 miles NW of the previously-mentioned wreck.

**Suratkal Point Light** (13°00'N., 74°47'E.), about 5 miles S of the entrance to the Mulki River, is shown from a 36m high white masonry tower with black bands standing on the point. An aero light is occasionally shown from a very tall tower at Mangalore Airfield, about 6 miles ESE of the point.

### New Mangalore (12°55'N., 74°49'E.)

World Port Index No. 49032

**3.16** The port of New Mangalore, a major all-weather port, is situated about 5 miles NNW of the old Mangalore port. The port is approached through a channel reported (2001) dredged to a depth of 14m, well marked by lighted buoys, and entered between breakwaters. The port consists of a turning basin, an oil jetty on the SW side of the lagoon and near the approach

channel, and seven berths contained in a basin extending N from the turning basin. The berths are used for general cargo, the export of iron and manganese ore, and the import of materials for a chemical and fertilizer factory.

#### Port Authority of New Mangalore

<http://www.newmangaloreport.com>

**Depths—Limitations.**—Ships with a draft of 14m can enter the port; the maximum permitted length is 183m.

Berth limitations are given in the accompanying table:

A depth of 15.1m is maintained within the harbor leading from the entrance to the turning basin.

It has been reported (1995) that depths at the E end of Berth 1 are less than charted.

The port is approached by a channel almost 3 miles long and 240m wide; it is maintained by dredging to 12.5m and marked by lighted buoys in conformance with the IALA Maritime Buoyage System (Region A). Several shoal patches, with a least depth of 7.5m, lie close S of the channel, about 1.3 mile E of Fairway Lighted Buoy.

New Mangalore Port Facilities			
Berth	Length	Depth	Remarks
1	125m	6.5m	Fertilizer and ammonia.
2	198m	10.1m	General cargo.
3	198m	9.5m	Ore.
4	198m	9.5m	Coal and coke
5	198m	9.1m	Containers.
6	198m	7.6m	Containers.
7	198m	9.8m	Containers.
8	300m	12.5m	Iron ore. Vessels up to 60,000 dwt. Berth exposed to swell during the South-west Monsoon.
9	300m	10.1m	Oil jetty. Tankers up to 30,000 dwt
10	320m	14.0m	Crude oil jetty

**Aspect.**—Fairway Lighted Buoy is moored about 3.5 miles W of the port and 0.4 mile W of the channel entrance. Range lights, in line bearing 079°, at the E side of the port, mark the approach channel through the entrance.

A signal station and port radio station are situated on the N entrance point of the port. A white concrete tower lies close S of the S entrance point. Two towers, one of which is conspicuous, lie a short distance inland from the head of the harbor. There is a conspicuous water tower 0.5 mile E of Fairway Lighted Buoy and 0.2 mile S of the leading line.

**Pilotage.**—Pilotage is compulsory for vessels over 200 grt and is available 24 hours. Pilots embark in the vicinity of Fairway Lighted Buoy.

Vessels should send ETA messages at least 48 hours in advance and ETD messages at least 2 hours in advance.

**Anchorage.**— Anchorage is recommended N of Fairway Lighted Buoy, in depths of 12 to 13m. A spoil ground is established about 1 mile S of Fairway Lighted Buoy.

### Mangalore (12°51'N., 74°50'E.)

World Port Index No. 49030

**3.17** Mangalore Harbor lies in the backwater formed by the confluence of the Gurpur River and the Netravati River. The port is only of importance to coastal vessels, as it is fronted by a shallow bar between low sandy spits. The port is closed from June through August during the Southwest Monsoon, when the bar is impassable. A shoal, with a depth of 15m, lies 6.5 miles WNW of the entrance to Mangalore.

**Aspect.**—In the approach to Mangalore, the following peaks are conspicuous:

1. Kodinjakal (Asses Ears), 346m high, about 18 miles NE of Mangalore.
2. Kuduremukha, a 1,890m peak of the Western Ghats, about 13 miles farther ENE.
3. Mudipina Padavu, 207m high, about 7 miles ESE of Mangalore.
4. Passodigumphe (Barn Hill), 324m high, a sloping mountain with a flattish summit, about 8.5 miles farther SSE.

The town of Mangalore is almost entirely concealed from the offing, but the following landmarks are conspicuous:

1. Mangalore Light, a squat, white, masonry tower with black bands, attached to a house resembling a small chapel, about 0.5 mile ENE of the harbor entrance.
2. A 41m high dome, surmounted by the steeple of the Roman Catholic Cathedral, about 0.5 mile N of the light structure.
3. The 76m high square tower of Saint Aloysius College, about 1.3 miles NNE of the cathedral.
4. A conspicuous white cross about 3.5 miles N of the harbor entrance.
5. A group of white houses close S of the harbor entrance.

A radio tower, having an elevation of 153m, lies about 1 mile NNW of Saint Aloysius College.

**Pilotage.**—Pilotage is compulsory for all vessels over 100 grt. Pilots board deep draft vessels in position 12°55'N, 74°45'E. Vessels with a maximum draft of 10m are boarded in position 12°55'N, 74°46'E. Boarding areas are best seen on chart.

Vessels can communicate with a signal station close to Mangalore Light. There is also a Coast Radio Station at Mangalore.

**Anchorage.**—Anchorage may be obtained, in 9.1m, with Mangalore Light bearing between 050° and 100°, distant about 2 miles. Vessels should not approach the lighthouse closer than 1.5 miles, as the depths then decrease rapidly.

**Caution.**—It is preferable to arrive off Mangalore during the afternoon with the sun astern, or at night when the light can be seen. The landmarks are difficult to distinguish during the morning haze.

Dangerous wrecks lie about 1.8 and 2.5 miles WSW of Mangalore Light.

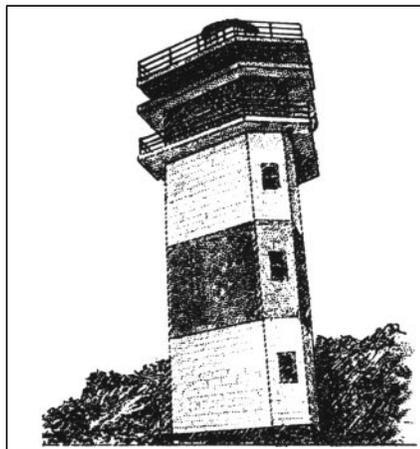
### Mangalore to Mount Dill

**3.18** The coast from Mangalore to Kotte Kunnu, about 55 miles SSE, presents a fringe of coconut palms broken here and there by the mouth of a river or a prominent headland. Manjeshwara, about 9 miles SSE of Mangalore, is a small customs port with minimum of trade. A radio tower lies near the coast about 5 miles NNW of Manjeshwara. Kumbala, a village with an old fort, lies about 15.5 miles SSE of Mangalore, at the mouth of the Shiriya River. The Chandragiri River enters the sea about 8 miles SSE of Kumbala, between the two hill forts of Kasaragod and Chandagiri, 53 and 45m high, respectively. The bar of the river dries and changes frequently; it can only be used by small craft at HW. Kasaragod Anchorage Light, primarily a mark for fishermen, is shown about 1 mile NNW of the river entrance.

**Kasaragod** (12°29'N., 75°00'E.), a large village, lies on the N side of the entrance to the Chandragiri River. A chimney, 41m high, is conspicuous in the village. Kasaragod Light, a white, octagonal, concrete tower with black bands lies N of the village. Storm signals are shown at Kasaragod; the Brief System is used. Further information on these storm signals may be found in Pub. 160, Sailing Directions (Planning Guide) South Atlantic Ocean and Indian Ocean under "India—Signals."

Bekal, about 6 miles SSE of Kasaragod, a small open port for local craft, is formed by a rocky promontory; an old fort, with a tall central bastion, lies on the promontory. A group of rocks, 1m high, lies about 1.8 miles NW of the fort. Hosdrug Fort, 37m high, is conspicuous about 6 miles SSE of Bekal, and 0.8 mile inland. A bare hill, 179m high, lies 2.3 miles NE of the fort. Kavvayi Backwater, close within and parallel to the coast, extends from about 5 miles SSE of Hasdrug Fort to Mount Dill.

**3.19 Mount Dill** (Mount Delli) (12°02'N., 75°12'E.), 259m high, is the summit of a conspicuous headland separated from the low-lying mainland by a narrow creek. Kotte Kunnu, a bluff point 52m high, at the SW extremity of the headland, is joined to the more elevated land by a low neck; a fort lies on Kotte Kunnu. Mount Dill Light (Kotte Kunna Light) is shown from a white, triangular, stone tower with red bands on the bluff point.



Mount Dill Light

Madai Light is shown about 2.3 miles ENE of Kotte Kunnu. Good radar returns have been reported from Mount Dill at 26 miles.

Anchorage, with moderate shelter from NW winds, can be obtained, in 7m, mud, with the summit of Mount Dill bearing 330°, distant 2.5 miles. Small vessels may find shelter off the mouth of the creek, SE of Mount Dill, during the NW winds which prevail here from February to May, in depths of about 4m. A short confused sea and a slight S set will be found here.

A stranded wreck lies 2 miles NNW; a dangerous wreck lies 3 miles SSE from Mount Dill Light.

### Mount Dill to Cannanore

**3.20** The coast from Mount Dill to Cannanore, about 13 miles SE, is sandy and fringed with coconut palms. The Valapattanam River, marked on the N side of its entrance by a clump of casuarina trees, flows into the sea about 7 miles SE of Mount Dill. The bar at the entrance to the river has a least depth of 1.2m, and is subject to seasonal change. Passage over the bar should not be attempted without a local pilot; the services of an unlicensed pilot can be obtained from Azhikal by telegram. Azhikal Light is shown at the S side of the entrance. Storm signals are displayed near the light.

**Azhikal** (11°55'N., 75°24'E.) (World Port Index No. 49040), with a thriving timber trade, lies on the S bank of the river, about 1 mile within the entrance. Boundary pillars, NW and SE of the river entrance, define the limits of the port.

Anchorage can be taken, in 8 to 9.1m, sand and mud, good holding ground, about 2 miles off the river.

### Cannanore (11°52'N., 75°22'E.)

World Port Index No. 49050

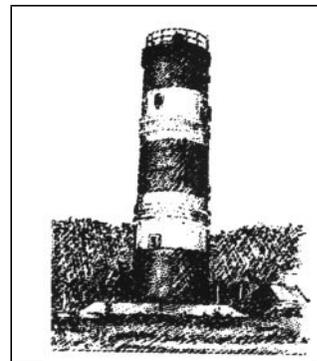
**3.21** Cannanore, a military cantonment and open roadstead port, is in charge of the Port Conservator, subordinate to the Port Officer at Calicut. The port is closed to local sailing craft from the beginning of June to the end of August, but vessels may work cargo during the Southwest Monsoon when weather permits. Moplah Bay, the bight E of Cannanore, is shallow, but affords shelter to local craft.

**Aspect.**—The following are prominent or conspicuous in the approach to Cannanore:

1. The flagstaff on the N bastion of Fort St. Angelo, which lies on a low rocky point at the S end of the town.
2. A chimney, 42.5m high, about 0.8 mile NW of the fort.
3. North Point, a 16m high headland, about 4.3 miles NW of the fort.
4. Two boundary pillars about 1 mile WNW and 1.8 miles ESE of the fort.

Cannanore Light is shown from a white, concrete column with red bands 1 mile WNW of Fort St. Angelo.

A red conical buoy is moored about 0.5 mile SE of the fort from October to May and marks the approach to the inner anchorage for small craft. Signaling with shipping is conducted from the flagstaff on Fort St. Angelo. Port limits are defined by lines drawn in a 270° direction from the above-mentioned boundary pillars to depths of 16.5m.



Cannanore Light

**Anchorage.**—Anchorage can be obtained, in about 9m, mud, good holding ground, about 1.8 miles SW of the fort.

**Caution.**—A rifle range extends SSW of the flagstaff of Fort St. Angelo. Vessels anchoring W of the E limit of the firing range (a flagstaff bearing 022°) should remain at least 1.5 miles offshore. During firing practice, a red flag is displayed about 0.3 mile W of the fort.

### Cannanore to Tellicherry

**3.22** The coast between Cannanore and Tellicherry, about 9 miles SE, consists of alternate sandy beaches and cliffs, fringed with coconut trees. Rocks, above and below-water, fringe the coast. Dharmapattanam Island, about 7 miles SE of Cannanore, is encircled by two rivers. Green Island, 34m high and covered with tall trees, lies off the W extremity of Dharmapattanam Island. The ruins of a redoubt are conspicuous on the summit of a bare hill, 61m high, about 1.3 miles NE of Green Island.

### Tellicherry (11°45'N., 75°29'E.)

World Port Index No. 49060

**3.23** Tellicherry, an open roadstead port, is open throughout the year. The port limits are defined by two lines extending SW into depths of 16.5m from the N boundary pillar on the rocky S extremity of Dharmapattanam Island, and the S boundary pillar on Punuli Point, about 4 miles SE.

**Aspect.**—An ancient fort stands in position 11°45'N, 75°29'E on rising ground near the coast. Tellicherry Light is shown from the NW bastion of the fort.

Bilikulu, a natural breakwater of basalt, 6m high, lies parallel to the coast, about 0.5 mile SW of the fort. Two similar but shorter ridges lie between Bilikulu and the shore. These ridges, together with numerous detached rocks above and below-water, between Bilikulu and the shore, give sufficient shelter to the landing at Tellicherry at LW during NW winds to enable vessels to communicate with the port when all others are closed.

Inland, several peaks of the Kundah Mountains are conspicuous:

1. Perali Mala (Perly Hill), 488m high, about 13.5 miles NE of Tellicherry.

2. Periya Peak (Periah Peak), 1,157m high, about 18 miles ENE of Tellicherry.

3. Nattavaram (Naduwarem Peak), 1,387m high, about 17.5 miles E of Tellicherry.

Conspicuous objects in the approach are the Club House, about 1 mile NNW of the fort, and the port flagstaff, about 0.3 mile SE of the fort. The hills near Tellicherry are thickly covered with coconut palms and other trees.

Shorukulu, a natural breakwater of basalt, 3.7m high, lies parallel to the coast, about 0.8 mile NW of Bilikulu. Naku-diankulu (Nukudiankulu), about 0.5 mile NW of Shorukulu, is a pinnacle rock drying 0.9m. Talayi Rock, a pinnacle rock with a depth of 1.5m, lies nearly 0.7 mile SE of **Nilot Point** (11°44'N., 75°30'E.). A black spherical buoy, removed between May and October, is moored on the S side of the rock.

**Signals.**—Communication with shipping is maintained from the port flagstaff by flags of the International Code and by Morse Code from the Port and Customs Office, about 0.3 mile SE of the fort.

**Anchorage.**—Anchorage for large vessels in unsettled weather is well offshore, in a depth of 12m, but in good weather a vessel can anchor, in 9.1m, soft mud, SW of the fort, about 1.5 miles from Bilikulu. Cargo is worked at the anchorage by lighters. A T-headed pier near the Port Office, used mainly by lighters, is 171m long, with depths of 1.8 to 3m alongside.

## Tellicherry to Calicut

**3.24** The Kundah Mountains lie only about 10 miles from the coast between Tellicherry and Calicut.

**Mahe** (11°42'N., 75°32'E.) (World Port Index No. 49070) is a small settlement on the S side of the entrance to the Mahe River. A light is shown on the S side of the river entrance. Some old forts and houses lie on the detached hills behind Mahe. Rocks extend offshore from both sides of the river entrance into depths of 3.7m.

Anchorage can be obtained, in 9.1m, mud, about 2.5 miles WSW of the light structure. Chombaku, an islet, 4m high, lies about 2.5 miles SSE of Mahe, and about 0.5 mile offshore; several rocks lie near the islet.

**Badagara** (11°36'N., 75°35'E.) is an important town on the coast, about 7 miles SSE of Mahe. The coast in the vicinity is low, sandy, and fringed by coconut trees.

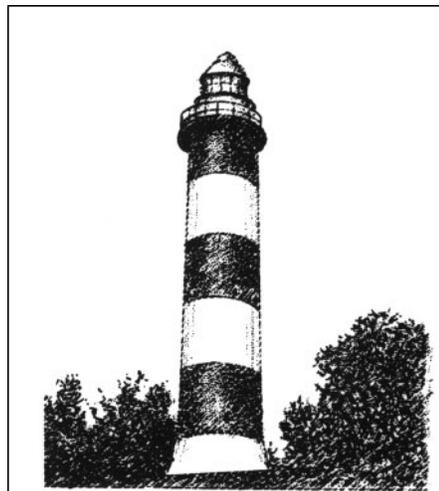
A flagstaff, 26m high, is conspicuous on the coast W of the town. A casuarana tree, 64m high, is conspicuous above the dense coconut plantations on a small hill close S of the town.

A flat-topped hill, 114m high, is conspicuous about 3 miles ENE of Badagara. A 101m hill and a 104m hill rise about 1 mile NNW and SSW, respectively, of the flat-topped hill. Farther inland, Nattavaram 1,388m high and Banasuram (Buffalos Hump), 2,060m high, about 20 miles WNW of Badagara, are conspicuous.

A conspicuous round red hill, 55m high, lies about 3 miles SSE of Badagara, on the S bank of the Murat River, about 1 mile within the entrance.

Anchorage can be taken, in 9.1m, mud, about 2 miles WSW of the flagstaff.

**Kadalur Point** (11°28'N., 75°38'E.), low but prominent, is covered with palm trees, over which will be seen a large round tree. Hills gradually rise NE of the point; the nearest summit is 78m high, about 1.3 miles NE of the point.



**Kadalur Point Light**

The coastal reef extends about 1.5 miles W and 1.3 miles S from the point. Trikodi Reef, with a least depth of 1.5m and Kadalur Reef, with a least depth of 3.4m, are the W and SW ends, respectively, of the coastal reef.

**3.25 Sacrifice Rock** (11°30'N., 75°32'E.), 18m high and conspicuous, lies about 6.5 miles WNW of Kadalur Point. It consists of granite and, having a white appearance, can be seen 10 miles in clear weather. The passage between this rock and the coast is free of dangers, but vessels using it should keep near the rock, and not proceed into depths of less than 13m. Vessels passing W of this rock at night should not proceed into depths of less than 27m which are found about 2.5 miles W of the rock. A shoal, swept to a depth of 2.7m, lies almost 1 mile offshore W of Tikkotti village.

The coast between Kadalur Point and Calicut, about 14.5 miles SSE, is generally low, sandy, and fringed with palms. Red laterite hills back the coast.

Quilandi, a large village, lies about 3.8 miles ESE of Kadalur Point. A water tower is conspicuous on the coast, close S of the village. The conspicuous summit of Palkunnu, 297m high, rises about 7.5 miles ESE of the village. A large black rock, with a tree on it, lies on the coast about 2.8 miles SSE of Quilandi.

**Elattur Cape** (11°19'N., 75°44'E.), about 4 miles farther SSE, is low and rocky, with coconut palms close inland. The mouth of the Elattur River, a shallow and rocky river, lies about 1.3 miles N of the cape.

**Vavul Mala** (Camels Hump) (11°25'N., 76°08'E.), 2,338m high, about 23 miles ENE of Calicut, is the highest and most conspicuous peak of the Kundah Mountains. It is visible far to seaward in clear weather. The Kundah Mountains end rather abruptly S of Vavul Mala.

**Calicut (11°15'N., 75°46'E.)**

World Port Index No. 49100

**3.26** The port of Calicut, also known as Kozhikode, is an open roadstead of considerable commercial importance. Cargo is worked at the anchorage by lighters. The port is unusable from the beginning of June to the end of August.

**Depths—Limitations.**—Reliance Shoal, with a least depth of 8.6m, extends about 2.5 miles NNW from a position 3.5 miles W of Calicut Light; the shoal is rocky, but the bottom near it is soft mud.

Anchorage Reef, with a least depth of 3.7m, lies about 1.3 miles WSW of Calicut Light. A lighted buoy, painted in black and white stripes, is moored W of the reef; it is in position from October to May.

Calicut Reefs, a group of rocky shoals with a least depth of 4.1m, extend about 1.5 miles N from a position 2.5 miles SSW of Calicut Light.

Coote Reef, with a least depth of 0.9m and over which the sea generally breaks, lies about 1.5 miles S of Calicut Light. A black and white striped can buoy is moored about 0.3 mile W of the reef. Gilham Rock, about 0.3 mile farther S, has a depth of less than 1.8m.

**Aspect.**—Calicut Light is shown from a white masonry tower near the Port Office at the N end of town. West Hill, 49m high, with the houses on it showing among the trees, lies about 2 miles N of Calicut Light and forms a good landmark in the morning when approaching Calicut. The dome of the Roman Catholic Cathedral, 45m high, is conspicuous 0.5 mile SE of the lighthouse. A rocky islet, 2m high, lies on the coastal reef about 3 miles N of Calicut Light.

Two white boundary markers, marking the N and S limits of the port, lie on the coast about 4 miles N and 5 miles S, respectively, of Calicut Light.

**Signals.**—The signal station, close N of Calicut Light, communicates with shipping by flags of the International Code or by Morse Code. Landing conditions are indicated by the following flags of the International Code:

1. K—Surf is impassable.
2. M—Communication with the shore is dangerous.
3. N—Boats can leave the harbor.
4. F—Boats can enter the harbor.

**Anchorage.**—Anchorage may be obtained with Calicut Light bearing 078°, at a distance according to the vessel's draft. Vessels should not anchor S of this bearing as the bottom is foul and rocky. The lighted buoy, moored W of Anchorage Reef, marks the S and E limits of the anchorage for vessels of moderate size.

There are three recommended anchorages, which can best be seen on the chart.

**Bey pore (11°10'N., 75°48'E.)**

World Port Index No. 49110

**3.27** The port of Bey pore (Beipur), an open roadstead, lies off the entrance of the Bey pore River and is considered a wharf of the port of Calicut.

**Depths—Limitations.**—Black Rocks, 1.2m high, lie towards the SE end of a reef about 0.8 mile S of the entrance to the Bey pore River. A rock, with a depth of 1.5m, lies about 0.5 mile SSW of Black Rocks. The bar of the Bey pore River had a depth of 3.5m between the breakwaters in 1990.

**Aspect.**—Kota Kunnu, a 60m hill, about 3 miles SE of the entrance to the Bey pore River, is a good landmark for vessels approaching Bey pore. Olavattur Kunnu, 245m high, about 8 miles E of Bey pore, lies among isolated hills in the vicinity. Urakuth Mala (Dolphins Head), a hill 477m high, about 13 miles ESE of the river entrance, is conspicuous.

New Bey pore Light is shown from an octagonal masonry tower, with red and white bands, on the SE side of the entrance to the Bey pore River.

Other landmarks are a flagstaff, 25m high, on the SE entrance point of the river; a conspicuous chimney, 58m high, about 1.5 miles NE of the flagstaff; and several chimneys of a tile works, across the river and about 0.2 mile N of the tall chimney.

**Pilotage.**—Pilotage is not compulsory; however, pilots are available for entering the river.

**Anchorage.**—Anchorage may be obtained, in 7m, about 1.5 miles WSW of the flagstaff; moderate-sized vessels usually anchor, in 8.5m, about 0.5 mile farther WSW. Large vessels anchor farther out.

**Caution.**—Vessels in the vicinity of Bey pore at night should not enter depths of less than 14.6m.

**Bey pore to Cochin**

**3.28** The coast between Bey pore and Ponnani, about 24 miles SSE, is low, sandy, fringed with palms, and backed by red laterite hills. A light is shown at Tanur, an important fishing village, about 11.5 miles SSE of Bey pore. A tableland, covered with palms, lies about 1 mile NE of the village. A tableland, about 90m high, with a few scattered trees, lies about 9 miles N of Ponnani.

**Ponnani** (10°47'N., 75°55'E.), a busy seaport for local craft, lies on the S side of the entrance to the Ponnani River. The port is closed during the Southwest Monsoon, and is in charge of a Port Conservator responsible to the Port Officer at Calicut. The extensive backwater of the Ponnani River forms a wide gap in the line of palms when viewed from WSW. The entrance of the river is wooded and prominent from the S. Ponnani Light is shown from a white, round, concrete tower with black bands, 0.8 mile S of the river entrance. The bar of the Ponnani River has a depth of not more than 2.1m, but small vessels with local knowledge can enter it at HW. There are some unlicensed pilots available.

The town of **Chetwai** (Chetwayi) (10°32'N., 76°03'E.) lies about 1.5 miles within the entrance to a backwater. The existence of the boundary pillars N and S of the backwater entrance is doubtful. Chetwai Light is shown from a 30m high circular concrete tower, lying 1.5 miles N of the boundary pillar.

Anchorage can be taken by small vessels, in 11m, mud, off the entrance to the backwater; local knowledge is necessary.

A range of hills, over 305m high in its highest part, lies about 18 miles ENE of Chetwai. It lies between the Western Ghats

and the coast, and terminates abruptly toward the S. The NW summit of this range gives good radar response.

The Periyar River (Pallipur River), about 22 miles SSE of Chetwai, is generally easy to identify from the W due to the gap in the fringing palms. Periyar River Light is shown from a white, square, concrete tower with black bands, situated 1.3 miles N of the river entrance.

In 1951, it was reported that the depth contours between the Periyar River and Narakal, about 8.5 miles SSE, had extended considerably seaward, and the coast had extended similarly up to 0.5 mile in places.

### Cochin (9°58'N., 76°14'E.)

World Port Index No. 49130

**3.29** The port of Cochin is a fine natural harbor formed by the estuary of the Periyar River and its backwater. The inner harbor is able to shelter a large number of vessels with drafts up to 9.1m at all seasons. It is the main deep water harbor S of Bombay and a base for the Indian Navy. In 1986, considerable development in Cochin Harbor had taken place, which included the construction of an oil terminal and other berths, widening and dredging of the channels, the establishment of new leading lights, and the introduction of the IALA Maritime Buoyage System (Region A) in the main entrance.

The N and S limits of the Port of Cochin extend 7.5 miles in a 270° direction from a position on the coast 5 miles SSE and 2 miles NNW of Cochin Light. The port area includes the harbor and backwater, with the creeks and channels connecting with them and their shores, whether of the mainland or of islands, as may lie within 46m of the spring tide HW mark.

The great estuary, or backwater, on which Cochin lies, extends for about 50 miles NNW to Ponnani, and about 30 miles S to Alleppey. Its width varies from 8 miles to a few hundred meters, and its channels connect with other inland waters. It has a least depth of 1.8m and is affected by tidal influence. Several rivers flow into the backwater making it brackish. During the Southwest Monsoon, which brings heavy rain to the seaward side of the Western Ghats, the watershed drainage of these rivers increases greatly and, entering the sea through numerous openings into the backwater, probably causes the constant shifting of the soft mudbanks off this part of the coast.

#### Port Authority of Cochin

<http://www.cochinport.com>

**Winds—Weather.**—Cochin is outside the cyclone area, but during the Southwest Monsoon, short gusts of wind 50 to 55 knots are sometimes experienced.

**Tides—Currents.**—The tidal rise at Cochin is 0.9m at MHHW, and 0.8m at MLHW. Salinity within the harbor has values between 1000 and 1020, according to tidal and seasonal factors.

The maximum velocity of the ebb current at springs, throughout the year, is from 2 to 3 knots, and at neaps from 0.8 knot to 1.3 knots. The velocity of the flood current at springs, throughout the year, varies 1.5 to 2 knots and at neaps from

about 0.8 knot to 1.3 knots. Both currents run for a considerable time after the predicted times of HW and LW, from 1 to 2 hours on the flood, and from 2 to 3 hours on the ebb, according to the season.

After heavy inland rains the ebb current may run continuously for many days, while the flood current enters the harbor under the surface ebb. On very rare occasions, and after high inland floods, the tidal current in the harbor may have a velocity of 5 knots or more.

In January and February, the effect of the ebb current is not noticeable W of the outer channel buoys, and no appreciable current is experienced off the coast in the vicinity of Cochin. Under monsoon conditions, strong eddies and crosscurrents were experienced in the harbor entrance between Vypin Island and Cochin, and also off the NW point of Willingdon Island.

On the ebb current, between the harbor entrance and the NW end of Willingdon Island, there is a strong set across the channel from the N part of the harbor; the limits of this current are marked by tide rips which cause a vessel to sheer.

**Depths—Limitations.**—The approaches to Cochin are clear of outlying shoals or banks, except for the shoal water of the bar, through which the deep approach channel has been dredged.

Mattancheri Channel, 183m wide, and Ernakulam Channel are maintained by dredging to a project depth of 9m, with the W portion of Ernakulam dredged to 12.8m in 1996; local authorities should be consulted for prevailing depths in the channels and alongside berths.

A shoal area N of the dredged channel includes a spoil ground which is awash in places. South of the dredged channel a shoal, with a depth of less than 1.8m, and on which the sea breaks, extends about 0.9 mile W from the coast.

Vessels, once E of Fairway Lighted Buoy, must not attempt to enter or leave the approach channel without a pilot on board. In 1985, less water than charted was found to exist outside the dredged channel on both sides. Another spoil ground lies about 2.5 miles SW of Outer Signal Station. A dangerous wreck and a small foul area lie near the N limit of the dredged channel, 1 mile E of Fairway Lighted Buoy.

Within the harbor entrance the dredged channel is about 0.2 mile wide; its N limit is marked by two lighted buoys. An anchorage for sailing vessels is situated N of the fairway, close within the harbor entrance.

The dredged channel then divides into Mattancheri Channel and Ernakulam Channel leading W and E, respectively, of Willingdon Island. A road bridge, with a lifting span, connects the SW end of Willingdon Island with the mainland W, and a road and rail bridge, with a navigable opening marked by lighted dolphins, connects the E side of the island with the mainland E.

Mattancheri Wharf, on the W side of the latter island, has four berths, Q1 to Q4, with charted depths of 8 to 9m alongside; vessels up to 172m in length can be berthed at the wharf. There are mooring berths on the E and W sides of the channel.

The repair dock at the shipyard along Mattancherry Channel can accommodate a ship of 100,000 dwt.

A number of Indian Naval vessels are situated at Vendurutti (Venduruthy Island) on the E side of Willingdon Island. In this area there are several flagstaffs; a radio station, with several

masts, is situated 183m NNW of the W end of the road and rail bridge.

On the W side of Willington Island are several deepwater berths. An oil berth, consisting of a T-head with dolphins, is 0.2 mile SE of the NW point of the island; a coal berth is 0.1 mile further SE.

Ernakulam Channel has two tanker berths on its E side, with depths of 9.1m alongside. The N berth can accommodate tankers up to 213.4m in length. An island tanker berth, flanked by mooring dolphins, is situated on the NE side of Ernakulam Channel opposite Berth Q7 and Berth Q8. A tanker of 115,000 dwt, partially loaded to a draft of 10.7m, can be accommodated.

Ernakulam Wharf, on the N side of Willington Island, can accommodate vessels up to 172m in length and 9.1m in draft. There are five berths, Q5 to Q9. Berth Q9 is a container terminal with a berthing length of 244m, capable of accommodating vessels with a draft up to 9.2m. Berth Q10, SE of Berth Q9, is a fertilizer berth; it is 217m long, 15m wide and lies 35m offshore to which it is connected by an approach bridge. This berth can accommodate vessels with draft up to 9.2m.

Approximately 0.8 mile SE of Ernakulam Wharf is Naval Jetty. Caution is necessary when berthing alongside Naval Jetty, on the W side of the channel, as the ebb current sets strongly off the pier and the flood current strongly onto it. The bar at the entrance to the harbor is dangerous for ship's boats when the ebb tide is setting strongly against the sea breezes, resulting in a short choppy sea.

A T-headed jetty, 350m long, is at Vendurutti, about 0.5 mile SE of Naval Jetty; an extensive area off the jetty is maintained at a depth of 8m.

There are numerous mooring buoys on the E side of the channel S of the tanker berths.

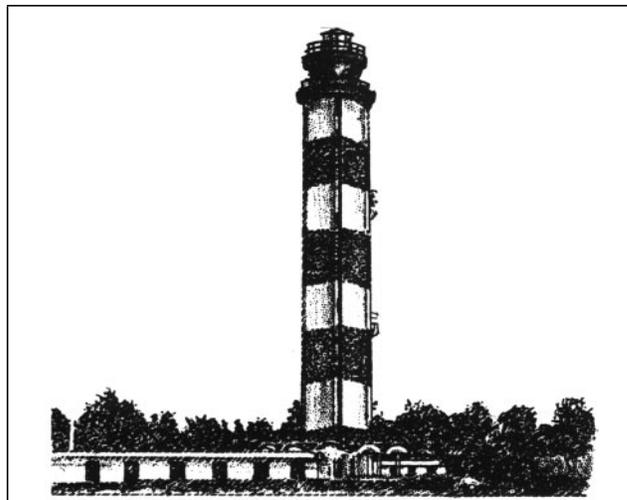
Tankers in ballast are subject to draft restrictions. Tankers less than 152.4m in length must have a minimum draft forward of 4.3m (plus or minus 0.6m and trimmed by the stern) and 4.9m aft. Minimum drafts for tankers of 152m and over are 4.9m (plus or minus 0.6m) forward and 6.1m aft. Additionally, tankers over 213m in length are subject to a maximum draft of 8.5m.

**Aspect.**—The coast in the vicinity of Cochin is low, sandy, and thickly fringed by palms. The highest of the Western Ghats are about 50 miles inland, but they can be distinguished only when the weather is clear. Haze settles over the land after sunrise, and the coast remains indistinct until midday, and even objects otherwise conspicuous are difficult to discern.

Kollengode Bluff (Kollangod Bluff), about 48 miles NE of Cochin, lies at the NW end of the Anamali Mountains, which form part of the Western Ghats. The bluff is conspicuous during the Northeast Monsoon, and forms the S part of Palghat Gap which is 1,220m lower than the mountains flanking it and through which the winds blow fiercely between November and February.

A buoy, painted in red and white stripes, is moored 32 miles WNW of the entrance to Cochin Harbor.

Cochin Light is shown from a concrete tower with red and white bands; a racon transmits 1.8 miles NNW of the harbor entrance. A tower, 22m high, and a water tower, 13.4m high, are conspicuous about 0.8 mile S and 1 mile S, respectively, of Builders Point.



**Cochin Light**

A wooden pile beacon lies 1.3 miles SSW of Cochin Light; a concrete pile beacon, 9.1m high, lies 1.5 miles WSW of the light.

A white house is conspicuous at the village of Kandakadavu, about 7 miles S of the entrance to the port of Cochin. The dredged entrance channel, Mattancheri Channel, and Ernakulam Channel are marked by lighted buoys. The harbor office, which is conspicuous, lies on the NW end of Willington Island. Range lights, situated N and NE of Willington Island, lead through the harbor entrance and through the center of Ernakulam Channel abreast the tanker berths.

**Pilotage.**—Pilotage is compulsory for all merchant vessels of over 100 grt and is advisable for smaller vessels. Deep-draft vessels are advised to wait for the pilot 0.5 mile W of Fairway Lighted Buoy. Government pilots board vessels about 1 mile NNW of Fairway Lighted Buoy. The pilot vessel has a red hull with a white house.

Vessels should send ETA messages 48 hours in advance either directly to Cochin Port Radio or through the agent. In addition, amendments to the ETA should be made at least 12 hours in advance. Vessels should contact port control 30 minutes prior to arrival for pilotage and berthing instructions.

Vessels may anchor in this vicinity, clear of the axis of the channel, good holding ground, mud. Vessels can enter or leave the harbor day or night at almost any state of the tide, except for crude oil tankers which may only enter by day. A vessel, equipped with radio, is stationed near the seaward end of the approach channel; it will transmit and receive messages concerning pilotage only. A vessel awaiting a pilot should, if anchoring, lie about 1 to 2 miles NNW of Fairway Lighted Buoy.

**Signals.**—The Signal Station is situated at the 37.5m flagstaff close N of Fort Cochin. This flagstaff lies on a conspicuous tower, painted white on its seaward side. The station communicates by flags and Morse Code as necessary. Storm signals are displayed; the General System is used. Further information on these storm signals may be found in Pub. 160, Sailing Directions (Planning Guide) South Atlantic Ocean and Indian Ocean under "India—Signals."

The following flags of the International Code should be displayed by vessels entering or leaving Cochin (meaning of hoist follows flags):

1. F—Am about to enter harbor and berth in Mattancheri Channel.
2. F and First Substitute—Am about to enter harbor and berth in Ernakulam Channel.
3. N—Am leaving a berth in Mattancheri Channel.
4. N over First Substitute—Am leaving a berth in Ernakulam Channel.

An oil tanker should display a red ball below these flags.

A vessel must not enter harbor until the signal has been repeated by the Signal Station. Signals for vessels leaving the harbor will also be repeated by the Signal Station.

A vessel shifting berth within Cochin Harbor must display a black ball or shape at least 0.6m in diameter at half mast and shall proceed at not more than half speed.

The following flag signals may also be displayed:

1. EM—Vessel shifting from Ernakulam Channel to Mattancheri Channel.
2. ME—Vessel shifting from Mattancheri Channel to Ernakulam Channel.
3. DN—Port's dredge proceeding to sea.
4. DF—Port's dredge entering harbor.

A vessel on fire and requiring assistance should continuously:

1. Sound on it whistle or siren the letter "F" in Morse Code together with rapid and continuous ringing of the ship's bell.
2. Hoist, by day, appropriate International Code Flag Signal (CB6, IT, etc.).
3. Telephone Port Fire Station, the Port's Fire Float, or Harbormaster.

A vessel requiring assistance in an emergency (moorings carrying away, oil leakage, urgent medical and police assistance, etc.) may sound at frequent intervals:

1. A succession of blasts on its whistle or siren to attract attention.
2. Sound V (3 short and 1 long blast) to mean "I require assistance."
3. Sound W (1 short and 2 long blasts) to mean "I require medical assistance."
4. Hoist V or W of the International Code of Signals.

**Regulations.**—Immobilization of main engines is not permitted without written consent by the Port Authority. Discharge of oily water or other rubbish is forbidden.

When plague is prevalent in Northern India, vessels must obtain pratique before communicating with the shore.

Two Submarine Exercise Areas are centered 25 miles W and 100 miles SW of the entrance to Cochin Harbor. These areas may best be seen on the chart.

**Anchorage.**—Anchorage is available off the port of Cochin, in 14.5m, with Cochin Light bearing 075°, 4.5 miles. During the Southwest Monsoon, the best anchorage, with good communication with Cochin, is about 2 miles NNW of Fairway Lighted Buoy.

**Directions.**—Vessels approaching Cochin should keep in depths of not less than 11m and W of Fairway Lighted Buoy. When in this position, hoist the signal for a pilot and await the pilot's arrival. The outer channel was dredged to 12.8m in

1986; the inner stretch of the channel to was dredged 11.9m in 1986.

### Alleppey (9°29'N., 76°19'E.)

World Port Index No. 49140

**3.30** The port of Alleppey lies about 29 miles S of Cochin; the coast between the ports is low, sandy, thickly fringed with palms, and densely populated. The port is an open roadstead under the superintendence of the Senior Port Conservator. Trade is carried on throughout the year in this vicinity due to the peculiar softness of the mud bank off it.

**Tides—Currents.**—The current at the anchorage sets S with a velocity up to 2 knots. From October to February, a N set, usually weak, is sometimes experienced.

**Depths—Limitations.**—There is a 387m long pier, with a depth of 1.8m at its head. The pier has been reported to give good radar returns at 10 miles.

**Aspect.**—Alleppey Light is shown from a white, round, masonry tower, about 0.3 mile E of the root of Alleppey Pier. As the town of Alleppey is difficult to distinguish from seaward, it is advisable to make a landfall while it is still dark to ensure identifying the lighthouse.

Manakkodam Light, a white square tower with red bands, lies 15.5 miles N of Alleppey Light.

A tall radio mast lies about 4 miles N of Alleppey Light.



Alleppey Light

**Pilotage.**—Pilotage is not available in this port.

**Signals.**—A signal station and flagstaff, the latter 37m high and prominent, is situated W of Alleppey Light. Day; night communication is carried out by flashing light mounted on a pillar at an elevation of 16m and by flags of the International Code.

**Anchorage.**—During the Northeast Monsoon, vessels of moderate size can obtain anchorage, in about 8m, with Alleppey Light bearing 077°, distant 2 miles, but sounding is essential as the mudbank shifts frequently so that the charted depths are unreliable. During the Southwest Monsoon, the best anchorage is farther offshore, in about 9.1m, with Alleppey Light

bearing 056°, but this anchorage depends upon the position of the mud bank which cannot be determined until after the monsoon.

**Caution.**—The mud bank off Alleppey is so stirred up by the swell as to break up the force of the waves, and cause a large area of smooth water, on the outer part of which vessels anchor.

The dark green mud is fine and oily to the touch. The smoothness of the water is probably caused by the oil which the mud has been found to contain. In calm weather this bank is not perceptible. This mud bank shifts position from year to year, and is sometimes found up to 11 miles S of Alleppey. It is subject to mud volcanoes, which bubble up, bringing dead fish, roots, and trunks of trees to the surface. The mud bank develops toward the end of June after the backwater has become swollen by the rains. The cause of this mud bank is said to be the greater elevation, about 1m, of the water level in the vast backwater over that of the sea. The hydraulic pressure forces out mud and vegetable matter through the several outlets during the Southwest Monsoon, and forms mudbanks along the beaches and in the shallow waters offshore. Evidence has been found of a subterranean connection, through mud, between the backwater and the sea. There is said to be a swell, during the Southwest Monsoon, to N of a position 2 miles N of Alleppey, but to the S the swell is quite deadened by this shifting mud bank.

### Alleppey to Quilon

**3.31** The coast from Alleppey to Quilon, about 40 miles SSE, is sandy, and in general, fringed with palms. From Alleppey to Pirakkad (Porakad), about 9 miles SSE, the coast is more thickly fringed by palms. A mud bank off Pirakkad was reported in to be extending seawards.

There is anchorage off **Kottapalli** (South Vazhapuram) (9°19'N., 76°23'E.), but local knowledge is necessary. This anchorage is sometimes used as a port when Alleppey is closed during the Southwest Monsoon or when its mud bank has moved elsewhere.

A light is shown near **Padiyamkara Tekku** (Pathiyankara) (9°14'N., 76°25'E.) during the Southwest Monsoon. The position of the light is dependent on the movement of the Alleppey mud bank.

At **Kovilhottam** (Koilhottam) (8°59'N., 76°32'E.), there is a water tower; a light is shown from a white, square, masonry tower with two black bands, close NW of the water tower.

Foul ground extends up to about 2 miles offshore from a position on the coast about 1 mile S of Kovilhottam to Tangasseri Point, about 6 miles farther SSE. Vessels approaching this part of the coast at night should not proceed into depths of less than about 27m.

**Nindakara** (8°56'N., 76°33'E.), about 3 miles S of Kovilhottam, is an open roadstead port at the entrance to Ashtamudi Backwaters. At the entrance, two breakwaters shelter a shallow basin, with jetties on its N side where barges load ilmenite sand. The entrance can be identified from seaward by a break in the palms fringing the shore, and by a bridge, which is prominent, spanning the outlet.

The port is seasonal, operating from mid-November to mid-April.

Storm signals are displayed; the Brief System is used. Further information on these storm signals may be found in Pub. 160, Sailing Directions (Planning Guide) South Atlantic Ocean and Indian Ocean under "India—Signals."

Anchorage, for large vessels working cargo, can be obtained, in about 12.8m, WSW of the entrance. Care must be taken to avoid a 4.4m shoal about 1.8 miles SW of the seaward end of the N breakwater. In good weather, anchorage may be taken, in about 9.1m, about 0.8 mile off the water tower at Kovilhottam. Anchorage can be taken about 1.3 miles W of Padiyamkara Tekku Light, in a depth of 8m.

### Quilon (8°53'N., 76°35'E.)

World Port Index No. 49160

**3.32** The port of Quilon is a roadstead lying in the bight close SE of Tangasseri Point. The port, in charge of a Conservator, is closed during the Southwest Monsoon from May 15 to September 14. The N and S limits of the port are defined by lines extending in a 247° direction from two boundary pillars. The N pillar and the S pillar lie about 0.7 mile E and 3 miles ESE, respectively, of Tangasseri Point. The W limit is defined by a line extending 180° from the point.

**Depths—Limitations.**—Tangasseri Reef, consisting of foul ground and shoal water, extends about 1.5 miles W and 1 mile SW of Tangasseri Point. Pallikall Shoal, with a depth of 2m, lies about 0.7 mile ESE of Tangasseri Point, near the SE end of the coastal reef. A black buoy and a red conical buoy are moored about 1 mile and 1.3 miles SE, respectively, of Tangasseri Point.

There is a least depth of 8.9m in the fairway of the channel between the buoys and a depth of 8.6m about 0.2 mile SSE of the black buoy. The red conical buoy marks the NW end of a group of dangers, with a least depth of 6.4m, extending ESE.

Gamaria Rock, with a depth of 7m and marked close N by a black and white conical buoy, lies about 1.3 miles ESE of Tangasseri Point. The above buoys are in position from October to May. There is heavy surf along the steep beach fronting the bight and landing is dangerous except in native boats.

**Aspect.**—**Tangasseri Point Light** (8°53'N., 76°43'E.) is shown from a concrete tower, 41m high, painted in black and white diagonal stripes, on the point. The point has been reported to be a good radar target at 17 miles.

The coast from close E of Tangasseri Point to about 3 miles NNW of it is rocky with groves of palms growing close to the HW line.

**Signals.**—Signals for vessels at anchor are displayed from the flagstaff near the light.

**Anchorage.**—Anchorage off Quilon is exposed to winds from the NW through W to SE, and is little frequented during the Southwest Monsoon, when communication with the shore is only practicable by signal. During the Southwest Monsoon vessels should anchor, in not less than 15m, with Tangasseri Point bearing about 000°, distant over 1 mile.

Between October and May, vessels can anchor in the inner anchorage, between Gamaria Rock and Pallikall Shoal, in about 9.1m, sand, with the red chimney of the tile works bearing 040°, and Tangasseri Light bearing 299°. A large vessel

may find a position about 0.3 mile farther SW more comfortable.

**Directions.**—Vessels approaching Quilon from the N should not approach Tangasseri Point in depths of less than 20m to avoid the foul ground W and SW of the point. When the tile work's prominent red 35m high chimney bears 044°, steer for it on that bearing, which leads between Gamaria Rock and Pallikall Shoal.

## Quilon to Kolachel

**3.33** The coast between Quilon and Trivandrum, about 31 miles SE, is sandy and fringed with palms. About 5 miles SE of Quilon a gap in the fringe of palms fronts a large backwater.

**Anjengo** (8°40'N., 76°46'E.), formerly of importance but now a fishing village, is seldom visited as its anchorage is exposed to the surf at all times. It is not easy to identify, even from a short distance, as the fort and other buildings are low and screened by trees. A light shows at a height of 38m from a circular concrete tower at Anjengo. A church with a white face is visible on the coast NW of the fort; there is a bungalow on a hill about 2 miles N. A red tableland, about 4 miles N of Anjengo, may be of assistance in identifying it.

Anchorage may be taken, in a depth of 21m, sand and shell, about 1 mile offshore abreast Anjengo. The bottom is foul and rocky in depths of less than about 18.3m.

The coast between Anjengo and Trivandrum is safe to approach, and the country inland is hilly and undulating. Patches of red tableland, when seen from beyond about 7 miles, appear as red cliffs above the palms fringing the coast.

**Agastya Malai** (8°37'N., 77°15'E.), 1,869m high and the highest peak of the Western Ghats, lies about 20 miles ENE of Trivandrum. Lower hills lie between the Ghats and the coast. Mukkuni Malai, 252m high, with a round, gradually sloping summit, about 4 miles ESE of Trivandrum, can be seen from a good distance to the S and also from the roadstead at Anjengo.

**3.34 Trivandrum** (8°29'N., 76°57'E.) (World Port Index No. 49170), a large city, lies about 1 mile from the coast. The ruins of a pier, extending to the LW line, are prominent on the coast S of the city; a flagstaff, 29m high, lies near the root of the pier; and a church, about 0.5 mile NE of the pier, is easily identified. A palace, consisting of a white rectangular building with a dull red roof, lies on the coast about 1.3 miles NW of the ruined pier; a white house is conspicuous close NW. Trivandrum Observatory, with two white domes, 61m high, lies on a hill 2 miles N of the city. A radio mast, marked by an obstruction light, is situated about 5 miles NNW of the ruined pier. Good radar returns have been reported from Trivandrum at 12 miles.

Anchorage can be obtained, in a depth of 18.3m, with the flagstaff near the ruined pier bearing 077°, about 0.4 mile. The coast between Trivandrum and Kolachel, about 26 miles SE, is sandy and fringed with coconut trees; it is safe to approach except near Enciam Islet.

**Kovalam Point** (Covelong Point) (8°23'N., 76°58'E.) is a bluff point with a conspicuous red-roofed building on it. Good radar returns have been reported from the point at 19 miles. Vilingjam Light is shown from a white round masonry tower,

36m high, about 0.7 mile SE of the conspicuous building. Vilingjam Point lies about 0.5 mile farther SE.

At Vilingjam, 3 miles NW of Karichal, there is a modern (1980) fishing harbor. The harbor is protected by two breakwaters. A fish factory, lying close to the shore, is conspicuous. Many small fishing craft may be encountered up to 9 miles SW of Vilingjam. A light is shown from a round, white, masonry tower with red bands, 36m high, on a bluff 0.5 mile SE of Kovalam Point.

Anchorage can be taken, in a depth of about 15m, 0.5 mile S of the ice factory.

**Enciam Islet** (8°13'N., 77°11'E.), with a conspicuous church on it, lies about 0.3 mile offshore. Rocks, above and below-water, extend about 0.5 mile SW and NE of the islet. A large conspicuous building, light gray with three towers at its N end, has been reported to lie near the coast about 3 miles NW of Enciam Islet.

**Caution.**—Vessels, when in the vicinity of Enciam Islet at night, should not approach into depths of less than 35m, which are encountered barely 2 miles seaward of the rocks in the vicinity.

## Kolachel (8°10'N., 77°15'E.)

World Port Index No. 49180

**3.35** Kolachel is an open roadstead with anchorage in about 13m in the lee of four small islets. The port is important for the export of ilmenite sand. Vessels of 10,000 15,000 grt have called here. Landing during good weather is fairly easy as the rocks off the village form a practical breakwater to the heavy surf on the coast.

**Depths—Limitations.**—The depths shoal gradually from 21m in the outer anchorage to 10m about 0.2 mile offshore in the area E of the town.

Several rocks, above and below-water, extend up to about 0.3 mile S and SW of Kolachel. Kurusukal, 6m high and surmounted by a white shrine carrying a black cross, lies about 183m S of Kolachel Light. Ahnakal, 3m high, lies close SSE of Kurusukal, with a rock awash close SE of it.

Pulleri, 1m high, the SE danger in the approach to Kolachel, lies about 0.3 mile SSE of Kurusukal. Patna Rock and Constance Rock, with depths of 2m, lie about 183m W and 0.5 mile WNW, respectively, of Pulleri.

**Aspect.**—The 209m summit of the Aunipauri Hills, about 4.5 miles N of Kolachel, is a good landmark in making the port.

On closer approach, the following conspicuous objects can be identified:

1. Kolachel Light, shown from a white platform on a mound close to the foreshore SW of the town.
2. The flagstaff close to the light.
3. The Roman Catholic church about 46m NNW of the light structure.
4. A low warehouse about 0.25 mile E of the light structure.
5. A small house with tiled roof, about 90m farther ESE.
6. A white cross close SE of the house.
7. A white pillar with black bands, from which a light is periodically shown, close ESE of the white cross.

**Signals.**—Storm signals, using the Brief System, are displayed from a flagstaff 0.4 mile E of Kolachel Light. Further information on these storm signals may be found in Pub. 160, Sailing Directions (Planning Guide) South Atlantic Ocean and Indian Ocean under “India—Signals.”

**Anchorage.**—Anchorage can be obtained, in a depth of 21m, with the flagstaff bearing 060°, 1.3 miles. Small vessels can obtain anchorage, in about 13m, sand, with the flagstaff bearing 327°, 0.7 mile. Mooring buoys are moored about 0.3 mile SE of Kolachel Light.

### Kolachel to Cape Comorin

**3.36 Muttam Point** (Muttum Point) (8°07'N., 77°19'E.), 35m high and with steep red cliffs, lies about 5.5 miles SE of Kolachel. The village of Muttamtura lies on the point. A light is shown on the point. A group of palmyra trees on high red ground, about 1 mile N of the light structure, forms a good landmark which can usually be seen above mist which may obscure the lighthouse. Muttam Point has been reported to give a good radar response at 18 miles.

Vessels in the vicinity of Muttam Point, at night, should not approach into depths of less than 45m due to the dangers W and SW of the point.

Crocodile Rock, a dangerous sunken rock about 3 miles SW of Muttam Point Light, is the outermost danger; the sea does not break over it in calm weather. Adunda Rock, 5m high, lies about 1.3 miles SW of the point. It is difficult to identify from seaward, and foul ground extends about 0.2 mile NNW from it. Kota Rock, 6m high and steep-to on its W side, lies about 1.3 miles WNW of Adunda Rock. Vessels should not pass inside of Adunda and Kota Rocks.

The coast extends about 14 miles ESE from Muttam Point to **Cape Comorin** (8°05'N., 77°35'E.). A heavy surf prevails

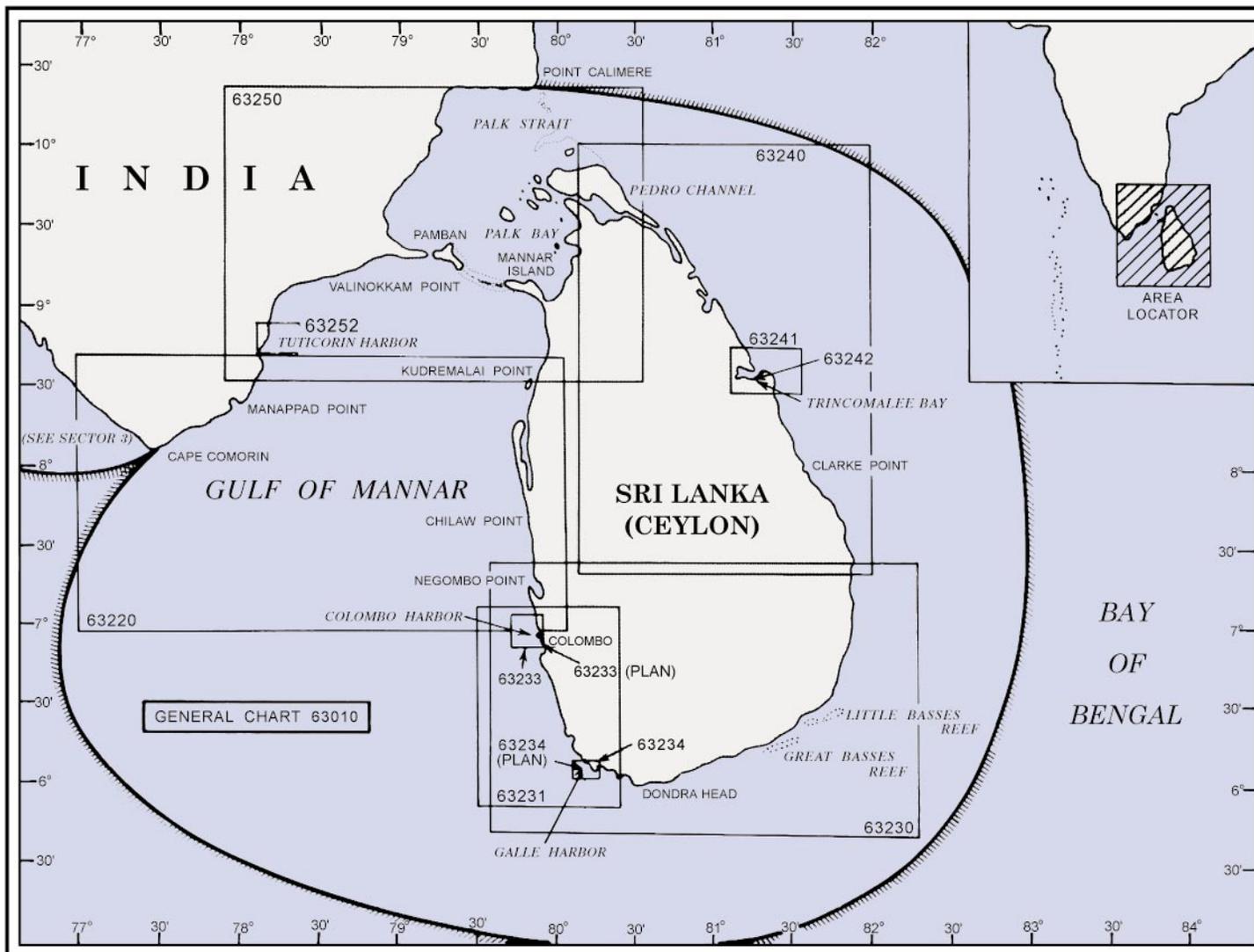


**Muttam Point Light**

along this coast and ship's boats should not attempt to land; the local inhabitants use only catamarans.

Wedge Bank, with a least depth of 55m, lies about 25 miles SW of Cape Comorin.

**Kanyakumari Port** (8°05'N., 77°32'E.) is a minor port used primarily for ferry traffic. Depths in the boat basin and alongside the pier are 2.3m or less.



Additional chart coverage may be found in NGA/DLIS Catalog of Maps, Charts, and Related Products (Unlimited Distribution).

**SECTOR 4 — CHART INFORMATION**

## SECTOR 4

### SRI LANKA (INCLUDING THE GULF OF MANNAR, PALK STRAIT, AND PALK BAY) AND INDIA—EAST COAST—CAPE COMORIN TO POINT CALIMERE

**Plan.**—This sector describes the Gulf of Mannar, Sri Lanka (Ceylon), and then Palk Strait and Bay. The arrangement of the sector is NE from Cape Comorin along the SE coast of India, from there S, E, and N along the coasts of Sri Lanka, followed by the description of Palk Strait and Palk Bay.

The sector includes the roadstead port of Tuticorin on the SE coast of India, and the important ports of Colombo, Galle, and Trincomalee of Sri Lanka.

#### General Remarks

**4.1** The Gulf of Mannar lies between the SE coast of the Indian Peninsula and the W coast of Sri Lanka. Its S boundary lies between Cape Comorin, the S extremity of India, and Point de Galle, the SW point of Sri Lanka. The gulf is bounded N by Adam's Bridge, a chain of islets and rocks extending from the E end of **Pamban Island** (9°11'N., 79°25'E.) to Mannar Island, about 16 miles ESE.

The NW coast of the Gulf of Mannar is, with the exception of the mountains extending N from Cape Comorin, generally low and sandy, with the mountains lying about 55 miles inland. This level plain has an average elevation of about 50m, and gradually rises toward Cape Comorin.

The W coast of Sri Lanka is low and planted with coconut trees. Inland, the foothills of the mountain district abreast Colombo begin about 20 miles from the coast.

**Adam's Peak** (6°48'N., 80°30'E.), 2,243m high and the highest land visible off the W coast of Sri Lanka, is an excellent mark during the Northeast Monsoon, but is seldom visible during the remainder of the year.

**Winds—Weather.**—The coast covered by this sector is, like the rest of Sri Lanka, predominantly in a region of the monsoon. Of the four phases to be considered the Southwest Monsoon is the most important, followed by the Northeast Monsoon. Between these two monsoon are the spring and autumn transitions with their light and unsteady winds.

In the Gulf of Mannar, the Northeast Monsoon is steadiest in January and has much weakened by March. The wind becomes light and variable toward the end of April, and squally showers are common.

The Southwest Monsoon is usually established sometime in May and gains strength in June. From July to the end of September fresh SW winds prevail, with mainly fair weather at the end of the gulf. The wind usually moderates near the head of the gulf at night and in the early morning and freshens again in the afternoon as a result of land and sea breeze effect. In October the wind is more variable and there are heavy squalls with rain in the latter part of the month.

In November, the wind is normally between WNW and NE and the weather is very unsettled with frequent heavy squalls and rain; the Northeast Monsoon usually becomes established by about the end of the month.

**4.2 Hiniduma Kanda** (Haycock) (6°20'N., 80°18'E.), 658m high about 19 miles N of Point de Galle, appears as a large round-topped mountain from all directions; it is conspicuous and rarely obscured.

The central part of the S half of Sri Lanka is mountainous, and on a clear day its outline is visible from W. The higher peaks are generally veiled in haze, particularly during the Southwest Monsoon, but are often visible during the morning hours at other times of the year and, occasionally, all day during the month of March. The mountains terminate somewhat abruptly E at **Namunakuli** (6°57'N., 81°06'E.), 2,033m high.

With the exception of several isolated hills rising abruptly from the E plain, the remainder of the island is practically flat. The whole island is densely covered with tropical forest and jungle with the exception of the open grassland, and in the parts which have been cleared for agriculture, or in the hills where hundreds of square miles have been cleared for the planting of coffee, tea, and rubber.

The entire W and S coasts of Sri Lanka and many parts of the E coast are densely planted with coconut trees. Fresh and salt water lagoons, lying a short distance inland, exist on both the E and W coasts, and notably at the N extremity of the island, but only to a limited extent to the S.

Depths in the approaches to the Gulf of Mannar are deep and clear of dangers, with the 200m curve lying 40 miles SSE of Cape Comorin and about 13.5 miles W of Colombo. Immediately within this curve, W of Colombo, there are depths of less than 55m; this steep edge forms a valuable guide when approaching the land in thick weather or at night.

The coastal bank is fairly level, and off Colombo there are depths of 18.3m to within between 1 and 3.5 miles of the shore.

Depths in the approaches to the S and E coasts of Sri Lanka are deep and clear outside the 200m curve, which lies from 2 to 18 miles offshore until N of Trincomalee Bay, where the 200m curve is charted about 38 miles W of Point Pedro. In Trincomalee Bay depths of over 200m lie within a few hundred meters of the shore.

The 20m curve in general lies between 1 and 3 miles off the S and E coasts of Sri Lanka, except in the vicinity of Great Basses Reef, Little Basses Reef and Egeria Patch, and until N of 9°N, where the 20m curve lies about 12 miles off Point Pedro.

#### India—Cape Comorin to Tuticorin

**4.3 Cape Comorin** (8°05'N., 77°33'E.), the S extremity of India, is low and sandy, with a small white pagoda on its extremity. This pagoda is surrounded by a high wall, above which the top of the pagoda may be seen. A bungalow lies NW of the pagoda. A conspicuous memorial, 37m high, lies close W of the cape. The coast close W of the pagoda is barren and sandy, but is wooded NE of it.

Cape Comorin Light is shown from a square white tower, 34m high, and painted in red bands, about 0.3 mile NW of the cape. A church, 54m high, lies in a village about 0.5 mile N of the cape.

Good radar returns have been reported from Cape Comorin at 23 miles.

Foul ground extends about 0.5 mile S and SE from the cape. An area of foul ground lies 1.5 miles offshore, about 6 miles W of Cape Comorin.

The land rises gradually N of Cape Comorin so that from a distance the cape appears as a sandy promontory. A mountain, 370m high, about 4 miles NW of the cape, appears as a pointed cone except from E or S. A range, about 9 miles farther N, with heights up to 1,041m, resembles a camel's hump.

Mahendragiri, 1,654m high, lies about 19 miles N of the cape. These high peaks of the Western Ghats may be mistaken at a great distance for the 370m mountain nearer to the cape.

**Tides—Currents.**—The tidal currents off Cape Comorin set E during the flood and W during the ebb, but their direction and strength are much affected by the ocean currents.

The coast between Cape Comorin and Manappad Point, about 35.5 miles ENE, is somewhat higher than the remainder of the NW coast of the Gulf of Mannar, with undulating sand hills up to 60m high. The background consists of reddish soil and rises gradually to the foot of the Southern Ghats a few miles inland. Many villages and whitewashed churches lie along this coast, but landing in a ship's boat is always difficult and dangerous.

An obelisk, 8m high, lies on the coast about 2 miles N of Cape Comorin, and serves to mark the position of a stranded wreck about 0.5 mile ESE.

**Caution.**—When approaching Cape Comorin from the NW during the Northeast Monsoon, a vessel sheltered by the coast as far as Muttam Point, about 14 miles W of the cape, may suddenly pass from a calm into the strength of the monsoon, even if already well offshore.

A dangerous obstruction was reported (2002) to lie about 8 miles WSW of Comorin Point.

**4.4 East Cape** (8°12'N., 77°47'E.) is prominent, and the coastal reef, with depths of 5.5m, extends about 1 mile offshore near the cape.

**Anchorage.**—Shelter from W winds can be found in the bight between Cape Comorin and East Cape, but during the Southwest Monsoon landing by ship's boats should not be attempted as swells roll into the bight.

Anchorage for small vessels can be obtained, in 7.3m, in the bight N of East Cape, partially protected from W winds and swell by the coast SW.

**Manappad Point** (8°22'N., 78°04'E.) is a high sandy promontory with a rock base. A light is shown from a white, round concrete tower with red diagonal stripes. The village of Manappad lies 0.8 mile W of the point.

Manappad Outer Shoal, with a least depth of 7.3m, lies about 8 miles SE of Manappad Point. A 13.4m shoal, reported in 1976, lies about 6 miles farther E. Other shoals lie WNW and WSW. Vessels should avoid passing through this area, and in thick weather should not get into depths less than 35m.

**Anchorage.**—Good anchorage can be obtained during the Northeast Monsoon, in 11m, about 1 mile offshore between Manappad Point and the town of **Periya Talai**, about 6 miles WSW of the point. From June through August, when the Southwest Monsoon is strong, heavy seas roll in on this part of the coast, and vessels should then anchor off Alantalai or Punnakayal.

The coast between Manappad Point and **Tuticorin** (8°28'N., 78°10'E.) is low, sandy, and fringed with coconut trees.

Between Manappad Point and the village of Alantalai (Alendal), about 5.5 miles NNE, an area of foul rocky ground extends about 2.8 miles offshore. There are heavy breakers over this area during the Northeast Monsoon; these breakers extend 1 mile SE of Manappad Point.

Alendal Shoals, with depths of 3.7m, extend to about 4 miles ESE of Alantalai.

**Anchorage.**—Anchorage by small vessels can be taken off Alantalai, in 7.3m, mud, with the church bearing 292°, distant 1.8 miles. Protection from SW winds is afforded by the coastal reef to the S.

**4.5 Tiruchendur Point** (8°30'N., 78°08'E.) is a low, rocky bluff headland, with a prominent dark-colored temple, 54m high, at its extremity. This pagoda is a useful mark and can be seen for a distance of about 15 miles. A conspicuous chimney, 28m high, painted in red and white bands and emitting a flame, lies about 5 miles NNW of the point. In 1976, a depth of 14m was reported 9.3 miles ESE of the point.

From Tiruchendur Point to abreast the fishing village of Punnaikkayal, about 8 miles N, the coastal reef extends about 2.3 miles offshore. In heavy weather, the sea breaks on this reef in depths of 4.6 to 5.5m; usually it breaks farther inshore in depths of 3.7m.

Punnaikkayal, about 1 mile inland, can be identified by the ruins of a church and by a group of palmyra trees on the beach. A 4.6m patch lies about 3 miles E of the village.

**Anchorage.**—Anchorage for small vessels, in 7.3m, can be found off Punnaikkayal, about 1.5 miles offshore, with the clump of trees bearing 258°. The coastal reef to the S provides shelter from S winds, but local knowledge is necessary.

## **Tuticorin (8°48'N., 78°10'E.)**

World Port Index No. 49320

**4.6** Tuticorin, also known as Tuttukuddi, is the largest commercial town on the W side of the Gulf of Mannar. The port is an open roadstead, well-protected by the land to the W from the Southwest Monsoon; it is available in all seasons.

The all-weather harbor of New Tuticorin, about 0.5 mile S of Tuticorin, handles the majority of cargo for the port. The port is protected on its N side by North Breakwater, which is 2.3 miles long, and on its S side by South Breakwater and Eastern Breakwater. The rocky sea bottom, making dredging closer inshore impossible, necessitates these long breakwaters. Natural depths of 11m become available only at a distance of approximately 2 miles from shore. The entrance to the harbor lies 3 miles SE of Pandyan Tivu Light.



**Tuticorin Light**

Tuticorin also has a passenger terminal for ferry services between the port and Colombo.

**Port Authority of Tuticorin**

<http://www.tuticorinport.com>

**Tides—Currents.**—The tidal rise at Tuticorin is 1m at MHWS and 0.7m at near HWN.

The currents along the coast, outside the islands near Tuticorin, generally set with the wind, varying in strength from 1 to 2 knots. They are weak and variable at the change of the monsoons. When there is a lull in the monsoon, there is a tendency for current to set into, instead of across, the Gulf of Mannar.

The tidal currents at Tuticorin set in a N direction with the flood tide and in a S direction with the ebb.

**Depths—Limitations.**—The approach channel is 2400m in length, 183m wide, and a depth of 12.6m.

Coal Jetty I and II on North Breakwater accommodates vessels up to 50,000 dwt, with a maximum length of 235m and a maximum draft of 10.7m. The oil jetty, situated seaward of the coal jetty, can accommodate vessels with a maximum length of 228m and a maximum draft of 10.7m.

There are four berths on the South Wharf, which lies on the inner side of Eastern Breakwater. Berth information is given in the accompanying table.

South Wharf—Berth Information		
Berth No.	Depth	Remarks
1	9.3m	General cargo. Maximum vessel length of 168m.

South Wharf—Berth Information		
Berth No.	Depth	Remarks
2	9.3m	Cement. Maximum vessel length of 168m.
3	10.7m	Salt. Maximum vessel length of 192m.
4	10.7m	Fertilizer. Maximum vessel length of 192m.

There are four berths situated on South Breakwater. Berth 5 and Berth 6 handle bulk cargo vessels up to 168m in length and 9.3m draft. Berth 7 and Berth 8, which handle container and dry bulk vessels up to 35,000 dwt with a maximum length of 275m in length, have an alongside depth of 10.7m.

The turning basin, which is just inside the breakwaters has a depth of 11.9m and is 500m in diameter.

A drying reef extends up to 0.5 mile E of Pandyan Tivu. Orripar, a rock shoal with a least depth of 0.9m, lies about 0.3 mile N of Pandyan Tivu.

Kariapar, a rocky pinnacle with a depth of 1.5m, lies about 0.8 mile NE of the NE extremity of Pandyan Tivu. Rocky pinnacles, each with a depth of 1.5m, lie about 0.2 mile E and 0.5 mile ENE, respectively, of Kariapar.

Van Tivu, about 2.8 miles NNE of Pandyan Tivu, lies on a reef which extends about 0.5 mile NE and 0.4 mile SE from it. A beacon, 10m high, lies on the S extremity of Van Tivu.

A boat channel, about 137m wide, leads to the piers at Tuticorin from a position about 1.8 miles NE of the N end of Pandyan Tivu. In 1974, there was a least depth of 3.7m in the channel. The least depth alongside the piers and wharves at Tuticorin is 3.7m.

**Aspect.**—**Vallanad** (8°43'N., 77°54'E.), a conspicuous red hill, 314m high, about 17 miles WSW of Tuticorin, may be seen before Pandyan Tivu Light is visible.

Pandyan Tivu Light is shown from the N end of Pandyan Tivu; a racon is situated at the light.

A beacon, consisting of a white masonry obelisk, 10m high, lies near the root of the S breakwater. Two water towers, with heights of 29 and 22m, are conspicuous about 0.3 mile and 1.3 miles W, respectively, of the above light.

Range lights, in line bearing 312°, lead into New Tuticorin; the front light is shown from a metal framework tower lying about midway along the N breakwater while the rear light is shown from a similar tower 1 mile S of Pandyan Tivu Light. A light is shown from the head of the N breakwater. Fairway Lighted Buoy is moored 1 mile SE of the harbor entrance. The channel leading NW to the entrance of the new harbor is marked by lighted buoys.

The following objects in Tuticorin are conspicuous and easily identified:

1. The yellow spire of Sacred Heart Cathedral, about 0.2 mile NW of the pierhead light at Tuticorin.
2. A chimney, 45m high, and a water tower, about 0.2 mile ENE of the cathedral.
3. The gray spire of the Roman Catholic Church, about 0.3 mile S of the cathedral.

**Pilotage.**—Pilotage for Tuticorin and New Tuticorin is compulsory; it is available 24 hours for all vessels except tankers, when it is available only from 0600 to 1800. Pilots boards .5 miles SE of Fairway Lighted Buoy and 1.5 miles ESE of the Fairway Lighted Buoy for vessels over 9m in draft.

Pilots should be requested through the ship's agent 72 hours in advance. The vessel's ETA should also be sent 72 hours in advance and confirmed or amended 6 hours in advance.

**Signals.**—A signal station, with a flagstaff 29m high, lies on the N end of Pandiyan Tivu. This station, manned day and night, is connected to the mainland by telephone. Communication is by International Code of Signals.

Storm signals are displayed from the signal station; the General System is used. Further information on these storm signals may be found in Pub. 160, Sailing Directions (Planning Guide) South Atlantic Ocean and Indian Ocean under "India—Signals."

**Anchorage.**—There are six recommended anchorages, with positions from East Breakwater Head Light, as follows:

1. Vessels less than 100m in length, 1 mile ENE, in depths up to 9.9m.
2. Vessels over 100m in length, 2 miles E, in depths up to 14.2m.
3. Tankers can anchor, in depths up to 15.9m, 3.5 miles ENE.
4. Deep water anchorage is 3.25 miles ENE, with depths from 14.2 to 15.5m.
5. The explosive anchorage is 0.75 mile E, in depths of 10m.
6. General anchorage can be taken, in depths up to 12m, 2.25 miles SE.

During the Northeast Monsoon, vessels should have a good scope of anchor chain and a second anchor always ready as there are many dangers to leeward.

During the Southwest Monsoon, from about mid-May to mid-August, the wind, though sometimes violent, is invariably offshore, and the sea is calm or slight.

**Caution.**—Vessels approaching the anchorage should make sure of their position, as the coast is low and the shoals extend some distance from it. Vessels making the anchorage at night should approach to seaward of all off-lying dangers.

Several wrecks and foul ground lie between 1.5 and 2.3 miles E and ESE of Pandiyan Tivu Light.

### India—Tuticorin to Valinokkam Point

**4.7** The town of **Pattanamurudur** (8°55'N., 78°11'E.), with some large trees visible up to 10 miles offshore, lies at the head of this bight, about 7 miles N of Tuticorin. The bight is filled by a flat, with depths of less than 5.5m, extending up to about 4.5 miles offshore. Kariya Shuli and Vilangu Shuli, two low-lying sandy islets, lie on this flat.

Between the Vaippar River and Vembar, about 7 miles NE, shoal water, with depths under 5.5m, extends up to 3.5 miles offshore. Two shoals, with least depths of 4.6 and 2.7m, lie 4.5 miles SE and 4 miles S, respectively, of Vembar.

Between Vembar and Valinokkam Point, about 18 miles ENE, the coast is low, sandy, and covered with palm trees. Detached shallow flats, on some of which are islands, lie from 1 to 5 miles offshore along this coast.

**Caution.**—Vessels, other than small coasting vessels, should not approach the coast between Tuticorin and Valinokkam Point, about 37 miles NE, closer than 6 or 7 miles due to the many off-lying shoals. The coastline forms a bight between Tuticorin and the entrance of the Vaippar River, about 13 miles NNE.

### India—Valinokkam Point to Pamban Pass

**4.8** The coast between Valinokkam Point and Ramen Point, about 32 miles ENE, is fronted by a chain of islands and shoals extending up to 6 miles offshore. Depths outside this chain of islands and shoals are regular, but in places overfalls occur.

An anchorage is located 2.5 miles NE of Valinokkam Point. A dangerous rock lies about 1 mile WSW of the anchorage.

Large vessels should not navigate in depths less than 22m off this stretch of coast as the area is imperfectly surveyed and several relatively shoal patches are charted. They should not sight any of the islands of which the chain is composed.

Kilakarrai Passage, the shallow passage between the chain and the coast, can only be used by small vessels; local knowledge is necessary due to the numerous shoals, with depths of less than 1.8m, and the narrow, undefined channels between them. The passage affords a smooth passage for small coastal vessels for half the distance between Tuticorin and Pamban.

**Valinokkam Point** (9°09'N., 78°39'E.) is marked by a beacon, 6m high. A submerged rock is marked by a beacon about 1.5 miles NE. These beacons are useful marks for vessels making the W entrance of Kilakarrai Passage, between Valinokkam Point and Anaipar Tivu (Anapipar Tivu), about 2 miles E.

The passage then leads S of a submerged rock, marked by a beacon, about 4 miles ENE of Valinokkam Point, and then to the anchorage off Kilakarrai. A light is shown from a white hexagonal concrete tower with red bands, 30m high, at Kilakarrai.

**Pilotage.**—Pilots for Kilakarrai Passage and for Pamban Pass are stationed at **Kilakarrai** (9°14'N., 78°47'E.).

**Anchorage.**—Anchorage can be taken off Kilakarrai by small vessels; local knowledge is necessary. Anchorage, somewhat sheltered from the Southwest Monsoon, can also be taken off **Muttupetai Betel** (9°16'N., 78°55'E.).

### The Gulf of Mannar—North Side

**4.9** The N side of the Gulf of Mannar is formed by Pamban Island and Adam's Bridge, both described in paragraph 4.11, and Mannar Island, described in paragraph 4.12.

**Pamban Pass** (9°17'N., 79°12'E.) is the navigable channel, partly artificial, through the banks which occupy the space between the W end of Pamban Island and the mainland. It is of great advantage to coastal craft trading between ports on the W coast of India and ports of the Bay of Bengal.

A rocky barrier extends in a straight line between the W coast of Pamban Island and Ramen Point, about 1.3 miles W. Pamban Viaduct, which carries the South India Railway is built on this barrier.

A cutting, 61m wide, through the barrier and crossed by a rolling lift-bridge, lies about 0.2 mile W of Pamban Island. The bridge is under the control of the Port Conservator at Pamban,

who requires 30 minutes notice to open the bridge; in an emergency it can be opened immediately.

On the W side of Pamban Pass the barrier is named The Great Dam. It consists of large masses of flat-surfaced rocks, which were formerly portions of a causeway that extended from Pamban Island to the mainland. The N face of the dam is steep-to, and at LW presents a wall-like appearance, but the boulders are sufficiently separated to allow a free passage to the water.

Ramen Point is the E extremity of a narrow tongue of land projecting E from the coast. A temple in ruins lies about 183m W of the point; a coconut plantation lies about 183m farther W.

**Depths—Limitations.**—In 1979, it was reported that the maximum draft for vessels using the pass was limited to 2.1m.

The pass is used by some coastal vessels of from 200 to 800 grt and about 61m in length; these are as large as can safely transit the channel.

**Tides—Currents.**—The tidal rise at Pamban Pass is 0.7m at MHWS, and 0.5m at MHWN.

The pass is well-marked with beacons, buoys, and is easy to navigate.

Tidal currents are only noticeable at the change of the monsoon in March, April, and October. At other times they are masked by the S current during the Northeast Monsoon, and by the N current during the Southwest Monsoon. These currents often attain velocities of 6 knots, making passage of the pass difficult.

**Pilotage.**—Pilotage is compulsory for merchant vessels. Licensed pilots at Pamban are under the orders of the Pamban Port Conservator. Pilots are stationed at Kundagal (Kundugal) Point (9°15'N., 79°13'E.), the SW extremity of Pamban Island, Mundel Point at the W end of Pamban Island, and on the N side of Pamban Pass, to look out for vessels approaching Pamban. There are no official signals for vessels needing a pilot, but local craft usually display a red or white flag.

**Anchorage.**—Anchorage can be taken 1 mile NW of Pamban Island Light, in a depth of about 7m, mud, good hold-in ground, with Pamban Island Light bearing between 122° and 134°.

**Signals.**—Flag P of the International Code of Signals, displayed from the port offices flagstaff at Pamban, indicates the bridge is fully open. This flag displayed from the N yardarm indicates that vessels from N may pass through, and from the S yardarm indicates that vessels from the S have priority.

## Pamban Pass—Approaches

**4.10 Mansfield Patch** (9°10'N., 79°18'E.), with a least depth of 5.8m, about 7 miles SE of Kundagal Point, is the N and shallowest of a group of detached patches. Batt Patch, with a least depth of 4.9m, lies about 2.8 miles WNW of Mansfield Patch; the sea breaks on Batt Patch in a fresh breeze.

Manauli Reef, with its E edge about 4 miles SW of Kundagal Point, consists of coral and dries in places. The E end of the reef is marked by beacons. Manauli Tivu (Manilla Tivu), with a conspicuous white beacon close E, lies about 2 miles from the E end of the Reef.

Pulli Shoal, with a least depth of 1.2m and over which the sea breaks, lies about 3 miles E of Manauli Tivu. Puma

Channel, leading to Pamban Pass, lies between Manauli Reef and Pulli Shoal.

Pulli Reef, N of Pulli Shoal, has three islands on it. Pumurichan, along the W edge, has a conspicuous beacon, 10m high, on its SW side; Pumurichan Tivu, farther SE; and Kurisadi Tivu (Kursadi Tivu). The extensive coral reef dries in places; its N edge is well defined at low water, but its S edge is indented and the sea breaks on it. Beacons mark the S and NW sides of Pulli Reef.

Kurisadi Beacon No. 2, 7m high, lies in the middle of Kurisadi Tivu. Kurisadi Beacon No. 1, 4.8m high, lies about 0.2 mile NW of Kurisadi Beacon No. 2, on the N edge of Pulli Reef.

Shingle Island, low and covered with scrub, lies nearly 1 mile ESE of Kurisadi Tivu. The island lies on Kallaru Reef, a coral reef, on the SW edge of which the sea breaks heavily. A conspicuous triangular white beacon, 9.5m high with a black band, lies on the E end of Shingle Island.

Kundagal Channel leads into Kundagal Gut, between Kundagal Point and the N side of Kurisadi Tivu, then NW into Sand Bank Channel, then NNE through The Basin to Pamban Pass.

The tidal current sets W through Kundagal Channel on the flood, and then W along the N edge of Pulli Reef, where it joins with the flood current through Puma Channel. The combined currents then set N, but they are weak unless influenced by strong S winds.

**Anchorage.**—There is anchorage, in 5.8 to 7m, in Kundagal Channel.

**Directions.**—Vessels approaching Pamban Pass from the S should use great care as the off-lying islands are low, and there are no hills or conspicuous landmarks. During the Southwest Monsoon, haze frequently overhangs and obscures the islands. Vessels over 4.6m draft should not approach within depths of 14.6m until their position is accurately determined.

The first landmarks identifiable from seaward are **Rameswaram Temple** (9°17'N., 79°19'E.), 50m high, appearing as a large square tower viewed from NE or SW and as a narrow pinnacle from SE or NW; Gandhamana Temple, 44m high, about 1 mile NW, lying in a large enclosure, but less conspicuous; Pamban Light, a white tower, on a sandhill on the NW point of Pamban Island; a red square water tower on a framework structure, 18m high, about 5 miles W of Pamban Light, and conspicuous when bearing less than 050°; and the beacon close E of Manauli Tivu, Pumurichan, and Shingle Island.

Vessels approaching Kundagal Channel, which is the better and more direct approach, should, after having passed the outlying dangers, steer to pass about 0.4 mile E of Shingle Island, taking care to avoid the shoals E. When the beacon about 0.3 mile NE of Kundagal Point bears 286°, steer for Kundagal Gut, passing S of Kundagal Point. Continue W and bring Kurisadi Beacon No. 1 and Kurisadi Beacon No. 2 in line, astern, bearing 130°; this range leads through Sand Bank Channel passing close SW both of a buoy, moored 0.6 mile W of Kundagal Point, and a buoy moored 0.5 mile further WNW. Keep close to beacons marking the SW side of the latter channel, and SW of Elbow Buoy, a red conical buoy at the junction of Sand Bank Channel and The Basin, a narrow channel leading NNE, with depths of 4.6 to 6.7m in the fairway, which is marked by

beacons. A NNE course through The Basin leads to the S end of Pamban Pass.

A buoy moored 0.5 mile SW of Elbow Buoy marks a shoal ground of less than 1m on the W side of the deeper water at the intersection of Sand Bank Channel and The Basin.

Puma Channel, the SW approach, only available to those with local knowledge, demands navigation by eye. Manauli Reef, on the W side, is well-marked on its S and E sides by breaking seas.

**Mandapam South Beacon** (9°17'N., 79°09'E.), in line bearing 338° with a beacon on a low hill NNW, leads into Puma Channel. When the beacon on the SW side of Pumurichan bears 060°, vessels should steer NE through Puma East Channel; then steer along the N edge of Pulli Reef and into the channel N of Pulli Reef, marked by beacons; and finally steering into Sand Bank Channel and following the directions given above.

The vessels bound for the drydock at Mandapam, about 0.5 mile E of Mandapam South Beacon, should pass through Puma Channel as described and, leaving Cana Paru Reef about 0.3 mile to port, continue on the 338° range line until 1.3 miles from Mandapam South Beacon; local knowledge is necessary from this point.

The drydock at Mandapam is 81m long and 15m wide, with the sill 2m below chart datum.

## Pamban Island

**4.11 Pamban Island** (9°17'N., 79°18'E.) is low, sandy, and well-planted with coconut trees towards its W end, where a broad peninsula extends about 3 miles N.

**Lands End** (9°10'N., 79°26'E.) is the SE extremity of Pamban Island; a small but conspicuous building lies near the point.

Dhanushkodi, about 2 miles NW of Lands End, is a railroad terminal; the red-roofed railway buildings are conspicuous.

Chuttram, close SE of Dhanushkodi, lies within a clump of palm trees about 24m high and is easily identified.

Mukkundaraya Chattram, a bushy dune about 2.5 miles farther NW, is easily identified.

Adam's Bridge is a narrow ridge of sand and rocks, mostly dry, which connects Pamban Island with Mannar Island, about 16 miles ESE. It is composed mostly of shifting sandbanks, with intricate shallow channels between them.

Shoal water extends up to 5 miles from the ridge, with depths under 11m. Farther seaward, depths increase sharply to over 183m about 12 miles SW of Adam's Bridge.

## Mannar Island

**4.12 Mannar Island** (9°05'N., 79°50'E.) is separated from Sri Lanka by a boat channel which is crossed by a conspicuous railway bridge and a road bridge. The island is wooded and has low sand hills on its SW side for a distance of about 5 miles from its SE end. At the W end, there are coconut and other palms near the villages.

A disused structure, consisting of a conspicuous black steel framework tower, 28m high, lies on the W end of Mannar Island.

**Tides—Currents.**—During the Southwest Monsoon, a strong current sets N over Adam's Bridge, but abates towards the W and towards the Indian coast. A confused sea is generally encountered near Mannar Island.

**Anchorage.**—Anchorage can be obtained, in 5.5m, mud, with the railway bridge between Mannar Island and Sri Lanka bearing 099°, about 5 miles.

During the Northeast Monsoon, good anchorage can be obtained by vessels drawing not more than 4.3m, about 1.5 miles off the W part of the island.

## Sri Lanka—West Coast—Mannar Island to Kudremalai Point

**4.13 Doric Beacon** (8°47'N., 79°56'E.), a white masonry tower about 7.5 miles N of the mouth of the Kal Aru, is conspicuous seaward in favorable light. About 1.5 miles N of the tower is the S of several mouths of the Aruvi Aru. A white obelisk lies on the N entrance point of the Kal Aru.

In the bight between the mouth of the Kal Aru and Adam's Bridge, about 30 miles NW, are pearl banks extending up to 10 miles offshore and with depths of less than 11m.

Numerous rocks nearly awash lie about 1 to 5 miles S of Doric Beacon.

Silavatturai Reef lies about 4 miles SW of Doric Beacon. Arripu Reef extends from close NW of the above reef to about 4 miles farther NW. Both reefs have depths of less than 1.8m. A beacon marks the N end of Arippu Reef. Vankalai Reef, about 5 miles NW of Arippu Reef, dries at its SE end; between the two reefs there is a 0.9m patch.

Shoal water, with depths of less than 11m, extends about 12 miles offshore between the mouth of the Kal Aru and **Moderegum Point** (8°36'N., 79°55'E.).

Cheval Bank, with a least depth of 4.6m, lies about 11 miles W of the mouth of the Kal Aru. A submerged obstruction, dangerous to navigation, was reported (1958) on the bank.

A beacon, consisting of a white obelisk, 29m high, lies about 0.5 mile S of Moderegum Point, and is visible up to 15 miles seaward when the light is favorable.

**Anchorage.**—Small vessels can anchor, in about 6.1m, from 2 to 3 miles W of the above beacon. Vessels should approach this anchorage passing N of Cheval Bank.

**Caution.**—It is not advisable to close the coast of Sri Lanka when N of **Karaitivu** (8°32'N., 79°47'E.), because of the extensive shoal banks lying off the coast.

Great caution should be exercised if obliged to navigate in depths of less than 5.5m for a distance of about 10 miles N of Moderegum Point due to several uncharted coral heads with depths of less than 0.6m in the area.

## Sri Lanka—West Coast—Kudremalai Point to Negombo Point

**4.14 Kudremalai Point** (8°32'N., 79°52'E.) is steep and rocky, with three long sand mounds S of it. A white masonry tower, 68.5m high, known as Kudremalai Tower, lies on the highest of these mounds. A beacon, 38m high, consisting of a black tripod with a diamond-shaped topmark, stands on the point.

Karaitivu (Kara Tivu), long and narrow, lies with its N end about 5.5 miles W of Kudremalai Point; the island is breached about 2 miles from its S end. The area between Karaitivu and Cheval Bank has not been completely examined; further shoaling has been reported.

Portugal Bay, E of Karaitivu, is shallow and offers anchorage to small vessels, in a depth of 5.5m, but local knowledge is necessary.

**Anchorage.**—Vessels with a draft not exceeding 4.3m can obtain good anchorage, in a charted depth of about 6.1m, about 2 miles W of Kudremalai Tower.

Dutch Bay, entered S of Karaitivu, is shallow.

Bar Reef, which dries, lies about 3 miles W of the entrance to Dutch Bay.

**4.15** The coast between Dutch Bay and Chilaw Point, about 45 miles S, is formed by the seaward side of a narrow peninsula.

A white tower, known as Aruakalu Tower, lies on the summit of a 79m hill about 4.5 miles NE of **Kalpitya** (8°14'N., 79°46'E.).

A shallow flat of rock and sand extends about 7 miles SW from the coast abreast **Mampuri** (7°59'N., 79°45'E.). A 3.7m shoal lies on this flat about 4.3 miles WSW of Mampuri and about 3.5 miles offshore; this shoal is particularly dangerous as depths over 183m are about 1.5 miles W of it.

Vessels passing the peninsula should keep 7 miles offshore and in depths over 37m to avoid the above-mentioned shoal.

A reef, above and below-water, lies about 3.5 miles N of Chilaw Point and about 0.5 mile offshore.

**Chilaw Point** (7°36'N., 79°48'E.) can be identified by a sand hill and a round hummock nearby. A red can buoy is moored about 3.5 miles WSW of the point.

**Anchorage.**—Anchorage for small vessels can be obtained, in 11m, about 1.8 miles NW of Chilaw Point. Vessels making this anchorage from the S should keep 4 or 5 miles offshore and close to the land near the point.

The coast from Chilaw Point to Negombo Point, about 24 miles S, is almost featureless except for a break in its fringe of coconut trees, about 4 miles N of Negombo Point, marking the entrance to Maha Oya.

## Sri Lanka—West Coast—Negombo Point to Colombo

**4.16 Negombo Point** (7°12'N., 79°48'E.) has been reported to give good radar returns at 22 miles. The twin towers of a church in Negombo, E of the point, are conspicuous. A church with a red roof and low twin towers, together with a school house about 183m NNW, is conspicuous about 5.5 miles S of the point.

A narrow reef, with a least charted depth of 2.7m, lies with its S end about 2 miles NNW of Negombo Point; a dangerous wreck lies at the SE of the reef.

**Anchorage.**—Anchorage can be taken about 1 mile W of this reef, except during the Southwest Monsoon. Small vessels, with local knowledge, can anchor E of the reef, in about 6.1m, about 0.5 mile offshore.

A 14.2m shoal extends over 3 miles N from a position about 8.5 miles WSW of Negombo Point.

**Mutwal Point** (6°58'N., 79°51'E.), at the N end of Colombo Harbor, lies about 14.5 miles S of Negombo Point. A trawler harbor, with a fishing harbor close E, lies NE of the point; a breakwater shelters each harbor from W.

Kalapu Gala, a narrow rocky reef, extends about 4 miles N from about 0.3 mile ENE of Mutwal Point; the reef lies parallel to the coast and about 0.5 mile offshore, with several rocky heads with depths of less than 1.8m. The sea breaks over the reef during the Southwest Monsoon, and even in calm weather rollers occur.

The entrance to the Kelani Ganga lies about 0.8 mile NE of Mutwal Point. The coast, for about 5 miles N of the river entrance, is sandy and thickly fringed with coconut trees.

A beacon, 8m high and painted white, lies about 2.3 miles N of the entrance to the Kelani Ganga.

## Colombo (6°57'N., 79°51'E.)

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**4.17** Colombo, the principal port of Sri Lanka, lies between Galbokka Point (6°56'N., 79°50'E.) and Mutwal Point, about 2 miles NNE. Galbokka Point is a black rocky knoll connected by a short sandy isthmus to the land at the S end of Colombo Harbor.

The harbor is artificially formed by three breakwaters, as follows:

1. Southwest Breakwater—extending NNE from the shore at the S end of the harbor.
2. Northwest Breakwater—a detached breakwater.
3. Northeast Breakwater—extending W from Mutwal Point.

There is a foul area on the inner side of the Northwest Breakwater. The S end of the harbor is connected with Colom-bo Lake by a canal with locks; the canal is dredged to a depth of 3m.

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**Winds—Weather.**—The Southwest Monsoon brings heavy rain and winds which occasionally reach gale force. During this time a moderate swell runs in the harbor, making cargo handling difficult.

**Tides—Currents.**—The tidal rise at Colombo is 0.7m at MHWS, and 0.5m at MHWN.

The current off Colombo is variable; its velocity seldom exceeds 0.5 knot. Near shoal water the current sets N at a velocity of 1.5 knots during the Northeast Monsoon, resulting in an E set off the W entrance; this has also been reported during the Southwest Monsoon.

**Depths—Limitations.**—The W entrance, between Southwest Breakwater and Northwest Breakwater, has a dredged depth of 13m; the approach, marked by lighted buoys and a directional light, has been dredged to a depth of 15m. There is a disturbed swell across this entrance during the Southwest Monsoon.

The N entrance, between Northwest Breakwater and Northeast Breakwater, has a limiting depth of 10.5m in its ap-

proaches. An 8.5m rock lies close outside this entrance, about 0.1 mile N of the head of Northeast Breakwater.

Dredging is carried out periodically to maintain the dredged depths.

A scend of up to 1m can be experienced in the harbor.

Vessels may enter and leave the harbor by whichever entrance is more convenient, subject to the depth limitation for the N entrance.

Vessels are not permitted to navigate the harbor, or to lie at moorings with less than 0.6m under their bottoms, except by special permission of the port authorities.

Queen Elizabeth Quay is on the E side of the SW breakwater. Berth No. 5 and Berth No. 6, at the N end of the quay, are used by container vessels with a maximum draft of 9.7m (1984). Berth No. 1 through Berth No. 4, along the central part of the quay, are used by ocean-going vessels with drafts of 9.1 to 10.1m (1984). Berths for small vessels are located at the S end of the quay.

Delft Pier (Bandaranaike Pier), in the S part of the harbor, berths vessels on either side and across the head.

Prince Vijaya Pier, on the S side of the NE breakwater, has depths of 7.5 to 9.5m alongside.

The area between North Pier and South Pier is known as the Oil Dock. The N side of South Pier, 270m long with a depth of 11m alongside and equipped with an oil pipeline, can accommodate a tanker with a maximum length of 228m and a maximum draft of 9.5m.

Guide Pier, on the S side of South Pier, can accommodate two vessels and has 7.5 to 9.5m alongside. The entrance to the drydocks is located at the end of this pier and vessels berthed to it have to be moved clear when vessels are entering or leaving the drydocks. Coconut oil can be loaded at Guide Pier.

To the S of the drydock entrance lies a range of wooden coaling jetties for lighters, with depths of about 4.6m alongside. Farther S are several more jetties including Block Jetty, on which there is a flagstaff.

Jaye Container Terminal is situated on the E side of the harbor opposite the W entrance. It has 1,292m of quayage with alongside depths between 12 and 14m and is equipped with modern container handling facilities, including four 35.5 ton gantry cranes.

An oil jetty, 90m in length and dredged to 11m, is situated on the E side of the Northwest Breakwater.

**Aspect.**—The land in the vicinity of Colombo is low and will not be seen from any great distance, but in exceptionally clear weather, Adam's Peak and the other mountains of Sri Lanka may be visible from a great distance.

Approaching from the W, the buildings in that part of the town, at the S end of the harbor, and known as The Fort, will first be seen at a distance of about 12 miles. Hotel Taprobane, with three small round turrets; the Clock Tower, which is conspicuous; and the offices of the Bank of Ceylon, are among the several prominent buildings in The Fort.

Drydock No. 1 has a length of 213m, a breadth at the entrance of 26m, a depth over sill at MHWS 9.75m, and a capacity of 30,000 dwt. Drydock No. 2 has a length of 107m, a breadth at the entrance of 16.4m, and a depth on sill at MHWS 6.7m. Drydock No. 3 has a length of 122m, a breadth at entrance of 16m, and a depth on sill at MHWS 5.5m. Drydock No. 4 is the largest of the docks, with a length of 263m, a width

of 43m, and a depth over the sill at MHWS of 9.3m. It has the capacity to accommodate vessels up to 100,000 dwt.

**Colombo Light** (6°56'N., 79°50'E.), on the W side of The Fort, about 91m within Galbokka Point, is a circular stone tower, 15m high, painted in black and white checkers.

Good radar returns have been reported from Colombo Light and Colombo breakwaters at 20 and 18 miles, respectively. A conspicuous white monument on four yellow curved legs lies at an elevation of 82m about 0.3 NNW of Galbokka Point.

On nearer approach to the harbor, the following landmarks may be identified:

1. A flour mill, 65m high and marked by red obstruction lights, at the NE corner of the harbor.
2. A tall red brick chimney, close W of the drydock, in the NE part of the harbor.
3. St. James Church, with twin towers, and St. Lucia's Cathedral, with a dome, about 1.5 miles NE of Galbokka Point.
4. All Saints' Church, with a tall spire, about 1.3 miles E of Galbokka Point.

Two steel framework radio masts, 93m high and showing red obstruction lights, lie about 2.5 miles ESE of Galbokka Point. Galle Face Hotel, a large red building, is conspicuous on the coast, about 1 mile S of the latter point. The Town Hall, with a white dome, is also conspicuous about 1 mile farther E.

South of Galbokka Point to Mount Lavinia, about 6.5 miles S, a narrow ridge of rocks, awash in some places and with the appearance of a barrier reef, lies about 183m offshore. Along this stretch, the railway stations at Kollupitiya, Bambalapitiya, Wellawatt, and Dehiwala, with their stone-covered louvered exteriors, show up prominently at the edge of the beach in the afternoon light.

**Mount Lavinia** (6°50'N., 79°52'E.) can be identified by a hotel which is radar conspicuous, a large white building, 29m high, lying on a rocky point on the shore. The land rises behind the hotel, forming a dark background, rendering it the most conspicuous object on this part of the coast, and visible in favorable light, 12 miles offshore.

**Pilotage.**—Pilotage is compulsory for all merchant vessels except those exempted by the port authorities. Pilots are available 24 hours, although it is unusual for a pilot to board between 0000 and 0400.

Requests for pilots, stating the vessel's ETA, should be made 24 hours in advance, with later corrections to the ETA if necessary.

In 1980, it was reported that all vessels that can be accommodated in Galle Harbor (under 122m in length and 6.4m draft) were being diverted to Galle, even though berths were available in Colombo Harbor. From these anchorages, vessels should contact the pilot station on VHF channel 16 for further instructions.

The pilot station is located on the spur of Southwest Breakwater.

A vessel wishing to take a pilot should make one of the signals prescribed by the International Code of Signals and indicate the name and draft as soon as the vessel arrives within visual signaling distance of the port.

To facilitate embarkation of the pilot, vessels should, unless they have been previously intercepted by the pilot launch, pick up the pilot 2 miles NW of Southwest Breakwater Light. Ves-

sels approaching this position should be on a SE course. A pilot motor launch, showing the customary signals, will come alongside vessels in this position.

Vessels are cautioned, unless boarded by a pilot or previously ordered to do so, not to approach the port within the 1 mile limit.

The following provisions should be made to assist the pilot in boarding:

1. A pilot ladder on the lee side. A boat rope is not required.
2. Two manropes of at least 3 inch line, with the lower ends free, are to be hung from the vessel's rail.
3. By night, a bright light to be shown midway between the rail and the water to indicate the position of the ladder and the manropes.
4. In vessels of high freeboard fitted with gangway doors, the lee door should be opened and the ladder hung from there. In the event of weather conditions being such as to prevent the vessel being boarded by a pilot outside the harbor, the appropriate signals will be displayed at the pilot station. The vessel may, at the discretion of the port authorities, be given the option of proceeding into harbor and picking up the pilot inside, the vessel being instructed by signal whether to run in or stand off.

The option to enter is not given at night under normal circumstances.

Vessels waiting to enter should remain under way as convenient, well clear of both entrances.

A vessel intending to leave harbor should make one of the signals for a pilot 30 minutes before being ready to sail.

In normal circumstances the pilot will leave an outbound vessel as it passes the pilot station.

If at any time assistance is required from the port authorities, the signal should be made for a pilot.

**Regulations.**—Vessels in Colombo Harbor, after they have been moored to the satisfaction of the port authorities, are responsible for tending their own lines.

**Signals.**—The signals in use in Colombo Harbor are shown in the accompanying table; the flags are from the International Code of Signals.

The port signal station and pilot station are sited together. The signal station maintains a day watch, but the pilot station maintains a 24-hour watch.

Any vessel observing that a person has fallen overboard from any ship, boat, lighter, or other craft should make the following signals:

1. By day:
  - a. Hoist International Code Flag O, and haul it up and down to attract attention.
  - b. Sound short blasts on the siren or whistle.
2. At night:
  - a. Flash the letter O in Morse Code in the direction of the pilot station.
  - b. Sound short blasts on the siren or whistle.

The above signals will be observed by either the pilot station, the harbor police, or the port fire brigade; a motorboat will then be dispatched to the scene.

When a large red flag is displayed on a floating crane engaged on new construction work, all vessels passing or in the vicinity are to proceed at such a speed that they cause no wash or any kind, or disturbance affecting the crane.

The appropriate quarantine signal is to be displayed by all vessels arriving in the harbor and no person except the pilot is to be allowed to board or leave the vessel until pratique is given. Vessels having, or having had within 10 days prior to arrival, any infectious disease are placed in quarantine for a period decided by the port health officials. In such a case, the vessel may have to anchor in the roadstead or other place as directed by the port authorities.

Vessels in quarantine must display the necessary signals.

Vessels discharging dangerous petroleum are surrounded, at a distance of not less than 30m, by a rope boom floated on red wooden buoys and displaying the following signals; by day, a red flag over a green flag; by night, four lights vertically disposed, red and green alternately.

**Anchorage.**—A tanker SPM buoy is situated 4.5 miles NW of Colombo Light. A submarine pipeline is laid in an ESE direction from the buoy to the root of the Northeast Breakwater. All shipping, other than tankers using the SPM buoy, are advised to keep clear of the area covering a radius of 1.2 miles centered on the SPM. Passage through this area is prohibited.

Colombo Port Signals		
Day	Night	Meaning
Red ball	Fixed red light.	Hoisted at the pilot station flagstaff when vessels are required to run out extra mooring lines to the buoys and to prepare a second anchor for letting go.
Flags UM	Four red lights vertically disposed.	Hoisted at the pilot station flagstaff when weather conditions are such as to prevent the pilot boarding vessels outside the harbor.
Flags IT	Three red lights vertically disposed, 2m apart, hoisted where best seen.	Vessel is on fire. Attention can be called to this signal by a continuous sounding with any fog signaling apparatus.
Flag G	Two red lights vertically disposed.	A pilot is required.
Flags POL	White, red, and white lights vertically disposed.	The police are required.
Flag W	Red, white and red lights vertically disposed.	The port surgeon is required.

All shipping other than fishing vessels, is prohibited from entering the charted area centered in position 6°58'N., 79°51.3'E.

A restricted area is established and passage through this area is prohibited around the outfall pipeline extending 1 mile NW from the N end of the port area, marked by a lighted buoy moored about 0.8 mile NNW of the N entrance.

Vessels arriving off Colombo should anchor off Negombo Point in the vicinity of position 7°11.5'N., 79°45'E., or off Panadura, S of latitude 6°43'N., until instructed to proceed to the anchorage off the harbor entrance.

**Directions.**—When making Colombo from the W, it is better for a vessel to be S than N of the port, as there are no conspicuous landmarks N.

Approaching from the W, steer to bring Colombo Light bearing about 090° until the vessel's position is accurately determined; then a course clear of dangers can be laid for the harbor.

Vessels coming from the N or S, should keep in depths over 37m until Colombo Light bears 090°, then proceed as previously directed.

It was reported in 1980, that all vessels arriving from W or N should first anchor off Negombo Point (7°12'N., 79°48'E.), and vessels arriving from the S should anchor S of the latitude of **Panadura** (6°43'N., 79°54'E.).

**Caution.**—Ona Gala, a narrow ridge, with its S end about 3.3 miles N of Galbokka Point, has a least depth of 6.4m at Galawala, near its N end. Vessels approaching Colombo from the N are advised to keep to seaward of **Ona Gala** (7°00'N., 79°50'E.). During the Southwest Monsoon, vessels are cautioned against being set to the NE onto Ona Gala.

Kelani Gala, a narrow bank with a least depth of 16.5m, lies with its S end about 1.8 miles WNW of Galboka Point.

Pala Gala, also known as Tartar Rock, is a pinnacle rock with a depth of 5.8m, nearly 0.5 mile NW of Galbokka Point. It is steep-to and never breaks.

Galua, also known as Drunken Sailor Rock, has a least depth of 1.2m, about 0.4 mile SW of Golbakka Point. The shoal consists of two rocky heads over which the sea breaks during the Southwest Monsoon. A red conical buoy is moored about 0.2 mile W of the W rocky head.

Firing practice areas are centered 24 miles SW and 34 miles WNW of Colombo Harbor.

### Sri Lanka—West Coast—Colombo to Beruwala Point

**4.18** The coast between **Mount Lavinia** (6°50'N., 79°52'E.), described with Colombo Harbor in paragraph 4.17, and Beruwala Point, about 23 miles S, is formed by a straight sandy beach with dense groves of coconut palms, rising to a uniform height of 26m behind it. The hinterland is densely wooded and there are numerous towns and villages.

The coastal railroad runs along the coast; the railroad stations and the steel bridges which span the entrances of rivers, lagoons, and lakes are usually visible from seaward. From a distance of about 4 miles offshore there are no conspicuous landmarks along this stretch of coast.

A narrow bank, with depths of less than 1.8m, runs parallel to the coast and about 0.5 mile off it, for a distance of a 2 miles S of Mount Lavinia.

Moratuwa, a fair-sized town, lies about 3.5 miles SSE of Mount Lavinia; Immanuel Church, with a red square tower and a large gray water tower, 0.5 mile SE of it, are conspicuous.

Panadura, a small town about 4 miles SSE of Moratuwa, has a lone round-topped banyan tree about 1 mile S of it.

**Gono Gala** (6°42'N., 79°53'E.), 4.5m high and round-topped, is the outer of two rocks; about 1 mile WSW of Panadura Station. Nilkete Rock, with a depth of 3.6m, and Po Gala, with a depth of 5m, lie about 1.3 and 1.5 miles, respectively, S of Gono Gala.

**Kaluwatte Gala** (6°39'N., 79°53'E.), with a depth of 9.1m and steep-to, lies about 2.5 miles offshore. Uan Gala, with a depth of 5.5m, also steep-to, lies about 0.6 mile farther SE.

**4.19 Kalutara** (6°35'N., 79°58'E.), an important town, straddles the Kalu Ganga near its mouth. A temple, with a conspicuous white dome, lies on the S bank of the Kalu Ganga, in Kalutara. The white dome of the temple is floodlit, and a fixed green light is shown at its top.

Bombuwala Hill, about 3.5 miles E of Kalutara, is a small range about 2 miles long, and the N of low hills behind the coast between Kalutara and Beruwala Point. Near its S end is a conspicuous flat-topped hill, 159m high.

Weragala Kanda (Weragoda Kanda), about 4 miles SSE of Kalutara, is conical, 107m high, and conspicuous. This hill is isolated and wooded except at its summit, where there is a white shrine.

Uheliya Reef, with depths of 7.3 to 9.1m, lies about 2.5 miles W of Kalutara, at the outer end of an area of shoals and uneven ground.

Pittaniya Rock, with a depth of 5.5m, lies 1.3 miles WSW of the temple at Kalutara. Pallaipara Rock, with a depth of 2.7m, and Modara Muduwa Rock, lie about 0.5 mile and 1 mile, respectively, S of Pittaniya Rock.

**Anchorage.**—Small vessels may anchor off Kalutara, in a depth of about 10m; local knowledge is necessary. This anchorage should be approached by passing between Uheliya Reef and Pittaniya Rock.

Maggonna Point, about 5 miles S of Kalutara, is a small rocky headland, about 9m high. Tria Gala, 1.5m high and steep-to, lies about 1 mile NW of Maggonna Point. A 6.4m shoal lies about 1.8 miles NW of Tria Gala, at the outer end of foul ground; a rock, which always breaks, lies about 0.4 mile S of Tria Gala.

**4.20 Beruwala Point** (6°28'N., 79°58'E.), with a rocky promontory at its N end, forms the W side of a small bay. Yakada Gala, 2.4m high, about 0.5 mile W of the point, is the outermost rocky islet off Beruwala Point.

Prompt Rock, with a depth of 8.2m, and Madda Gala, with a depth of 5.9m, lie about 3 miles and 2.7 miles, respectively, WNW of Beruwala Point; both dangers are steep-to and soundings give no warning of approach to them. The above dangers are the outermost of numerous dangers lying W and NW of Beruwala Point.

Welmaduwa Island, about 0.7 mile SSW of Beruwala Point, is covered with tall coconut palms, and its highest part is a rocky cliff, 14m high, on its seaward side. Vessels navigating along the coast should give the island a berth of 4 miles.

Barberyn Light is shown from a white tower on the summit of Welmadura Island.

Good radar returns have been reported from Barberyn Light and Beruwala Point at 15 and 17 miles, respectively.

**Anchorage.**—It is not advisable to anchor off Beruwala Point in depths less than 11m because of the off-lying dangers and the swell that is usually experienced.

### Sri Lanka—West Coast—Beruwala Point to Galle Harbor

**4.21** Between the entrance of **Bentota Ganga** (6°26'N., 79°59'E.) and Galle Harbor, about 29 miles SSE, vessels should remain in depths over 37m, or about 6 miles from the coast, although at this distance there are few landmarks from which to fix position. The most prominent landmarks lying near the coast are the monument on **Galboda Kanda** (6°24'N., 80°01'E.) in the afternoon and **Waal Islet** (6°08'N., 80°06'E.). However, it was reported that the coast between Beruwala Point and Balapitiya Point, 13 miles SSE, gives good radar image up to 35 miles.

If visible, **Hiniduma Kanda** (6°20'N., 80°18'E.) is conspicuous, and **Hindelnattu** (6°07'N., 80°24'E.), about 12.5 miles ENE of Point de Galle, though its summit is poorly defined, forms a valuable mark when E of Waal Islet.

**Yakinigeduwa** (Katakurundu) (5°58'N., 80°23'E.), an islet which when seen from the W appears as a tuft rising over the extreme point of low land E of Galle, also forms a valuable mark.

**Godagala Point** (6°25'N., 80°00'E.) is a dark-colored rocky headland, about 9.1m high, which is not very conspicuous; a rest house lying among some trees on the coast, about 0.5 mile N, is fairly conspicuous.

Handram Gala, a black bare rock, 2.4m high, lies about 0.5 mile WNW of the point. Deba Gala, a boulder with depths of 2.7m, lies about 0.5 mile WSW of Godagala Point, with other dangers S and SE of it.

Galboda Kanda, about 2 miles SSE of Godagala Point, is a flat-topped hill, 47m high, with a temple and white monument on its summit. It is conspicuous from seaward and visible 10 miles in clear weather.

Kaikawalagala Point is a low rocky headland, about 2.5 miles SSE of Godagala Point. Dodampara Rocks, two small rocks, 0.9m high, are part of a group of rocks and reefs lying within 0.8 mile of Kaikawalagala Point.

Sabungala Point (Babungala Point), about 0.5 mile farther S, is a reddish point, about 8m high. A ridge, with depths of 6.4 to 9.1m, extends from about 1 mile W of the point, S for about 2 miles, parallel to the coast, about 1.5 miles offshore.

Arangala Point, about 0.8 mile SSE of Sabungala Point, is about 12m high and rocky. A small hill, 33m high, about 0.5 mile E of the point, is surmounted by a temple and monument; it is obscured by trees from some directions.

Duwemodera Hill, 53m high, about 1 mile E of Arangala Point, is isolated and fairly conspicuous, with a ridge extending E. Pelagas Kanda, about 1.8 miles farther E, is 71m high and flat-topped with a single tree on its summit. **Ahungala Point** (6°19'N., 80°02'E.) is 43m high, cliffy, and covered with coconut palms. Kola Islet, with a few palm trees on it, lies close S of the point. A small rock, awash and steep-to, lies 1.5

miles NW of the point. A ridge, with a least depth of 6.4m, lies about 1 mile offshore, and extends about 1 mile S of the rock.

Balapitiya Point, about 2.8 miles S of Ahungala Point, is a low, flat, double point, covered with coconut trees; a large boulder, 10.7m high, lies on the coast, nearly 1 mile N of the point. Foul ground extends W and N of the point. Depths of 5.9 to 8.2m lie about 1 mile offshore for a distance of about 1.5 miles S of the point.

**4.22 Akurala Point** (6°12'N., 80°03'E.) has been reported to give good radar returns at 14 miles. About 0.5 mile N of the point, the coastal belt of coconut trees is broken by a wide gap, clearly visible from seaward; Delmar (Galgoda), a 37m hill with a single tree on its summit, can be seen through the gap.

Passi Rock, about 1 mile W of Akurala Point, is dark-colored and consists of five heads; the sea always breaks over one of the heads, which is about 0.6m high. The rock should be given a wide berth, as the bottom is irregular for about 0.4 mile W of it.

Foul ground extends up to 1 mile offshore between Akurala Point and Telwatta Point, about 3 miles SSE. Foul ground extends 0.8 mile offshore between Akurala Point and Patingala Point, 2 miles NNW. The latter point consists of several large rocks, and has the ruins of a temple on it. Debaha Rock, 1.2m high, lies about 0.4 mile W of Telwatta Point.

**Hikkaduwa Point** (6°08'N., 80°06'E.) is low, flat, and covered with coconut trees, among which a rest house is almost hidden. Waal Islet, 9.1m high, is a large group of flat-topped rocks, lying on the outer edge of the foul ground extending about 0.4 mile W from the point. The islet is fairly conspicuous from seaward.

Hikkaduwa Gala is a rock with a depth of less than 1.8m, on a shoal about 1.3 miles S of Hikkaduwa Point

Dodanduwa, about 2.3 miles SE of Hikkaduwa Point, is a low point terminating in two islets; Manda Gala, 3.6m high, the outer islet, continues seaward to form a rocky point and has a clump of coconut trees near its shoreward end which serves to identify it.

The coast between Dodanduwa and Point de Galle, about 7.5 miles SE, is formed of a brown sandy beach with rocky projections at intervals, and backed by low hills rising to elevations of 45 to 70m about 0.5 mile inland. The coastline is thickly planted with coconut trees and the hillsides are densely wooded. Within or on the edge of foul ground fronting this coast are several rocks above-water, but none are particularly conspicuous.

Goda Gala, a rocky patch with a depth of 8.2m, lies about 1.5 miles SW of Dodanduwa Point.

**Caution.**—An 18.3m patch was reported (1944) to lie about 13.5 miles W of Dodanduwa Point.

**4.23 Bataina Gala** (6°02'N., 80°10'E.), about 3 miles NW of Point Galle, is a rocky bluff, 14m high, at the S entrance of the Gin Ganga. Pedruana Gala, two rocks close together, lie about 0.4 mile S of Bataina Gala; the inner rock is 1.8m high.

**Mada Gala** (6°02'N., 80°09'E.), about 2 miles SW of Bataina Gala, has depths of less than 1.8m is steep-to, and lies near the W end of a bank with depths of less than 18.3m.

Alu Gala, about 1.3 miles W of Point de Galle, is 0.9 high and steep-to. Ala Gala, about 1.5 miles farther W, is a rock

with a depth of less than 1.8m, marked by breakers during both monsoons, and should be given a berth of at least 0.3 mile. A dangerous wreck lies on the E side of Ala Gala.

A government hospital, a long two-storied building, painted light buff, with pillared verandahs, is conspicuous on the coast about 1.3 miles NW of Point de Galle. The Public Works Department bungalow, painted white, lies about 0.7 mile farther WNW on the top of Nindan Godella, a rocky projection, 5.5m high. A road bridge crosses the entrance of a lake about midway between the two buildings.

### Galle Harbor (6°01'N., 80°13'E.)

World Port Index No. 49250

**4.24** Galle Harbor is entered between Point de Galle and Watering Point, about 1 mile ESE. Point de Galle is the S extremity of a peninsula projecting about 0.5 mile S from the adjoining coast, and forming the W side of the harbor. The town of Galle is built on the S part of the peninsula and is surrounded by fortifications; it is joined to the mainland by a low flat isthmus. There are coconut palms and other trees among the houses, but the W side of the peninsula is clear and covered by grass.

The harbor is approached through Western Channel, Central Channel, and Eastern Channel. Western Channel is unmarked and used by local craft only. Dredging of the channel to the harbor N of Gibbet Island to a depth of 9.7m was completed in 1984.

**Winds—Weather.**—Winds from the W and NW predominate from April to November; winds from the E and NE predominate from December to March.

During the months of May and June, very disturbed conditions, sometimes lasting for 3 days, may be experienced in the harbor, accompanied by swells up to 4.3m high.

The climate in Galle is hot and humid in March and April before the Southwest Monsoon breaks.

**Tides—Currents.**—Tides the tidal rise at Galle is 0.6m at MHWS, and 0.4m at MHWN.

During the Southwest Monsoon, the current sets E along the coast, and during the Northeast Monsoon in the opposite direction.

**Depths—Limitations.**—The central channel has depths of 12.8 to 16.5m in its outer part, and a depth of 11m in its narrowest part, about 0.4 mile E of Point de Galle. The S part of this channel had been swept to a depth of 9.1m; the swept depth decreases N of Gibbet Island to 6.1m. In 1980, pending further dredging, a channel draft limitation of 5.5m was in force.

Eastern Channel has a least depth of 11.9m in the fairway as far as its junction with Central Channel.

The piers on the NE side of Galle each have a depth of 1.8m for about 30m from the outer end. An artificial harbor enclosed by two breakwaters is situated N of **Gibbet Island** (6°02'N., 80°14'E.); in 1984 it was dredged to a depth of 8.8m. Cloisburg Pier, which fronts the N side of Gibbet Island, is 427m long and can accommodate vessels with a draft of 7.9m. The N section of this harbor is a fishing port providing a pier where vessels with drafts to 3m can berth. A rocky spit, with depths from 2.5m to 5m, extends 183m SW from the root of the break-

water which extends WNW from Gibbet Island; about 0.2 mile W of the head of this breakwater there are depths of 6.2m.

Galu Gala, a bank with a least depth of 33m and frequented by fishermen, lies about 3 miles SW of Point de Galle in the approach to Galle Harbor.

Kadda Rocks, three shoal patches, lie along the W side of the central channel, between 0.6 and 0.8 mile SSE of Point de Galle. Outer Kadda Rock and Inner Kadda Rock have least depths of 3.7m, and Middle Kadda Rock has a least depth of 3.2m. During the Southwest Monsoon, the sea breaks heavily over the entire length of these rocks, but during the Northeast Monsoon the water over them is seldom disturbed.

Sealark Rock, with a depth of 6.4m, lies on the W side of the channel, about 0.5 mile SSE of Point de Galle Light. It is marked on its S side by a black and white checkered buoy.

Secundra Rock, with a least depth of 9.1m, lies on the E side of the channel, about 0.8 mile SSE of Point de Galle Light. A red conical buoy is moored close SW of it.

Polkote Gala, a 0.9m patch on which the sea breaks during the Southwest Monsoon, lies about 0.5 mile SE of Point de Galle Light; a black and white checkered buoy is moored SE of the rock.

Belikatu Wawa, a 3.7m patch, lies on the W side of Central Channel, about 0.2 mile E of Point de Galle Light; it is marked NE by a black and white checkered buoy.

Matte Mada, a shoal with three heads and a least depth of 3.2m, lies on the E side of the channel, about 0.1 mile E of Belikatu Wawa. It is marked W by a red conical buoy, and the sea breaks over it during the Southwest Monsoon.

Welihukka, a rock patch with a least depth of 0.9m, lies about 183m E of the fortifications on the E side of the town abreast Sailor's Bastion; black and white checkered buoys are moored off its N and S ends.

Katta Gala has a least depth of 2.4m over a head about 0.5 mile ENE of Point de Galle Light. Outer Katta, an 6.1m patch, lies about 183m SSW of this head, and is marked on its W edge by a red buoy. Inner Katta Buoy, a red buoy, is moored about 137m NW of the head.

In 1982, a stranded wreck lay 183m W of Katta Gala; work on its removal was in progress. In 1986, a small part of the superstructure was visible at LW. The wreck is marked on its W side by three small unpainted can buoys

Eastern Channel is entered between **Unawatuna Point** (6°00'N., 80°15'E.) and Alut Ground, with a least depth of 11.4m, 0.7 mile SSW of Watering Point.

Gal Pare, consisting of several heads with a least depth of 7.8m, lies on the SW side of the channel, about 0.5 mile WSW of Watering Point. The shoal is marked on its E side by a black and white checkered buoy.

Bloomfield Rock, with a least depth of 7.8m, lies close NW of Gal Pare, on the SW side of Eastern Channel and also on the E side of Central Channel. It is marked on its N side by a buoy painted in black and white bands, and surmounted by a staff and triangle.

Imbu Ranne Gala, consisting of several heads, has a least depth of 6.4m about 0.3 mile WNW of Watering Point. A spherical buoy, painted in red and white bands, is moored about 137m SSE of the S head, and a black and white checkered buoy is moored close E of the N head. Both buoys are removed during the Southwest Monsoon.

Diya Mudawa, a 4.9m shoal, on which the sea breaks during the Southwest Monsoon, lies on the NE side of the channel, about 0.2 mile NW of Imbu Ranne Gala.

**Aspect.**—Inland, the country is generally flat, but becomes more hilly N. Among these hills is Kurundu Kanda, 90m high and flat-topped, about 3.5 miles NNE of Point de Galle and Hiniduma Kanda (Haycock), about 16 miles farther NNE. On clear mornings in the early months of the year.

Adam's Peak, previously described in paragraph 4.1, may be seen a little to the E of Hiniduma Kanda, previously described in paragraph 4.2, appearing as a sharp regular cone flanked by lesser peaks appearing as though on the shoulders of its slopes.

Approaching Galle, Point de Galle Light and Edwards Pillar form good landmarks. **Point de Galle Light** (6°01'N., 80°13'E.) is shown from a round tower on Utrecht Bastion, at the SE extremity of the peninsula. Galle Tower (Edwards Pillar), about 1.5 miles farther E, is a black and white tower, 15m high, lying on the summit of Rumassala Kanda, a large wooded hill, 75m high, sloping down to the sea to form the E side of Galle Harbor. In 1978, a conspicuous stranded wreck lay 2.5 miles W of Point de Galle Light on the E side of Ala Gala.

The following landmarks are on the W side of the harbor within the town of Galle:

1. The mosque, a large white two-storied building with two small domes and some low minarets at the SE corner of the peninsula.
2. All Saint's Church, with a square tower, surmounted by a red four-sided pointed roof and a large weather vane in the middle of the town.
3. The clock tower, a square stone structure with an elevation of 43m

The Roman Catholic Chapel, about 0.8 mile WNW of Point de Galle, is a large conspicuous building, painted white with two towers on its front facing the sea and a dome behind. The chapel lies on a hill and has an elevation of 41m.

To the N of the town are extensive low wooded hills. The only ones likely to be recognized are **Residency Hill** (6°02'N., 80°13'E.), 62m high, and Hirimbure Kanda, 76m high, about 2 miles farther N.

Good radar returns have been reported from Point de Galle and Point de Galle Light, at 19 and 18 miles, respectively.

Central Channel and Eastern Channel are buoyed. When vessels are leaving the harbor at night, certain buoys are lighted as required by the port authorities.

A red and white checkered buoy, surmounted by a staff and cage, is moored nearly 1 mile S of Point de Galle Light, and marks the W side of the entrance to Central Channel. Point de Galle Light is shown on Utrecht Bastion at the SE extremity of the peninsula.

If this buoy is not in position a signal to that effect is made from the signal station. Under no circumstances should implicit reliance be placed on the buoys being in their charted positions.

**Pilotage.**—Pilotage is compulsory for all vessels unless exempted by the authority of the Master Attendant, Colombo, represented at Galle by the Assistant Master Attendant, who is in charge of the port and is also pilot at Galle. The latter is provided with a pilot launch painted white with "Galle Pilot"



*Photo Courtesy of Sri Lanka Maritime Archaeological Unit*

#### **Point de Galle Light**

painted in black letters on the bow, and a mooring boat. The pilot can be contacted by VHF, but is not available at night.

The usual signal for a pilot should be displayed by vessels approaching the port; vessels should await the arrival of the pilot close to the buoy at the W entrance of Central Channel. A pilot ladder on the lee side, and two manropes of at least 3-inch rope with the ends free, are required to be provided. Vessels are not taken into the harbor at night, but should anchor at the outer anchorage until daylight. Vessels can be taken out of the harbor at night in good weather.

Vessels should send their ETA 24 hours in advance. The message should be passed through Colombo Port Radio and the local agents.

**Regulations.**—Vessels without qualified medical officers may not have communication with the shore, nor may any person, except the pilot, board them until permission is obtained from the health authorities; in no circumstances may cases of infectious disease be landed without the consent of the Government Health Officer.

The regulations governing vessels having plague, cholera, or yellow fever on board, and the signals required for all vessels arriving off the port, are the same as those for Colombo.

**Anchorage.**—During the Southwest Monsoon, the best berth, in 28m, sand, lies with Point de Galle Light bearing 012°, and Ereminia Galla Point, a large black rock, 6.1m high, with a pointed top, about 1 mile ESE of Unawatuna Point, bearing 094°.

During the Northeast Monsoon, vessels usually anchor in the outer anchorages, in a depth of 18.3m, with Point de Galle

Light bearing 335°, and with Kota Gala, a black rock close SE of Unawatuna Point, in line bearing 101° with Ereminia Gala Point.

During the Northeast Monsoon, in the inner anchorages there are eight anchorage berths, one of which will accommodate a vessel up to 121.9m in length and 6.4m draft.

During the Southwest Monsoon, there are six anchorage berths, one of which will accommodate a vessel 145m in length and 7.6m draft.

In 1977, there were two inner anchor berths for use by vessels with a draft between 7.9 and 7m in the Northeast Monsoon, and between 7.6 and 6.4m in the Southwest Monsoon. The bottom at the anchorage is sand and mud, good holding ground.

Vessels moor head and stern, using both power anchors, with their bows S and port anchors to the E. The stern moorings are laid by the pilot, some being laid as required and others kept ready with ends secured to small white conical buoys. Vessels are required to be ready to veer chain when required to do so by the port authorities, and must have their main engines ready to use at short notice.

There is also good anchorage during the Northeast Monsoon for vessels up to 152.4m in length and 9.1m draft, with Watering Point bearing 162°, distant 0.2 mile.

Vessels should anchor well clear of Central Channel and Eastern Channel and their approaches.

**Directions.**—Vessels approaching Galle Harbor from the NW should keep Point de Galle Light bearing less than 078°, which will lead clear of the dangers W of the point. Vessels approaching from seaward should keep the above light bearing 012°, which leads to the outer anchorage.

Vessels entering Central Channel should pass about 0.2 mile E of the outermost buoy and follow the recommended track indicated on the chart. When Point de Galle Light is abeam, course may be shaped as required, keeping E of Capera Buoy and the similar buoy 183m N of it, and W of the Outer and Inner Katta Buoys.

Before the anchorage is reached speed should be reduced to the minimum consistent with retaining command of the vessel.

A vessel entering by Eastern Channel should take care to avoid the dangers and foul ground extending from Unawatuna Point to Goda Gala (Bellows Reef), a rocky patch, with a depth of 1.8m, over which the sea always breaks, about 0.8 mile SE. Then bring the N end of Kachcheri, a conspicuous buff-colored building about 0.2 mile N of Utrecht Bastion, in line with the Roman Catholic Chapel bearing 322°. Steer on this range until Central Channel is reached, then follow the directions for that channel.

### Sri Lanka—West Coast—Galle Harbor to Weligama Bay

**4.25** The coast between **Unawatuna Point** (6°00'N., 80°15'E.) and Ereminia Gala Point, about 1 mile ESE, recedes to form a small sandy bay. A large white house is conspicuous about 0.5 mile ENE of Unawatuna Point.

Between Ereminia Gala Point and Yakinigeduwa (Katukurund Islet), about 7.5 miles ESE, the coast consists of an irregular sandy beach backed by a thick belt of coconut trees through which runs the railroad between Galle and **Matara**

(5°56'N., 80°33'E.). The shore is fronted by reefs and foul ground, on which the sea always breaks, extending up to 0.4 mile offshore. The depths are irregular outside the breakers, but there are apparently no off-lying dangers except for a 9.1m patch, about 3 miles WNW of Yakinigeduwa.

The railway station at Talpe lies about 0.8 mile E of Ereminia Gala Point. Malagoda Kanda, a conical hill, 93m high, lies about 1.3 miles N of Talpe; a conspicuous tree is on its summit, and the summit of a shoulder extending SW is also prominent.

Kotavanni, a solitary black rock, 15.2m high, about 3.5 miles ESE of Talpe and fairly prominent, helps to identify the outlet of the Koggala Lake, about 0.4 mile farther E. Debaha Rock, 0.9m high, lies about 0.8 mile SE of the lake outlet.

About 2 miles N of Koggala Lake, the land begins to rise, sloping gradually to Hindelunattu, 410m high, about 8 miles NNE of the lake. This mountain forms a good landmark all around the S and SW coasts; it is conspicuous with its large rounded summit and a small pointed shoulder on its NE flank.

**Yakinigeduwa** (Katukurundu) (5°58'N., 80°23'E.), an islet, with steep, cliffy sides, is joined to the mainland by a causeway. Trees on the islet are 40m high, with tufted tops. A rocky reef, with some above-water heads, extends about 0.2 mile SE from the islet. A prominent reddish cliff, 21 to 30m high, projects from the coast about 0.6 mile W of the islet.

The coast between Yakinigeduwa and Rassamunai Point, about 2.5 miles E, consists of a sandy beach backed by coconut palms, until within 0.5 mile of Rassamunai Point where the land rises to terminate in red cliffs which form a prominent mark.

### Weligama Bay (5°57'N., 80°26'E.)

World Port Index No. 49260

**4.26** Weligama Bay, entered between Rassamunai Point and Mirissa Point, about 1.5 miles ESE, is encumbered with numerous islets and dangers; a SW swell may break on any shoal patch with a depth of 5.5m or less.

Rassamunai Point consists of red cliffs extending about 0.5 mile W and 0.3 mile N of it. Good radar returns have been reported from the point at 16 miles. The town of Weligama, somewhat scattered, lies on the NW side of the bay.

Mirissa Point forms the W end of a fairly high peninsula partly covered with coconut palms.

The W and N shores of the bay to the entrance of Polatu Ganga is a sandy beach backed by coconut palms. The land at the head of the bay is very low and not visible from the bay, but hilly country about 3 miles inland starts to rise to Hindelunattu, about 6 miles farther NNW, and is visible over the coconut palms. Gongola, 1,386m high, about 30 miles NNE of the bay, is visible in clear weather above the intervening hills.

On the E shore of the bay, a sandy bight lies between Mirissa Point and Wera Point, 27m high and cliffy, about 0.8 mile NE. The village of Mirissa lies at the head of this bight. The shore between Wera Point and the S entrance of Polatu Ganga is mainly composed of moderately high, red cliffs.

Yala Rock, with a least depth of 2.7m and steep-to, lies about 0.5 mile SW of Rassamunai Point.

Pares Shoal, with a depth of 4.5m, lies about 0.5 mile ESE of Rassamunai Point. The sea always breaks on the reef fringing the point.

Sealark Rock, with a depth of 8.7m, lies about 0.2 mile E of Pares Shoal, and Kada Rock, with a depth of 4.5m, lies about 0.2 mile farther SE, near the middle of the entrance to the bay.

Karamas Rock, with a depth of 6.9m, lies about 0.4 mile N of Kada Rock.

On the E side of the entrance, between Mirissa Point and Kola Point, about 0.7 mile ESE, the sea always breaks on the foul ground extending up to 0.2 mile offshore. Palapana Gala, shoal rocky ground with a least depth of 6.9m, lies about 0.4 mile S of Mirissa Point.

Diyumba Alut Rock, with a depth of 5m and on which the sea occasionally breaks, lies about 0.3 mile W of Mirissa Point, and about 0.4 mile E of Kada Rock.

Diyumba Rocks, with a least depth of 2.3m, lie about 0.5 mile N of Mirissa Point.

Prompt Shoal, with a depth of 5m, lies near the middle of the bay, about 1 mile NNW of Mirissa Point. Puhamodal Rock, with a least depth of 2.7m, lies about 0.2 mile farther NNW.

Gan Island, 12.5m high, about 0.4 mile W of Parei Duwa, is not easily distinguished from the shore W because of the coconut palms on it.

Ruwana Rock, 1.8m high, lies about 0.6 mile NE off Rassamunai Point; a rocky head, awash, lies close E.

Parei Duwa (Pigeon Island), about 1.3 miles NE of Rassamunai Point and about 0.2 mile off the head of the bay, is 16.1m high, rocky and covered with scrub; there are no palm trees on it.

**Anchorage.**—Anchorage can be taken, in 9.1 to 11m, sand and rock, SE of Ruwana Rock, or in similar depths in the SE part of the bay, off the village of Mirissa. A good berth off the village of Mirissa is with the red cliff on Kada Point, the S entrance point of Polatu Ganga, bearing 039°, and Ruwana Rock bearing 294°. Although no reliable information has been obtained it is probable that the anchorage SE of Ruwana Rock can be used during the Southwest Monsoon.

**Directions.**—Vessels approaching from the W should pass about 0.8 mile S of Rassamunai Point to avoid Yala Rock. Vessels from the E should pass S of Prinz Heinrich Patch, which lies about 1.5 miles SE of Mirissa Point. Proceed into Weligama Bay with Parei Duwa (Pigeon Island) in line bearing 352°, with a gap in the hills inland. This course leads between Kada Rock and Diyumba Alut Rock. Course may be altered ENE for the anchorage off Mirissa when clear of Diyumba Alut Rock.

If proceeding to the anchorage SE of Ruwana Rock, enter on the same range and pass E and N of Karamas Rock.

### Weligama Bay to Dondra Head

**4.27** The coast between Mirissa Point and Galgodiya (Chula Lanka), about 5 miles E, is densely wooded with coconut palms and appears moderately high. Several dagobas (shrines) on this coast show up well when light conditions are favorable.

The bottom is rocky and uneven in depths of less 9.1m off this stretch of coast. Vessels should ordinarily keep in depths over 37m, and pass about 1.5 miles S of Veragalle Point.

**Tides—Currents.**—Currents are irregular within 2 miles of this coast and W of Dondra Head. There is often an indraft into Matara Bay.

Prinz Heinrich Patch, with a least depth of 7.3m, lies about 1.5 miles SE of Mirissa Point. Galgodiya in line bearing 074° with Brown's Hill, 1.8 miles ENE, leads S of the patch. Mirissa Point in line bearing 347° with Hindelunattu, leads W of Prinz Heinrich Patch.

A rocky ledge, 3m high at its highest point, extends about 183m offshore from Veragalle Point (5°56'N., 80°27'E.), about 0.5 mile E of Kola Point.

Talarabee Point, about 0.4 mile farther E, is rocky and elevated, with a dagoba, 36.5m high, showing above the tree tops close behind it. Kalcotta Rocks, three heads, 0.3 to 0.6m high, lie about 0.2 mile S of Talarabee Point.

Tanana Rocks, 0.9 to 1.5m high, about 1 mile farther E, lie about 0.2 mile S of Atalahua Point, a low point.

Moolkalle Point, about 1 mile E of Atalahua Point, is rocky and has a dagoba on it; it contrasts with its surroundings as it is covered with low scrubs instead of coconut palms.

**4.28 Galgodiya** (Chula Lanka) (5°56'N., 80°32'E.), an islet 22m high and covered with coconut palms, is connected to the coast by a causeway in bad repair. Several rocks, two of which are about 2m high, lie about 0.3 mile S of the islet.

Matara Bay, formed by the curving coastline between Galgodiya and Dondra Head, about 3.3 miles E, is entirely open S and mostly foul.

Madumora Reef, about 0.8 mile SE of Galgodiya, has depths of less than 1.8m over its N edge, and a least depth of 2.7m near its S edge. Sleet Rock, about 1.5 miles farther ESE, has a depth of 10m and is the outermost danger in the E part of the bay.

Matara, on the NW side of the bay, is a town of considerable size and importance, ranking next to Galle in the Southern Provinces. The town is not easily seen from seaward, but the clock tower shows up well in favorable light between the bearings of 347° and 302°.

An islet, 12.5m high, just E of the clock tower, is connected to the shore by a causeway on which the sea generally breaks. Some conspicuous red cliffs, the highest 37m high, lie about 1 mile farther E. Brown's Hill, 52m high and identified by a red triangular patch on its SW slope, rises behind the red cliffs.

### Sri Lanka—South Coast—Dondra Head to Hambantota Point

**4.29 Dondra Head** (5°55'N., 80°36'E.), the S extremity of Sri Lanka, is low with a grove of tall coconut trees at its W extremity. The headland appears as an islet, although it is connected to the mainland. Dondra Head Light is shown from a white octagonal tower, 49m high, near the E point of Dondra Head. A white pyramidal beacon, with an elevation of 13.7m, lies about 0.5 mile NE of the light.

Dondra Head has been reported to give good radar responses at 19 miles.

An IMO-adopted traffic scheme has been established off Dondra Head.

The coast between Dondra Head and Hambantota Point, about 34 miles ENE, is generally low and has sandy and rocky

stretches; there are no dangers outside a distance of 1.3 miles offshore. The W part, between Dondra Head and Nilawelli Point, about 8 miles ENE, has a somewhat elevated appearance due to the low-lying parts being covered with coconut palms. From Nilawelli Point to Tangalla Point, about 6 miles NE, the coast becomes generally rocky, fairly high, and indented by bays. To the E of the latter point, it again becomes low, sandy, and backed by coconut palms as far as Kalametiya Point, nearly 9 miles ENE. Then to Hambantota Point, about 12 miles ENE, it is low, barren, and sandy, and is interrupted by only a few cliffy points.

The coast between Dondra Head and Gandura Point, a rocky point about 1.8 miles ENE, consists of rocky cliffs which are about 30m high in one part. Gandura Bay lies between the latter point and **Kottagoda Point** (5°57'N., 80°38'E.), a rocky point with boulders.

**Anchorage.**—There is good anchorage, in 18.3m, sand in the W part of Gandura Bay, with Gandura Point bearing 248°, about 0.6 mile. The anchorage is not protected from the swell.

Etawa Reef, with a least depth of 3.6m, lies between 0.5 and 1 mile E of Kottagoda Point. Bambri Rocks, 1.2m high, lies about 0.5 mile farther NE.

**4.30 Nilawelli Point** (5°57'N., 80°43'E.) is rocky and steep-to, with a clump of coconut trees, 24m high, on it. The point is connected to the mainland by a narrow strip of sand over which the surf washes in a moderate swell; when seen from the E or W, it appears as an islet. A white dagoba lies 1 mile N of the point.

Walakanda (Waulugala), a hill with a bare summit, 169m high, about 3.3 miles NNW of Nilawelli Point, forms a good mark for vessels coasting, but shows up less to vessels farther offshore, because of the other hills behind it.

Nilawelli Bay lies between Nilawelli Point and the S extremity of a rocky peninsula, about 1 mile NE. Two detached above-water rocks lie off the S extremity of the peninsula.

Anchorage can be obtained in the bay, in about 16m, sand, about 0.4 mile NE of Nilawelli Point.

Mahawelli Bay, about 2.5 miles NE of Nilawelli Point, lies immediately N of Mahawelli Point. The latter point is the E extremity of a steep and rocky peninsula, moderately high, and nearly bare of trees. Mahawelli Rock, awash, lies about 0.2 mile E of the point. Middle Rock, nearly awash and always breaking, lies about 0.5 mile farther ENE. Unaeria Rocks, consisting of four distinct heads, 0.3 to 1.8m high, lie close E of Middle Rock.

Anchorage, with local knowledge, can be taken, in about 11m, sand, close N of Mahawelli Rock. The approach to the anchorage is made between Mahawelli and Middle Rocks.

Tangalle Bay (Tangalla Bay) lies between **Tangalle Point** (6°01'N., 80°48'E.) and Rekawa Point, 15m high, rocky and barren, about 4 miles ENE. The town of Tangalle (Tangalla), with an old conspicuous white fort, lies on Tangalle Point. Rocky reef, just below-water, fronts most of the shore of the bay.

Two radio masts, marked by red obstruction lights, are situated about 8 miles NNW of Tangalle.

Good radar returns have been reported from Tangalle Point at 9 miles.

Tangalle Rock, awash and steep-to on its S and E sides, lies about 1 mile ESE of Tangalle Point. Ma Rock, with a depth of 4.6m, and Kadul Rock, with a depth of 3.2m, lie about 0.4 mile NE and 0.2 mile NNW, respectively.

To enter Tangalle Bay, pass 0.5 mile E of Tangalle Rock, then steer about 021° until the coconut trees on the S bank of Kirama Oya (Kunkalle Ganga) are in line, bearing 265°, with the small white dagoba, about 0.5 mile NW of the fort. Steer on this range and anchor, in 9.1 to 11m, with Tangalle Rock bearing between 167° and 149°

**4.31 Kahandawa Rocks** (6°03'N., 80°54'E.), 0.6m high, lies about 0.8 mile S of Kahandawa Point. A rocky head, with a depth of 8.7m, lies about 0.3 mile S of the rocks.

**Kalametiya Point** (6°04'N., 80°56'E.), moderately high and rocky, terminates in a large boulder, from which a chain of rocky islets extends SE to Watta Rock, a barren islet, 7m high and prominent due to the light color of its upper part. Rocky patches, with depths of 7.3 to 9.1m, lie within 0.5 mile SW, S, and E of Watta Rock.

Kalametiya Rock, of which a small pinnacle just shows, lies about 0.4 mile E of Kalametiya Point.

Anchorage, with local knowledge, can be obtained, in about 11m, sand and rock, from 0.3 to 0.5 mile ENE of Watta Rock.

Ulandhe Point, about 2.8 miles ENE of Kalametiya Point, is steep with red cliffs, and a summit, 18m high, behind it.

Swell Rock, with a depth of 6.9m and upon which the sea breaks in a moderate swell, lies 1 mile SW of Ulandhe Point.

Rattan Point is similar to and about 0.8 mile NE of Ulandhe Point, from which it is separated by two sandy bights. Rocks extend nearly 0.4 mile offshore between the points.

Rattan Point has been reported to give good radar responses at 18 miles.

The mouth of the Walawe Ganga, about 1.8 miles E of Rattan Point, is usually a small opening in the sandy beach.

**Godawaye Point** (6°06'N., 80°03'E.), 15m high and rocky, has a white dagoba within the point and a reef awash close E.

Ibha Rock, with a depth of less than 1.8m, lies about 0.8 mile SSE of Godawaye Point; it is steep-to and the sea does not always break on it.

Nehindi Rock, awash and steep-to, lies about 2 miles ESE of Godawaye Point and 1 mile offshore.

The coast between Godawaye Point and Hambantota Point, about 5 miles ENE, is a continuous stretch of sand on which a heavy surf breaks.

**4.32 Hambantota** (6°07'N., 81°08'E.) (World Port Index No. 49270), a town and port, lies on the W side of the bay formed between Hambantota Point and Pitawatan Point, about 1.3 miles NE. There is seldom much protection from swell in this bay as even with winds the swell sets onto the coast.

Hambantota Point is the SE extremity of a rocky promontory with red sandy soil. A bare rocky ledge extends about 137m SE of the point; the highest part of the ledge, at its outer end, is 4m high. A large white martello tower and some houses lie on the promontory; a disused light stands on its summit, about 0.2 mile W of Hambantota Point.

Good radar returns have been reported from Hambantota Point at 19 miles.

Hambantota Light was formerly shown from a square white tower on the summit of the promontory, about 0.2 mile W of Hambantota Point. Since 1977, the light has been extinguished.

**Anchorage.**—The best berth in the bay, in 10m, lies 0.4 mile NE of Hambantota Point.

### Sri Lanka—South Coast—Hambantota to Butawa Point

**4.33** The coast between Hambantota and Illukatiya Point, 42 miles ENE, is sandy and barren, with points from 15 to 50m high. The land between and behind the points is low, with hills here and there which usually rise abruptly. In clear weather the mountain district of Sri Lanka will be seen in the background. The usual and recommended route for vessels proceeding along this coast is outside of **Great Basses Reef** (6°11'N., 81°29'E.) and Little Basses Reef to the NE, passing about 2 miles SE of the lighthouses marking the reefs upon these ridges. Care should be taken in passing Little Basses Reef, described in paragraph 4.37, where depths of less than 18.3m extend to about 3 miles ENE of the lighthouse at the E end of this reef.

**Katagarama Peak** (6°23'N., 81°20'E.), 425m high, is the summit of a range; it is sharp-topped when viewed from SW, but flat-topped from E or SE. Good radar returns have been reported from the peak at 37 miles.

Rocky Knob, 98m high, about 7 miles SE of Katagarama Peak, is a remarkable pillar of rock protruding from a rocky ridge.

Akasachetiya, 162m high, about 4 miles NE of Rocky Knob, is a very prominent mass of bare rock.

Open anchorage, over a bottom of sand and rock, can be obtained off almost any part of this stretch of coast, but none of the bights afford shelter during either monsoon. During the Southwest Monsoon, however, if the wind is well to W, the sea is less disturbed off the E part of the coast. Close to the beach, there are several rocky patches, below and above-water, over which the sea breaks heavily.

**4.34 Patirajja Point** (6°10'N., 81°14'E.), about 6.3 miles ENE of Hambantota, is reddish in color and terminates in a rocky ledge, 0.6m high. A bare sandhill lies about 0.3 mile W of the point.

Urani Point, about 3.3 miles farther ENE, may be identified by a small grove of coconut palms lying behind it; such palms are rare in this area. The village of Bundala is near this grove.

**Dorava Point** (6°12'N., 81°19'E.), 18m high, is bare, rocky, and easily identified.

Lansiya Rock, 6.4m high, lies 0.5 mile S of Dorava Point; foul ground extends 1 mile W of the rock.

Dorava Rock, with a least depth of 5.5m, lies about 0.8 mile SE of Dorava Point, and is the outermost off the point.

Between Dorava Point and Butawa Point, about 11.5 miles NE, sand hills and rocky formations of moderate height lie close behind the coast.

Kirindi Point, a rocky formation, lies about 1.3 miles NE of Dorava Point. Kirindi Knob, a group of boulders, 34m high, lies about 0.3 mile W of the point. From the W, it may be seen over the land inside Dorava Point, appearing as a conical summit.

A rocky ledge, with Korha Rock, 0.6m high, at its extremity, extends about 0.3 mile ESE of Kirindi Point.

The village of Kirindi lies close to the beach N of the point.

**Anchorage.**—Open anchorage can be obtained, in about 15.8m, S of Kirindi Point, rather than E of the point where there appears to be much rock. Vessels approaching the anchorage should keep Katagarama Peak well open E of Kirindi Knob, bearing about 359°, which leads just E of Dorava Rock.

Mutugala Point lies about 2 miles ENE of Palatupana Point, and is somewhat similar to it. The point is fronted by patches of rocky reef, and a rock, 1.8m high, lies about 91m SE of it. Shoal patches, with a depth of 6.9m over the outer one, extend about 0.5 mile S of the point.

**4.35 Palatupana Point** (6°14'N., 81°22'E.) is the extremity of a sandy elevation, about 2.5 miles NE of Kirindi Point.

A bushy summit, 59m high, and another, 39m high, lie about 1.3 miles NW, and 0.8 mile NNW, respectively, of Mutugala Point. The latter summit is used as a range mark for the passage inside Little Basses Ridge.

Amaduwa Point, about 2.5 miles NE of Mutugala Point, is low and rocky at its extremity. A rocky reef, its outer part awash, midway between the points, extends about 0.3 mile offshore. A rock, 5m high, lies about 0.1 mile S of Amaduwa Point.

The sandy coast between Amaduwa Point and Butawa Point, about 3.8 miles NE, forms several bights with rocks lying from 0.1 to 0.2 mile offshore. Two of these rocks, close together, the higher one 4.6m high, lie about 0.2 mile offshore. Shoal water, the outer part with a least depth of 5m, extends about 0.5 mile from the coast, about 1.5 miles NE of Amaduwa Point.

Great Basses Ridge, a steep-to and narrow rocky ridge, with depths of less than 18.3m, extends 13.8 miles ENE from a position about 3 miles S of **Urani Point** (6°11'N., 81°17'E.).

**Great Basses Reef** (6°11'N., 81°29'E.) lies on the ridge, about 2 miles from its E end; parts of the reef, which is about 0.2 mile long, are above-water.



Photo Courtesy of Udena Atygalle, *The Sunday Times* (Sri Lanka)

**Great Basses Reef Light**

Great Basses Reef Light is shown from the NE and highest part of Great Basses Reef, from a white granite tower, 38m high, with a conical top; the tower is surrounded by two galleries, one above the base and the other close under the lantern. Good radar returns have been reported from the light structure at 17 miles.

No depth of less than 12.8m has been found on Great Basses Ridge, except within 2 miles of the lighthouse, and vessels should not approach within that distance of the light in either an ENE or WSW direction.

Ship Rock, about 5.5 miles NE of Great Basses Light, has a depth of 9.1m and lies in the middle of a narrow, rocky shoal.

### Sri Lanka—South Coast—Butawa Point to Illukatiya Point

**4.36 Butawa Point** (6°19'N., 81°29'E.) is rounded and moderately high. Butawa Rock, 1.8m high and steep-to on its SW and SE sides, lies about 0.2 mile SE of Butawa Point.

Chiddle Rock, with a depth of 9.6m and steep-to, lies about 0.4 mile SE of Butawa Rock.

Shoal and uneven depths extend up to 0.8 mile offshore between Butawa Point and Patanagala Point, about 2 miles NE. The outermost danger is a rock, with a least depth of 6.9m, about 0.8 mile SSE of Patanagala Point.

Patanagala Point is the extremity of a bare rocky hill, 42m high, and somewhat resembling a haycock. Elephant Rock, 0.6m high, lies about 0.4 mile ESE of the point.

Transit Hill, a bare, rocky elevation, with two peaks of nearly equal elevation and joined by a ridge slightly lower, lies about 0.4 mile WNW of Patanagala Point. The W peak is 50m high.

A sand hill, 33m high, lies about 4 miles NE of Patanagala Point, terminating in two rocky points about 0.8 mile apart; the NE point is Pillanawa Point. This sandhill, backed by low land, appears as an island from a distance. Two rocky heads extend about 0.3 mile S of the SW rocky head, and shoal water extends about 0.5 mile farther offshore. The coast for about 2 miles SW of Pillanawa Point should not be approached within 0.8 mile.

The coast, from about 1 mile NE of Pillanawa Point to Uda Point, about 3.3 miles farther NE, is closely backed by sand hills of moderate height, partly covered by scrub.

Pahala Point, about 3.3 miles NE of Uda Point, is the extremity of a sand hill slope; rocky ledges and sunken reefs extend about 0.2 mile offshore for about 1 mile on either side of the point.

Lewin Rock, with a least depth of 5.5m, lies about 1 mile offshore, about 3 miles ENE of Pahala Point.

Daedalus Rock, about 0.8 mile SSE of Lewin Rock, has a least depth of 3.2m, and appears to be a boulder resting on a narrow ledge, with depths of 5.5 to 9.1m extending about 0.5 mile S.

**Illukatiya Point** (6°30'N., 81°42'E.), poorly defined, is the S entrance point of Kumbukkan Oya, about 4 miles NE of Pahala Point. The coast between the two points is principally composed of sand hills, partly covered with scrub. Kumbukkan Oya is fronted at its mouth by patches of sunken reef extending about 0.2 mile offshore.

Little Basses Ridge, with depths of not more than 9.1m, extends from its SW end about 1 mile SE of **Butawa Point**

(6°19'N., 81°29'E.), for about 17 miles ENE. The ridge is in most parts very narrow and steep-to, and there are many rocky heads, especially in its SW part, on which the sea often breaks.

An extensive bank lies S of the W half of Little Basses Ridge, and has a least depth of 10m about 3.8 miles SE of **Pillanawa Point** (6°22'N., 81°34'E.).

**4.37 Little Basses Reef** (6°24'N., 81°44'E.) lies about 1.5 miles within the NE end of Little Basses Ridge, and is about 0.6m high. The approach to the reef is steep on its S and SE sides, the 200m curve lying about 1 mile SE of the reef.

The wreck of a 7,000 grt vessel, stranded and broken in two, lies about 3.5 miles WSW of Little Basses Reef.

Little Basses Light is shown from a white granite tower, with a black band, 38m high, on Little Basses Reef. The tower has a domed roof, and is surrounded by two galleries under the lantern.

Good radar returns have been reported from the light structure at 16 miles.



Photo Courtesy of Udena Atygalle, *The Sunday Times* (Sri Lanka)  
**Little Basses Reef Light**

**Winds—Weather.**—Winds from the W and SW prevail from April to November.

In January, the sea is rough; vessels bound NE should avoid the SE coast of Sri Lanka. In March, the passage up and down the coast is easy.

**Tides—Currents.**—Tides and currents on Little Basses Reef are, as follows:

1. January—The currents set SSW at 2 to 2.5 knots.
2. February—The currents usually set SSW at 2 knots, but may be less.
3. March—The currents generally set SSW, but are variable and weak at times.

4. April—The currents are variable, but occasionally set SW; they are usually weak but can be strong when setting SW.

5. May—The currents set NE at 1 to 3 knots.

6. June, July, August, and September—The currents set NNE at 1 to 3 knots.

7. October—The currents set NNE at 5 knots, changing about the middle of the month to SSW.

8. December—The currents set SSW at 5 knots.

**Caution.**—An area of shoal ground lies NNW of Little Basses Reef; vessels should not approach within 1.5 miles of the reef with the lighthouse bearing between 148° and 185°. If wishing to communicate with the lighthouse, it should be approached between the bearings of 134° and 109°; the approach to the reef should be avoided on all other bearings.

Depths beyond the E end of Little Basses Ridge are irregular and overfalls occur.

The sea may break on any part of Little Basses Ridge with a moderate swell, where depths do not exceed 5.5m, and probably in greater depths. It is inadvisable for other than vessels of light draft to attempt to cross any part of the ridge; such vessels should cross between 2 to 6 miles SW of Little Basses Light.

Atlas Rock, with a depth of 5.5m, lies about 1.5 miles NE of Little Basses Light.

### Sri Lanka—East Coast—Illukatiya Point to Batticaloa Roads

**4.38** The coast between Illukatiya Point and Sangamankanda Point, about 33 miles NNE, is nearly all sandy and backed by jungle, which extends over low, flat ground to isolated hills inland. From there to Batticaloa Roads, about 45 miles farther NNW, the coast is cultivated in many places with coconut palms, and the land behind the coast is low and flat.

The depths off this coast are fairly regular, gradually decreasing toward the land, except N of **Arugam Bay** (6°50'N., 81°50'E.) to Sangamankanda Point.

Mayagala, 221m high, about 13 miles W of Illukatiya Point, has a remarkable cone-shaped appearance when seen from the E. Dematagala, about 2 miles ENE of Mayagala, has two summits, the higher of which is 306m high. Mandagala, 159m high, about 6 miles farther E, is conspicuous; its summit has a light-colored precipice facing E, and the top of the precipice, seen from the SE, appears clear of the summit.

Chimney Hill, about 11 miles NW of Mandagala, is unusual, appearing as a truncated cone, surmounted by a vertical rock resembling a chimney. This hill, which is isolated, can be seen outside a distance of 4 miles off the coast. **Kongola** (6°34'N., 81°42'E.) lies nearer the coast.

Asses Ears, about 5 miles NNE of Kongola, and Kudumbegala, about 2.3 miles farther NNE, are easily recognized.

Panawa, a sandy, jungle-covered ridge, terminates in a scrub-covered, rocky point, 26m high. The point, from N or S, appears as a flat-topped islet, and a stretch of bare sand lies S of the point. Bolt Point, about 2.8 miles farther N, is a scrub-covered rock, 28m high.

Nilalahela, 194m high, lies about 8 miles W of the entrance to Arugam Bay, and has two summits. The hill, from the E, appears as a single peak, steep on its S side. It is a good

landmark, as it is the highest in the vicinity, and darker than its surroundings.

**4.39 Sangamankanda Point** (7°01'N., 81°52'E.) lies close N of a long, sandy stretch of coast line; a white martello tower, 6.1m high, lies near the point. Good radar returns have been reported from the point at 17 miles.

Sangamankanda Light is shown at an elevation of 7.6m, from a white concrete tower on a brown base, at the point.

Sangaman Kanda, 86m high, lies about 3 miles WSW of the point.

Egeria Patch, a narrow ridge of coral and sand, with a least depth of 12.8m, lies with its NE extremity about 5.3 miles SE of Sangamankanda Point. The bottom has been seen clearly in 16.5m.

Komari Ridge (Komariya Ridge) lies with its N end about 1.5 miles E of Sangamankanda Point. It is composed of sand and coral, and has a least depth of 5m. The bottom is very uneven for about 3 miles seaward of the ridge; heavy breakers may be caused by winds and currents.

In the vicinity of Sangamankanda Point, several mountains form landmarks. In clear weather, **Namunakuli**, a sharp peak, 2,036m high, and **Maragal Kanda**, a long and rounded mountain, about 1,100m high, are visible about 45 and 31 miles, respectively, WSW of Sangamankanda Point.

**Westminster Abbey**, 558m high at its NW point, lies about 20 miles W of Sangamankanda Point; it is a remarkable tower-like mountain, best seen from E or S and very prominent.

**Konduruhela** (Kumburahela), 345m high, lies 12.5 miles W of the same point; it is a very prominent, isolated sugarloaf peak.

**Wadinagala**, 736m high, lies about 22 miles WNW of Sangamankanda Point and has a sharp peak, conspicuous from all directions.

**Thomson Hill** is about 10 miles NW of Sangamankanda Point; **Sharp Hill** and **Bennington Hill**, the latter wooded and wedge-shaped, lie about 1.8 miles NNE and 5.5 miles NW, respectively, of Thomson Hill.

**Friar's Hood** (7°26'N., 81°30'E.), 655m high, is well-named and shows up well among the surrounding hills. It is usually the first landmark coming from the N, is unmistakable, and readily identified from great distances in clear weather.

A cluster of red roofs is conspicuous about 10 miles N of Sangamankanda Point; a white tower, about 13 miles farther N, is also conspicuous.

The depths off the coast between Sangamankanda Point and Batticaloa Roads are regular, except for a few rocky patches within 1 mile of the coast. The 200m curve lies between 4 and 10 miles offshore; outside this curve the depths increase suddenly and heavy overfalls occur even in good weather.

**Alphee Shoal** (7°25'N., 81°52'E.), with a least depth of 5.9m, lies about 2 miles ENE of the conspicuous white tower.

### Batticaloa Roads (7°46'N., 81°41'E.)

World Port Index No. 49280

**4.40** Batticaloa Roads, an open roadstead, off the entrance of Batticaloa Lake affords good anchorage during the South-

west Monsoon, but is dangerous during the Northeast Monsoon.

The town of Batticaloa lies about 3 miles S of the lake entrance; a railroad bridge crosses the lake in the vicinity.

**Winds—Weather.**—At Batticaloa, W or SW winds prevail from February to November.

During the night and morning at Batticaloa, the wind is usually light and variable, particularly during the Southwest Monsoon, and in the transitional periods between the monsoons. In the afternoon, sea breezes, usually from NE to SE, are prevalent.

During the Southwest Monsoon, a hot, dry wind, usually W or SW, may blow down from the hills. It is most prevalent during June and July, when winds from these directions are recorded in the afternoon, on an average of 7 days per month, instead of the usual sea breeze from E.

Depressions from the Bay of Bengal may affect Batticaloa at the close of the Southwest Monsoon. The Northeast Monsoon sets in towards the end of November.

**Aspect.**—**Batticaloa Light** (7°45'N., 81°41'E.) is shown from a white tower, 28m high, on the W side of the entrance to Batticaloa Lake.

A conspicuous lattice tower, marked by red obstruction lights, stands about 1.5 miles SSE of the light.

Beacon Rock, with a least depth of 2.7m, lies about 1.5 miles ENE of Batticaloa Light, and is the outermost danger.

Brennus Shoal, with a least depth of 3.2m, lies about 1 mile NE of the same light. A 5.5m patch lies about 0.3 mile NNW of the shoal, and Tower Rock, with a least depth of 1.8m, lies about 183m SSE of the shoal.

Numerous other dangers lie between Beacon Rock and Batticaloa Light.

Surveyor Rock, with a least depth of 6.4m, lies nearly 1 mile N of Batticaloa Light. Khandalla Bank, with a least depth of 6.4m, lies about 183m SW of Surveyor Rock.

**Anchorage.**—A good berth for a large vessel, in 13.7m, lies with Batticaloa Light bearing 151°, distant 1 mile.

A small vessel may anchor, in 12m, about 0.2 mile ESE of Khandalla Bank, with Batticaloa Light bearing 176°. This is a convenient berth for communicating with the shore.

**Caution.**—Approaching from the S, a vessel should not enter into depths of less than 18.3m until Batticaloa Light bears 199°. A light-draft vessel may approach the anchorage ESE of Khandalla Bank, with Batticaloa Light bearing not less than 180°.

### Sri Lanka—East Coast—Batticaloa Roads to Trincomalee

**4.41** The coast between Batticaloa Light and Clarke Point, about 16 miles NNW, is covered with numerous coconut palms and backed by several conspicuous hills. From there to Foul Point, about 35 miles NNW, the coast is low and covered with jungle, and the hills inland are few and unimportant.

Beyond the 200m curve, along this coast, the depths increase suddenly and overfalls occur, even in good weather.

In thick weather, it is safe to navigate off this coast by remaining in depths of not less than 37m.

**Tower Hill** (7°43'N., 81°24'E.), 244m high, about 17 miles W of Batticaloa Light, is hog-backed, with a conspicuous rock, resembling a tower, on its summit.

Barons Cap, 210m high, about 7 miles N of Tower Hill, is a sugar-loaf hill; it is conspicuous when clear of other hills, especially from about due E, but from NE its top appears broader and merges with the hills farther S.

Gunner's Quoin, about 15 miles W of Baron's Cap, is a large, wedge-shaped mountain, and a good mark.

Kirimechiodai Malai (Grimechiodai Malai), 7 miles WNW of Clarke Point, is 56m high, and only seen between bearings of 247° and 292°, when it appears as a low, wedge-shaped hill with a small peak, rising steeply from S and sloping N.

Kunchan Kallu, 125m high, lies about 10.5 miles WNW of Clarke Point; from the SE it appears wedge-shaped and moderately steep-to S, but from the NE it has no well-defined summit.

Small Quoin, about 4.3 miles farther WNW, is 158m and from the SE slopes to a single rounded summit.

Baker Rocks lie on reefs extending about 1.3 miles NE of **Vandeloos Point** (7°55'N., 81°35'E.).

Clarke Point, about 4.5 miles farther NNW, is low and fringed by rocks and foul ground. Elephant Rock, 7m high and light-colored, lies close N of Clarke Point.

Challitivu Island, about 8.5 miles NNW of Clarke Point, is 9.1m high and wooded. Panditivu Munai, about 4.3 miles farther NNW, is sharp and rocky, with a small above-water rock close off it.

**4.42 Kadeawella Point** (Muricaadi Munai) (8°12'N., 81°26'E.) is fronted by rocks, the highest of which is 3m high.

Virgel Rocks (Virugel Rocks), about 2.5 miles N of Kadeawella Point and about 1 mile offshore, consist of two sunken rocks and a rock, 0.9m high.

Tree Rock, 13m high, with a tree on it, lies about 5 miles NNW of Kadeawella Point and about 0.3 mile offshore; a rock, 0.6m high, lies about 0.5 mile E of Tree Rock.

Ship Rock, 19m high, lies about 1.8 mile NNW of Tree Rock, abreast a conspicuous rock on the coast. Alligator Rock, 0.9m high, with a sunken rock close NE, lies about 1.5 miles E of Ship Rock.

The entrance of a lagoon lies about 2.8 miles N of Ship Rock. Several islets lie off the entrance; the highest islet, 18.3m high, with some trees on it, is conspicuous.

White Rock, 7.6m high, lies on the beach about 3 miles N of the lagoon entrance and shows up well during the forenoon.

Heming Rocks extend about 1.5 miles NE from White Rock; the highest rock is 6.1m high, and the outermost is 2.1m high and about 1 mile offshore.

Coral Point, about 6 miles NNW of White Rock, is surrounded by coral reef.

**Foul Point** (8°32'N., 81°19'E.), about 2.8 miles NW of Coral Point, is low, covered with coconut trees, and forms the SE entrance point of Trincomalee Bay.

Munayai Paru, a coral patch with large boulders, with a least depth of 4.3m and steep-to, lies about 1 mile NNW of Fort Point, and close off a reef extending NW of the point.

**Tides—Currents.**—Near Trincomalee, the current sets as follows:

1. October to February—usually S at 0.5 to 3 knots.

2. March and April—usually N at 0.5 to 1.3 knots.
3. May to July—generally inappreciable, but irregular currents set strongly N and sometimes S.
4. August—usually N at 0.5 to 1.3 knots.
5. September—Same as for May to July.

### Approaches to Trincomalee Harbor

**4.43** Trincomalee Harbor is approached through Trincomalee Bay, which is entered between **Fort Point** (8°32'N., 81°19'E.) and Flagstaff Point, about 5.5 miles NW. The entrance of Trincomalee Harbor lies on the NW side of the bay.

Koddiyar Bay occupies the S portion of Trincomalee Bay; Tambalagam Bay, a shallow lagoon, extends from the NW corner of Koddiyar Bay.

**Round Island** (8°30'N., 81°13'E.) lies in the W part of Trincomalee Bay, about 5.5 miles W of Foul Point. A light is shown from a white round tower, 21m high, on the summit of the island.

Depths in Trincomalee Bay, in the approach to Trincomalee Harbor, are deep.

### Trincomalee Bay—Southeast Side

**4.44** The coast between Foul Point and Norway Point, about 2.5 miles WSW, is low and fronted by a shoal bank. Northesk Rocks, a patch with a least depth of 1.2m, lies about 1.5 miles W of Foul Point.

Norway Islet, 13.4m high, lies about 0.3 mile WSW of Norway Point. Beacon Rock, 2.4m high, lies about 0.2 mile SW of Norway Islet.

Koddiyar Bay, entered between Norway Point and Marble Point, about 4 miles W, has low shores, with several rivers emptying into it.

Koddiyar Sands fronts the shore for about 1 mile E and 2 miles W of the mouth of the Koddiyar Aru. When the rivers are in flood, shoal depths extend farther seaward off the mouths of the Koddiyar Aru and the river about 1.8 miles farther W; an extension of about 91m has been recorded after heavy rains.

Brown Shoal, with a least depth of 9.1m, lies about 1.3 miles NW of the W entrance of the Koddiyar Aru.

**Elizabeth Island** (8°30'N., 81°13'E.), about 1 mile S of Round Island, consists of bare rock with a well-defined summit, 10.3m high; the island appears conical from the N. The island is surrounded by rocks and shoals to a distance of 0.2 mile, except on its E side. A beacon, 9.4m high, lies near the summit of the island.

Niger Rock lies about 0.5 mile NW of Elizabeth Island.

### Trincomalee Bay—Northwest Side

**4.45** **Flagstaff Point** (8°35'N., 81°15'E.), the NW entrance point of Trincomalee Bay, is the N end of Fort Frederick. It is a bold promontory with black vertical cliffs on its E side, which gradually diminish in height from 9.1m at Flagstaff Point, to sea level in a rocky point at the SE corner. The promontory gives a wedge-shaped appearance from the N or S as the top of the headland slopes with the cliffs. The summit, 51m high,

with a building and a radio mast marked by a red obstruction light on it, is about 0.2 mile from the N point. A large, detached rock, with perpendicular sides and a flat top, lies close off the N end of Flagstaff Point.

The Maidan, an open grassy space between the fort and the town of Trincomalee, is the SW end of Fort Frederick, where there is a fortification wall, 15m high, with bastions at each angle. The white gateway of the fort, on the S front, is very conspicuous from S, as is the Irrigation Office, a large white building near the sea, on the S front.

Dutch Bay lies between Fort Frederick and Dutch Point, about 0.7 mile S. It has low sandy shores, and the flatland, on which the S part of Trincomalee is built, stretches back to Trincomalee Harbor. Dutch Point, 34m high to the tops of the trees, has a cliffy and rocky sea face.

The N part of Dutch Bay is shoal and rocky, and Prai Malai, a small rocky islet, lies about 91m offshore. The white dome of the Roman Catholic Church, showing above the trees, is conspicuous about 0.5 mile NW of Dutch Point. The Naval Commissioner's House, a white flat-topped two-story structure, with a pillared veranda and lying among trees, is conspicuous about 137m farther N.

**Anchorage.**—During the height of the Southwest Monsoon, Dutch Bay will be found to be a more convenient anchorage for boat work than Trincomalee Harbor, as there is an excellent lee for landing anywhere along the shore, and as a rule, no swell. The best anchorage, in 12m, lies with Dutch Point bearing 174°, distant about 0.5 mile.

Rocky Point, about 0.3 mile S of Dutch Point, is the NE end of Ostenburg Ridge. The point is narrow and cliffy, and extends about 0.3 mile NE in a series of remarkable knife-edged rocks; among these rocks is a rocky pillar that very conspicuous from the N or S. The rocks forming the point diminish in height gradually, and end in a shoal ridge about 91m outside the outermost rock, where it is steep-to.

**4.46** **Chapel Point** (8°33'N., 81°15'E.), nearly 1 mile S of Rocky Point, is rocky with a rounded base, behind which the land rises steeply to Chapel Hill, 103m high. The hill forms the NE end of Elephant Ridge, and is covered with jungle; the remainder of the ridge is more sparsely wooded, and between the trees, are long vertical streaks and spaces of red earth.

Chapel Island, about 0.2 mile SSE of Chapel Point, is flat in its N part with trees and bushes, but the higher portion is bare rock, the summit consisting of a large square-topped and flat-fronted boulder.

Chapel Rock, about 0.5 mile NE of Chapel Point, is 0.9m high; a rocky ridge, with a rock awash at its outer end, extends about 0.2 mile NE from the rock.

Elephant Point, about 1.3 miles SW of Chapel Point, is low and can be easily recognized by the low bastion of an old fort at its extremity. Hoods Tower lies near the summit of a 77m hill, about 0.3 mile NE of Elephant Point.

Elephant Island, about 0.4 mile ESE of Elephant Point, is 36m high to the tops of the trees. The W part of the island is a narrow rocky point terminating in a small cone, 2.4m high.

Elephant Rock, with a least depth of 1.2m, lies about 183m W of the SW end of Elephant Island.

### Trincomalee Bay—West Side

**4.47 Marble Point** (8°31'N., 81°13'E.), about 0.8 mile WSW of Round Island, appears from the E as a small round hill, 30m high, terminating S in a low, rocky ridge, about 0.9m high.

Diamond Hill, a wooded and fairly-conspicuous peak, 78m high, rises about 0.5 mile NNW of Marble Point. White Top Rock, 6.7m high, lies close offshore about 0.2 mile NE of Diamond Hill.

Clappenburg Point, the W entrance point of Trincomalee Harbor, lies about 1.3 miles N of Marble Point. It is the E extremity of a narrow, cockscomb ridge, extending about 0.5 mile WSW and forming a straight, bare cliff on its S side; the ridge has two summits, 33 and 30m high, and small shrubs grow along the crest. About 0.3 mile WSW of Clappenburg Point, the cliffs are broken to the waterline by a precipitous gap, spanned by a narrow causeway. The part E of the gap is known as Clappenburg Island.

A conspicuous masonry beacon, 3m high, painted in black and white bands, and surmounted by a disc topmark, lies on Clappenburg Point.

Clappenburg Hill (Kodipotumalai), 110m high and covered with dense jungle, rises to a double summit, named Kari Malai Utu Malai, about 1 mile WSW of Clappenburg Point.

Grommet Rock, awash, lies about 0.5 mile S of Clappenburg Point. The rock is often not visible on a calm day, but during the Southwest Monsoon the sea usually breaks over it. A 2.3m patch lies about 0.2 mile NE of Grommet Rock.

Minden Rock, with a least depth of 3.7m, and Nade Munai Paar, a 2.3m patch, lie about 0.3 and 0.5 mile, respectively, SE of Clappenburg Point. These steep-to dangers are seldom marked by breakers or show in any way.

**Tides—Currents.**—Near Round Island, a current, apparently tidal, runs ESE and WSW, sometimes attaining a velocity of 1.5 knots.

A current has been experienced off Norway Point, setting NE at a velocity of 2 knots, out of Koddidiyar Bay.

### Trincomalee Harbor (8°33'N., 81°13'E.)

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**4.48 Trincomalee Harbor**, entered between **Clappenburg Point** (8°32'N., 81°13'E.) and Elephant Point, is the only entirely sheltered natural harbor in the South Asian subcontinent. The shores of the harbor are indented by picturesque bays and coves separated by hilly, wooded points; it also encloses several islands and islets.

The harbor, which was formerly a naval base, is now under development, to include improved alongside berthing, as a commercial port.

There are considerable depths extending about 1.3 miles within the harbor entrance, then gradually shoaling with a fair degree of regularity into the various bays and coves. Vessels of almost any size can obtain anchorage in the harbor.

**Winds—Weather.**—The climate of Trincomalee is generally healthy. The dry season is from May to September, during the Southwest Monsoon, although there is a tendency for showers in the afternoon and evening. A wind sometimes de-

velops in the harbor causing small breaking waves which may endanger boats.

During the Northeast Monsoon, there is a heavy swell on the outer beaches; wind and rain storms of short duration, but violent, occur.

**Tides—Currents.**—The tidal rise at Trincomalee is 0.7m at MHWS, and 0.5m at MHWN.

During November and December, the months with the greatest average rainfall, the surface water is practically always running out of the harbor, at velocities varying from 0.5 to 1 knot in mid-channel, but with a greater velocity near the shore. After passing Elephant Point, the current sets SE at a velocity of 1 knot.

At a depth of 18.3m, and probably at lesser depths, the water flows inward at half the velocity of the outgoing surface current. Little is known of the current inside Trincomalee Harbor during the Southwest Monsoon.

**Aspect.**—Although there are a number of piers in various parts of the harbor, the large majority of cargo is transferred by lighters.

In China Bay, Oiling Berth No. 2 and Oiling Berth No. 3 lie on the SE and NW sides, respectively, of a pier, about 0.5 mile WNW of Round Point. The berths each have an alongside depth of 10.3m and a length of 122m. It was reported (1978) that the pier was unsafe for ocean-going vessels to berth alongside.

Oiling Berth No. 1 lies about 0.2 mile W of Round Point and can accommodate vessels up to 200m in length with a draft of 9.7m.

Prima Jetty, a T-headed jetty, is situated SW of Round Point. It is flanked by dolphins and can accommodate vessels up to 230m in length and 70,000 dwt. There is an alongside depth of 13m.

**Pandi Aricha Munai Paar** (8°32'N., 81°13'E.), a shoal with a least depth of 4.6m, lies about 0.2 mile ENE of Clappenburg Point, the W entrance point of the harbor. The shoal is marked SE by a red can buoy.

The W side of Trincomalee Harbor is indented by four principal bays, which also contain several coves.

Clappenburg Bay lies on the N side of Clappenburg Island. Clappenburg Wharf lies at the head of the bay.

Great Sober Island, in the SW part of the harbor, is dominated by Gravel Hill, 70m high, the wooded summit of the island. A causeway, carrying a water pipeline, joins the NW part of Great Sober Island to a boulder strewn spit extending NE from the coast.

Small Sober Island, 35m high, lies close E of Great Sober Island, to which it is connected by a ruined causeway. Eagle Point, the E extremity of Small Sober Island, is marked close S by a beacon. A lighted buoy, painted in red and white stripes, is moored about 91m SSW of the beacon. A small 12.8m patch lies about 0.2 mile N of Eagle Point.

Orlando Cove lies N of Little Sober Island, on the E side of Great Sober Island.

Round Point, the N entrance point of Malay Cove, lies about 1 mile NW of Eagle Point. Sister Shoal, with a least depth of 2.7m, lies in the entrance of Malay Cove, about 0.5 mile S of Round Point. There is a 3.7m shoal patch 162m S, and a foul area about 0.2 mile SW, respectively, of Sister Shoal.

China Bay lies N of Malay Cove and is separated from it by a promontory terminating in Round Point, on which Mount Challenger lies, rising to a height of 56m, 0.4 mile WSW of the point.

A conspicuous flour mill and silos, marked by red obstruction lights, stand 0.2 mile WSW of Round Point. On the S side, the mill is fronted by a quay, 183m long and flanked by dolphins, used by bulk carriers to supply the mill.

Round Point Shoals consists of two shoal patches, about 183m apart, lying about 0.1 mile N and 0.2 mile NW, respectively of Round Point. There is a least depth of 3.7m over the E shoal, which is marked SE and SW by buoys. The W shoal, marked NW by a buoy, has a least depth of 4.6m.

Harden Buoy, a can buoy painted in black and white checkers, is moored close E of a 4.1m patch, about 0.5 mile WNW of Round Point.

Cod Bay, at the head of the harbor, is entered between Middle Point (8°34'N., 81°12'E.) and Cod Point, about 0.2 mile WNW.

Railway Spit Buoy, a can buoy painted in black and white checkers, is moored close E of two shoal patches, about 0.3 mile SW of Middle Point.

Elephant Point, previously described in paragraph 4.46, is the E entrance point of Trincomalee Harbor, and the SW extremity of Elephant Ridge.

Ostenburg Point, about 0.5 mile NW of Elephant Point, lies at the SW extremity of Ostenburg Ridge. Ostenburg Light is shown from a lantern on the SW corner of a wall of a conspicuous building, about 1,137m N of Ostenburg Point. A radio mast is situated about 0.8 mile E of the light. Elephant Ridge and Ostenburg Ridge, two straight-topped hills, parallel to each other, form the S part of the E shore of Trincomalee Harbor.

Dockyard Shoal, consisting of two rocky heads with depths of less than 1.8m, lies about 0.5 mile N of Ostenburg Point. Buoys are situated close NW of the inner head and close SW of the outer head.

York Shoal, about 0.3 mile NNW of Dockyard Shoal, lies at the end of a spit extending about 0.4 mile WSW of York Island. A red conical buoy and a lighted buoy are moored SW and WNW, respectively, of the shoal. Koroela Rock, about 91m N of York Shoal, has a least depth of 4.2m and is marked NW by a red conical buoy.

Kachcheri Bay and Powder Bay lie in the area between Ostenburg Point and Plantain Point, about 1.7 miles NW. Powder Island, separating the two bays, is 9m high to the tops of the trees and is connected to the coast by a causeway.

Powder Rocks, a group of low, black rocks, lie near the SW end of the shallow spit on which Powder Island lies. The highest rock is 2.7m high, with some mangrove bushes on it.

Powder Spit buoy marks the W end of shoal water surrounding Powder Rocks.

Plantain Point is the SW end of a narrow, wooded peninsula; Orrs Hill, 31.4m high, about 0.5 mile NW of the point, is the summit of the ridge. A white cylindrical beacon stands on the point, with a lookout tower about 0.2 mile NE. There are a number of houses on the point, partially obscured by trees. A shoal spit extends about 0.1 mile SW of Plantain Point.

Yard Cove is entered W of Plantain Point.

**Pilotage.**—Pilotage is compulsory and is available during daylight hours only. The vessel's ETA, together with a danger-

ous cargo declaration, should be sent through Colombo at least 24 hours in advance. The pilots board 0.2 mile N of Round Island.

Vessels awaiting a pilot should anchor 0.5 mile NW of Round Island; if arriving between 1800 and 2100, vessels may be brought in at the discretion of the Deputy Master Attendant.

Vessels embarking a pilot should preferably lower an accommodation ladder; if this is not practicable they should let down a pilot ladder and two stout man ropes.

Vessels can communicate with the pilot station via VHF.

**Regulations.**—There is a naval signal station near Ostenburg Point.

Vessels may enter during daylight hours only.

The Port Health Officer boards vessels after arrival at the anchorage; pratique for vessels arriving from another port in Sri Lanka is automatic.

**Signals.**—The following signals, consisting of flags from the International Code of Signals, are required from all vessels arriving off the port:

1. Flag Q by day, or red and white lights, vertically displayed, at night—The vessel has not yet received pratique.
2. House flag under the ensign at the stern, by day, or white light under stern light, at night—Restricted pratique has been granted.
3. Signal QQQ by day, or three green lights, vertically disposed, at night—The vessel is infected.

**Anchorage.**—A good anchorage can be found in almost any part of Trincomalee Harbor during fair weather. The most sheltered anchorage in the harbor is in Orlando Cove, in 28m, with the NE point of Great Sober Island bearing 316°.

Anchorage in the approaches to the port is only permitted to vessels awaiting a pilot, but vessels may find sheltered and convenient anchorage in Dutch Bay, Orlando Cove, and NW of Round Island.

**Directions.**—Approaching from the S, pass 2 miles E of Foul Point, steering 314° until Round Island bears 235°; steer for it on that bearing until the beacon on Clappenburg Point bears 295°. Then head for the beacon on that bearing until Round Island Light bears 168°, when course should be altered NNW into the harbor, keeping the same light bearing 168° astern.

Approaching from the N, keep Foul Point Light bearing 179° until Round Island Light bears 236°; steer for it on that bearing until the beacon on Clappenburg Point bears 295°, then proceed as directed above.

At night, approaching from S, do not bring Foul Island Light to bear less than 193° until Round Island Light bears 247° on this bearing the sector changes from red to white. Keeping in the white sector, steer for the same light until Foul Point Light bears E. Then alter course to W, keeping Foul Point Light bearing 090° astern, and passing through the red sector of Round Island Light. On entering the white sector of Round Island Light, alter course to 348° keeping the same light astern in the white sector, bearing 168°.

Approaching from the N at night, keep Foul Point Light bearing 179° until Round Island Light bears 236°. Keeping in the white sector, steer for Round Island Light on the same bearing until Foul Point Light bears E, then proceed as directed above.

**Caution.**—All anchorages and landings in the approaches to Trincomalee and those within the harbor are subject to security clearance from the Sri Lanka Navy and prior notification to the pilot station before use.

Firing practice areas are centered 17 miles NE and 23 miles ESE of Trincomalee Harbor.

### Sri Lanka—East Coast—Trincomalee to Point Pedro

**4.49** Back Bay, entered between **Flagstaff Point** (8°35'N., 81°15'E.) and Elizabeth Point, about 3 miles NNW, is largely used by local craft trading with Trincomalee during the Southwest Monsoon.

The SE side of the bay, formed by the NW side of Fort Frederick, has a rocky shore with steep, wooded, and grassy slopes above. The W shore of the bay, between Fort Frederick and Red Bluff, about 3 miles NNW, is formed by a smooth sweep of sand, backed by a low shore fringed with coconut palms; farther inland is a low range of wooded hills. Red Bluff consists of two patches of bare, earthy cliffs, 14m high and covered with jungle.

Back Bay Light is shown during the Southwest Monsoon from a house about 0.8 mile WSW of Flagstaff Point.

Bazaar Rock, 0.6m high, lies on the outer part of a reef, surrounded by foul ground, extending about 0.3 mile NNE from the beach, about 1 mile W of Flagstaff Point.

Elizabeth Point is low and not easily distinguished, the land behind being slightly elevated, wooded, and fronted by coconut trees. Coral reef extends about 183m offshore SW of the point.

Lively Rocks lie at the E end of a shoal spit, extending about 0.5 mile E of Elizabeth Point. Two of these rocks are always above-water; one of these is 0.6m high; the sea nearly always breaks on another of these rocks.

Anchorage may be taken anywhere in Back Bay during the Southwest Monsoon, but it is dangerous during the Northeast Monsoon. The most convenient berth, in 14m, sand, lies with Flagstaff Point bearing 137°, distant about 0.6 mile.

The coast between Elizabeth Point and Koduwakattu Malai, about 17 miles NW, consists of long, sandy beaches fronting several lagoons. The shore is generally wooded and backed by low hills. Reefs and foul ground extend over 1.5 miles offshore between Elizabeth Point and Ava Point, about 7 miles NNW, and for about 1 mile offshore between Ava Point and Koduwakattu Malai, about 10 miles farther NW.

**Caution.**—A number of rocks and shoals, lie off this section of coast, and uncharted dangers may lie within the 20m curve.

Nilaveli Hill, 55m high and shaped like a sugarloaf, is conspicuous about 3 miles NNW of Elizabeth Point; radio masts are conspicuous about 1.5 miles farther N.

Malai Porru Putta Paar, with a least depth of 4.3m, lies about 1 mile NE of Elizabeth Point. This dangerous shoal is steep-to and the sea does not break over it. The E extremities of Fort Frederick and Chapel Island, in line bearing 179°, lead E of this danger.

Fairlie Rocks, awash, extend 0.5 mile offshore E of Nilaweli Hill. Diomedea Rock, awash, and a 3m depth lie about 1.8 miles NE and 2.3 miles ENE, respectively, of Nilaweli Hill.

Pigeon Island, 30.2m high and rocky, lies about 2 miles ESE of Ava Point. Shoals extend E, and a rocky islet lies about 0.7 mile SSE of the island.

**Caution.**—At night or in thick weather, vessels should not approach the coast between Elizabeth Point and Pigeon Island in depths of less than 46m.

Foul ground extends about 1.3 miles ENE from Ava Point.

**4.50** Andamban Malai, a rounded hill 116m high, lies about 5 miles WNW of Ava Point. Pinnacle Rock, a sharp finger-like peak, 65m high, is conspicuous about 1.3 miles NE of Andamban Malai.

Flat Rock, 6.4m high, lies about 5 miles NW of Ava Point. Pinnacle Rock, 1.5m high, with a shoal area extending E, lies about 1 mile SSE of Flat Rock.

**Koduwakattu Malai** (8°52'N., 81°05'E.) is the N of two rocky headlands separated by a sandy bay. A framework tower, 61m high, is conspicuous about 0.8 mile S of the point. Another tower stands about 2.3 miles farther SSE. A group of rocks, one of which is 6.1m high, lies about 2 miles WNW of the point. Good radar returns have been reported from the point at 17 miles.

**Anchorage.**—During the Southwest Monsoon, vessels may obtain sheltered anchorage up to 2 miles offshore S of Koduwakattu Malai, in depths of 18.3 to 28m, mud, and farther NW along the coast, in 16.5 to 18.3m.

Shoulder Point, a low rocky headland, lies about 6 miles NW of Koduwakattu Malai. It is fringed by reefs with two rocks 4.5 and 6.1m high. A light is shown from the point. A dangerous reef, on which the sea breaks, and which was not examined in 1945, lies about 1 mile SE of Shoulder Point.

**Black Point** (9°06'N., 80°54'E.) has conspicuous cliffs, 36m high, close N. The entrance to a lagoon, N of the cliffs, is also conspicuous.

**Mullaittivu Light** (9°16'N., 80°49'E.) is shown from a metal framework obelisk with a dome top, 19.8m high, in the village of Mullaittivu. Mullaittivu Shoals, with depth of less than 9.1m, extend about 7 miles N from a position 4 miles SSE of Mullaittivu Light. These shoals also extend about 3 miles E of Mullaittivu Light; rocks, with depths of less than 1.8m, lie between 1 and 2 miles NNE and NNW of the lighthouse. During the Northeast Monsoon the sea breaks heavily on the N side of Mullaittivu Shoals.

**Caution.**—Vessels should not approach the coast within 2 miles between Shoulder Point and Mullaittivu Shoals; there are no reported off-lying dangers with the possible exception of a 9.1m patch and an 11.3m patch, about 1 mile NE and 3.3 miles N, respectively, of Shoulder Point.

Vessels passing Mullaittivu Shoals should not approach within depths of 37m.

**4.51** A conspicuous hillock lies about 4.5 miles NW of Mullaittivu.

About 8 miles farther NW, a gap appears distinctive between the bearings of 200° and 248°; a conspicuous tree lies on the NW side of the gap.

Another very distinctive gap in the coast, with a conspicuous tree SE, lies about 3.5 miles NW of the above gap.

Chundikkulam, about 2.5 miles farther NW, has several gaps SE which are not always visible, but are conspicuous at times.

**Kaddaikadu** (9°34'N., 80°29'E.), about 8 miles NW of Chundikkulam, has a church which is conspicuous between the bearings of 180° and 200°.

Pedro Channel South Obelisk, a white obelisk, 15m high, surmounted by a white diamond, is conspicuous about 2 miles NW of Kaddaikadu; the top of the obelisk has a height of 22.2m.

Saint Anthony's Church lies 4.5 miles NW of the obelisk. Saint Mary's Church, with a red roof, at Kudarappu, about 4 miles farther NW, is visible at intervals between the trees.

Pedro Channel Middle Beacon, a concrete beacon, painted in black and white bands, lies about 1.3 miles NNW of Saint Mary's Church.

Some very conspicuous sand dunes lie near the coast about 4.5 miles NW of Saint Mary's Church. A Hindu shrine, visible from seaward and close to a red-roofed church, stands about 1.5 miles NW of the sand dunes.

There are several other Hindu shrines at Manalkadu and Katkoyalam, about 2.5 and 5 miles, respectively, NNW of the sand dunes. Manalkadu Church was reported to be distinctive between the bearings of 188° and 270°.

The coast between Katkoyalam and Point Pedro is lined with casuarina trees and palms, about 21m high.

**4.52 Point Pedro** (9°50'N., 80°15'E.), the NE point of Sri Lanka, is marked by Point Pedro Light, shown from a white masonry tower, 32m high.

Point Pedro Shoal, with depths of less than 9.1m, lies roughly parallel with the coast and from 3 to as much as 8 miles offshore. From abreast Point Pedro, it stretches about 23 miles SE, and several miles NW. Stork Shoal, with a least depth of 1.8m, about 6 miles ESE of Point Pedro, and Ethiopia Shoal, with a depth of 2.3m, about 3.5 miles farther SE, are the two shallowest heads.

Pedro Channel, the passage between Pedro Shoal and the coast, has depths of 11.4 to 14.6m.

Point Pedro, a town and port open from mid-February to mid-October, lies about 0.8 mile W of Point Pedro. There is a custom house with a red roof and several bungalows in the vicinity. It has been reported (2002) that a small dolphin jetty at Point Pedro can work lighters of up to 2.5m draft.

**Anchorage.**—Good anchorage can be obtained in any part of Pedro Channel, except in the prohibited anchorage area near Point Pedro.

**Directions.**—A vessel passing outside of Pedro Point Shoal should not approach land inside depths of 37m by day, or inside depths of 46m at night, between **Pigeon Inland** (8°43'N., 81°12'E.) and Point Pedro.

A vessel proceeding through Pedro Channel should pass Mullaittivu Shoals in a depth of not less than 37m, and should not approach the coast NW of these shoals inside depths of 18.3m, until Pedro Channel South Obelisk bears 280°. The coast should then be approached on this bearing, as discolored water and shallower depths than charted have been reported in this vicinity. This course leads N of the shoals extending NW from Mullaittivu and S of the SE end of Point Pedro Shoal. After clearing the latter shoal, alter course NW keeping about 1.5 miles off the coast.

**Caution.**—During SW winds, a red sand-haze forms over the land between Mullaittivu and Point Pedro; the haze may reduce coastal visibility to about 3 miles.

The best time to make the obelisk is during the forenoon, so as to arrive at the S end of the channel about noon. The obelisk will then be visible from the N until the high trees and light structure at Point Pedro are made out, and there will be no difficulty in avoiding Ethiopia Shoal.

## Palk Strait

**4.53 Palk Strait** (10°00'N., 80°00'E.), forming the N entrance to Palk Bay, lies between the N coast of Sri Lanka and the E coast of India. The strait is occupied largely by banks, with depths of from 5.5 to 9.1m, and by numerous shoals with less depths over then.

The three principal entrance channels are South Channel, Middle Channel, and North Channel. South Channel, consisting of East Channel and West Channel, and North Channel are generally used by local vessels. Large vessels use Pedro Channel and West Channel.

**Tides—Currents.**—The tidal rise in Palk Strait (Point Pedro) is 0.7m at MHWS, and 0.5m at MHWN.

The tidal currents in Palk Strait and Palk Bay are irregular, being influenced by the prevailing winds. During February, March, and April the tidal currents are more regular, changing every 6.5 hours at high and low water in the bay. They set W during the rising tide and E during the falling tide at Trincomalee.

From West Channel to Delft Island, about 18 miles SSW, the tidal currents follow the direction of the coast, setting SW and SE during the falling tide at Trincomalee. At springs, the currents reach a velocity of nearly 1 knot in Delft Channel and about 0.8 knot in the West Channel.

Currents generally set with the wind, except in May and October when they are variable. During February, March, and April, in a calm, there is no current in the entrance of Palk Bay.

In the middle of Palk Bay, the current sets leeward in either monsoon.

When a N current is running outside Palk Strait, a current setting out of the strait is usually found. When a S current is running, it is presumed that the reverse takes place. Close inshore, tidal currents are felt, and they vary the strength of the current in the vicinity of Middle Banks.

**Depths—Limitations.**—**South Banks** (9°57'N., 79°57'E.) consist of a number of shoals with depths of less than 5.5m. Depths of 7.3 to 9.1m extend E of these banks to join Point Pedro Shoal, N of Point Pedro. A depth of 5.5m was reported (1973) to lie in approximate position 10°01'N., 80°03'E.

Middle Banks consist of numerous shoals, with depths of less than 5.5m, lying N of South Banks. The banks include Eight Foot Bank, with a least depth of 2.3m, about 6.5 miles S of **Point Calimere** (10°17'N., 79°53'E.).

South Channel consists of E Channel and West Channel. East Channel, with a least depth of 7.3m, lies between South Banks and Point Pedro Shoal; a depth of 5.5m was reported (1973) about 16.5 miles NW of Point Pedro. The channel, with a least depth of 10.1m in the fairway, lies between South Banks and the shoal water extending NW from **Karaitivu** (9°44'N., 79°53'E.). A least depth of 10.7m could be carried (1944)

through West Channel over a width of 0.3 mile, but local knowledge is necessary to ensure safe navigation in this depth.

Middle Channel, between South Banks and Middle Banks, is about 4 miles wide, with a least depth of 4.6m in the center of the channel; elsewhere the least depth in this channel is 5.5m.

North Channel, between Middle Banks and Point Calimere to the N, has a least depth of 5.9m over a width of about 1.8 miles, between the shore bank fringing Point Calimere and a 4.1m patch about 4 miles SSE of the point.

**Caution.**—It has been reported (1993) that vessels may not use Palk Strait and the E territorial waters of Sri Lanka without prior permission of the Sri Lankan Naval Command.

### Palk Strait—South Side (Sri Lanka)

**4.54** The S shore of Palk Strait is formed by the N coast of the Jaffna Peninsula, which extends about 21 miles WSW from **Point Pedro** (9°50'N., 80°15'E.). This coast is generally low and sandy, with some cliffs and sandhills visible from seaward. It is backed by salt water lagoons and stony plains. The Jaffna Peninsula is most fertile, being irrigated from numerous wells.

The coast from Point Pedro to Palmyra Point, the N extremity of Sri Lanka, then to Tondaimanar, 4.5 miles farther WSW, is lined with palmyra and coconut palms from 21 to 27m high, and fringed by a narrow reef extending up to 183m offshore. Tondaimanar is marked by a cliff, 7.6m high; the lagoon entrance close W serves as a leading mark for East Channel.

Between Tondaimanar and Kankasanturai, about 5.5 miles W, the coast is stony, lined with tall palms, and fringed with a reef. Vessels should not approach within 0.5 mile of this coast.

**Kankasanturai** (9°49'N., 80°03'E.) (World Port Index No. 49300) is the chief port of call on the N coast of Sri Lanka, for vessels during the Southwest Monsoon. It has considerable trade with ports in S India, and there is a custom house.

There are two stone bastions on the beach and a small pier. A light is shown from a round masonry tower, 22.3m high, near the W bastion.

Cargo boats, which may be used as lighters, anchor off the beach during good weather; lighterage operations are only conducted from March to October during the Southwest Monsoon.

A chimney, about 61m high, of the cement works, is conspicuous about 1 mile WSW of Kankasanturai. There are two radio masts at Jaffna Airport, about 2.5 miles ESE of the port.

A breakwater extends about 0.5 mile NW from the shore 0.5 mile W of Western Bastion. A spur extends 0.2 mile W from the breakwater near its NW end; a quay for vessels discharging coal and gypsum for the cement works was under construction in 1983 on the S side of the spur.

There is a berth for coastal vessels drawing up to 4.2m on the SW side of the breakwater near its root.

Vessels of 20,000 dwt, with a draft of 7.3m, berth between two mooring buoys at the harbor entrance until the quay has been completed.

Anchorage for vessels waiting to berth can be obtained about 0.5 mile NW of the breakwater head. A pilot will board at the anchorage. Vessels not supplying the cement works anchor off the beach near Western Bastion in good weather.

The coast between Kankasanturai and the NW extremity of the Jaffna Peninsula, about 9 miles WSW, is bordered by palmyra and coconut palms, and fringed by coral reef. A conspicuous sand hill lies about 1 mile W of Matakal, a village about 5 miles WSW of Kankasanturai.

A bank, with depths of 5.5m and less, extends up to 2 miles offshore in places off the NW end of the Jaffna Peninsula. A 3.2m coral patch lies near the outer edge of this bank, nearly 1.8 miles NW of the conspicuous sand hill W of Matakal.

**Karaitivu** (9°44'N., 79°53'E.), off the NW end of the Jaffna Peninsula, has a sandhill, 6.1m high, on the NE point of the island; the sand hill has some palms on it and is conspicuous from NW. A light is shown from a white masonry tower, 29.5m high, on Kovilan Point, the NW extremity of Karaitivu.

A flat, with depths of less than 5.5m, fronts the W side of Karaitivu, extending up to 3 miles offshore. Several shoals, with depths of 3.7 to 5.5m, lie N and NW of this flat, and with Kovilan Point bearing between 125° and 075°; the outermost of these shoals, with a least depth of 4.1m, lies about 5.8 miles WNW of Kovilan Point.

### Palk Strait—North Side (India)

**4.55** The N shore of Palk Strait consists of the low-lying coast between **Point Calimere** (10°17'N., 79°53'E.) and a low point, about 39 miles WSW, which projects from the coast close S of the entrance to the Vellar River.

Point Calimere Light is shown from a concrete tower, 18.2m high, close within the point; a racon transmits from the tower. A drying sand bank, inside of which local craft find shelter in bad weather, extends about 1.5 miles NE of the point.

Between Point Calimere and Atirampattinam, about 29 miles W, the coast consists of mud flats, covered with mangrove bushes, and flooded during heavy rains and high spring tides.

Atirampattinam (Adirampatnam) is a port of refuge for local craft between May and September. It has a considerable local trade, principally with Sri Lanka.

Shaullavanaigenpatam, about 6 miles SW of Atirampattinam, has a high column which is conspicuous and visible 15 miles.

Anchorage may be obtained, in about 5.8m, soft mud, with the white tall mast at Atirampattinam bearing 000°, about 4.5 miles, and with the column at Shallavanaigapatam bearing 281°. Smaller vessels may anchor closer to the town. With S or SE winds, a heavy swell sets on this coast making the anchorage unsafe, but during the Northeast Monsoon it is considered good.

A spit of hard sand, with depths of less than 5.5m, extends 13 miles ESE from the low point close S of the entrance to the Vellar River. A detached 5.5m patch lies about 1 mile SE of the outer end of the spit.

A heavy swell generally runs over the spit and it should not be approached from the E within a depth of 11m.

Large vessels should use Pedro Channel and West Channel. The least depth in the fairway of West Channel is 10.1m.

Vessels intending to enter through South Channel should make for a position about 12.5 miles N of **Tondaimanar** (9°49'N., 80°08'E.); when the lagoon entrance close W of the village can be distinguished, it should be steered for bearing 185° until depths increase to 11m. Then alter course W towards

the entrance to West Channel, keeping in depths of 11 to 12.8m.

At the E entrance to West Channel, with Kovilan Light bearing about 158° and the obelisk on the N end of **Analativu** (9°41'N., 79°47'E.) bearing about 207°, a course of 281° should be made good through West Channel, exercising great care, by keeping in the middle of the fairway to avoid the bank off Matakal and the shoals extending NW of Karaitivu.

Vessels intending to enter Palk Strait through North Channel should sound continuously, and if coming from the SE, should not get into depths of less than 14.6m until Point Calimere can be distinguished.

**Caution.**—Many fish traps are laid off the N coast of Sri Lanka and constitute a danger to powered vessels, especially at night, due to the large blocks of wood and strong moorings attached to them.

## Palk Bay

**4.56 Palk Bay** (9°30'N., 79°30'E.), the continuation S of Palk Strait, is bounded on the E by the coast of Sri Lanka, on the S by Mannar Island, Adam's Bridge, and Pamban Island, and on the W by the coast of India.

The bay has general depths of 11 to 12.8m, but on its E side depths of 9.1m and less extend up to 15 miles from the coast of Sri Lanka, and within it are several islands, rocks, and shoals. On the S side of the bay depths of less than 9.1m extend up to 7 miles from the coast. The NW part of the bay has not been fully surveyed.

## Palk Bay—East Side (Sri Lanka)

**4.57** A flat, with depths of less than 5.5m, extends about 10 miles W of the W end of Jaffna Peninsula; several islands and shoals lie on this flat, and enclose a large basin with depths of 2.3 to 3.2m.

**Karaitivu** (9°44'N., 79°53'E.), the northernmost of the islands, was previously described in paragraph 4.54.

Eluvativu, about 2.5 miles WSW of the S end of Karaitivu, is low and covered with tall trees.

Analativu, about 1.5 miles SW of Eluvativu, is covered with tall trees; a white obelisk, 26.8m high, is conspicuous at its N end.

Nayinativu, 1.5 miles S of Analativu, also has tall trees on it; there is a conspicuous small temple, with a red roof, near the SW end of the island.

Punkudutivu, separated from Nayinativu by a channel about 1 mile wide, is planted with some coconut palms. Punkudutivu Light is shown from a conspicuous stone building near the SE end of the island.

Velanai, NE of Punkudutivu, is the largest island of the group. Mandaitivu, separated from Velanai by a narrow channel, is marshy in its N end, but there are some coconut palms on its S end.

**Kayts** (9°42'N., 79°51'E.) is a small port on the N end of Velanai, near the middle of the S side the channel separating Velanai and Karaitivu. The port is open throughout the year, but is most frequented during the Southwest Monsoon.

Fort Hammenhiel, the quarantine station, lies about 0.3 mile SW of the SW extremity of Karaitivu. A light is shown from a structure on the fort.

Anchorage may be obtained, in 7.3m, sand, with the N point of Eluvativu bearing 135°, distant 1 mile. Small local vessels anchor, in about 3.7 to 5.5m, from 1.5 to 3 miles NW of Fort Hammenhiel, and discharge part of their cargo before entering port.

**4.58 Delft Island** (9°31'N., 79°41'E.) is separated from Nayinativu by Delft Channel. Tall palm trees are on the W and NE parts of the island, while the S part is grassland, divided by loose stone walls, with trees about 6.1m high. When seen from some distance N, the island appears as two islands, due to a shallow salt water lake which occupies the middle of the island.

A white iron framework beacon, 16.1m high and surmounted by a white disc, marks the NW extremity of Delft Island. A light for the use of fishermen is shown from the NE extremity of the island. A beacon, consisting of a white brick tower with an elevation of 14.6m, marks the SE extremity of the island.

Temporary anchorage, during strong NE winds, may be obtained off the W side of Delft Island, with the S end of the high palms bearing 067°.

The fairway of Delft Channel has a least depth of 9.1m over a width of about 1.5 miles between the 10m curve lines off Nayinativu and the NE extremity of Delft Island; a depth of 9.1m can be carried over the N end of the shoal bank which extends NNE from Delft Island.

Neduntivu Shoal, with a least depth of 3.7m, lies on the W side of the channel, and extends from 0.5 mile to 2.5 miles NNW from the NE extremity of Delft Island.

On the E side of the channel, a narrow detached shoal ridge of sand and coral, with depths of 4.9 to 5.5m, lies about 0.6 mile off and nearly parallel with the W side of Nayinativu.

Kakerativu (Kakeraitivu), about 9.8 miles ESE of Delft Island, is a sandy islet, 4.6m high and covered with scrub. A conspicuous white framework beacon, 16.1m high and surmounted by a white disc, stands on the SW side of the island.

Palaitivu, 8 miles ENE of Kakerativu, is mostly covered with coarse grass and scrub, up to 6.1m high. A white tower, 7.6m high, stands near the NE end of the island.

A rocky shoal, with a least depth of 1.2m, lies about 4 miles NW of Palaitivu.

Jaffna Lagoon, a large, shallow expanse of water, is entered between **Kalmunai Point** (9°36'N., 80°03'E.) and Mandaitivu, about 3 miles W. A white tower, 7.6m high, stands on Kalmunai Point.

A light is shown from Jaffna Obelisk, a white concrete tower about 2 miles NW of Kalmunai Point.

**Jaffna** (9°39'N., 80°01'E.), the principal town of the Jaffna Peninsula, lies on the N shore of Jaffna Lagoon, about 4 miles NW of Kalmunai Point.

A radio mast, 21.3m high and marked by a red obstruction light, stands in Jaffna, about 2.3 miles NW of Jaffna Obelisk.

The Northeast Monsoon prevails at Jaffna from the end of November to February; the Southwest Monsoon blows from the middle of May to October. The prevailing winds are SE during March and the first half of April.

**Irnativu North** (9°17'N., 79°59'E.) and Irnativu South are two low, coral islands, separated by a canoe passage. Irnativu North, the W island, has a village lying among palms in its N part; a tower, with an elevation of 16.1m, stands near the NE end of the island.

### Palk Bay—South Side

**4.59 Talaimannar** (9°06'N., 79°43'E.), near the W end of Mannar Island, is connected to the railway system of Sri Lanka. A pier extends about 264m N of the coast at Talaimannar; the pier support a double railway track, and has depths of 3m at its head. There is regular ferry service between Talaimannar and Dhanushkodi, about 19 miles WNW.

Mannar Island Light is shown from a conspicuous white concrete tower at the root of the pier.

Pamban Island and Adam's Bridge have been previously described in paragraph 4.11; Mannar Island has been previously described in paragraph 4.12.

**Dhanushkodi** (9°11'N., 79°25'E.), about 2 miles NW of Lands End, is connected to the railway system of India. A pier, for use by vessels of the ferry service between Dhanushkodi and Talaimannar, extends from the NE coast of Pamban Island abreast the town. The pier is 219m long, with depths of 3.4m on each side of the pier head; the pier carries a double railway track.

**Kachchaitivu** (Kachchtivu) (9°23'N., 79°25'E.), about 10 miles SW of Delft Island, is 12m high and covered with scrub. There is a well and a small shrine on the NE side of the island. Depths of less than 9.1m extend 1 mile SE of the island.

Depths of less than 5.5m extend about 2.5 mile NE from the broad peninsula extending N from Pamban Island.

**4.60 Pamban** (9°17'N., 79°13'E.) (World Port Index No. 49330), administered by a conservator, lies close N of the W extremity of Pamban Island. Cargo is handled by lighters to and from the beach.

South and SW winds prevail from April to October. Pamban Light is shown from a conspicuous white tower on a sandhill on the NW point of Pamban Island. NE Beacon, 5.5m high and white, lies close N of the light.

Kanthe Thuki Reef, composed of partly drying coral heads, lies between 0.3 and 0.5 mile W of Pamban Island Light. A

boat channel between this reef and the coast is used by pilots when boarding vessels during the Northeast Monsoon.

Outer Fairway Buoy, painted in black and white checkers, is moored in the N approach to Pamban Pass, about 0.3 mile NW of Kanthe Thuki Reef, and about 0.7 mile WNW of Pamban Island Light.

Anchorage may be obtained, in 6.7m, mud, good holding ground, with Pamban Island Light bearing between 122° and 134°, distant 1 mile.

Good anchorage may be obtained, in 10m, mud, with Pamban Island Light bearing 135°, distant about 3.3 miles.

Pamban Pass was previously described in paragraph 4.9. The channel N of the rolling lift-bridge over Pamban Pass is marked by buoys and beacons.

The coast from **Ramen Point** (9°17'N., 79°11'E.) to Devipattanam, about 21 miles NW, is generally low and level.

Kathu Vallimuni Reef, consisting of scattered coral heads, extends up to 0.5 mile offshore, and lies parallel with the coast for about 1.8 miles W of Ramen Point. There are several heads, which dry 0.6m, at the E end of the reef.

Vella Pertumuni Reef extends about 3 miles W of Kathu Vallimuni Reef, from which it is separated by a boat channel.

A water tower, 17.7m high, consisting of a red square tank on a framework structure, is conspicuous about 3 miles W of Ramen Point.

The town of Attangarai lies on the NW side of the entrance of a river, about midway along this stretch of coast. A detached 6.9m patch lies about 7.5 miles NE of the river entrance.

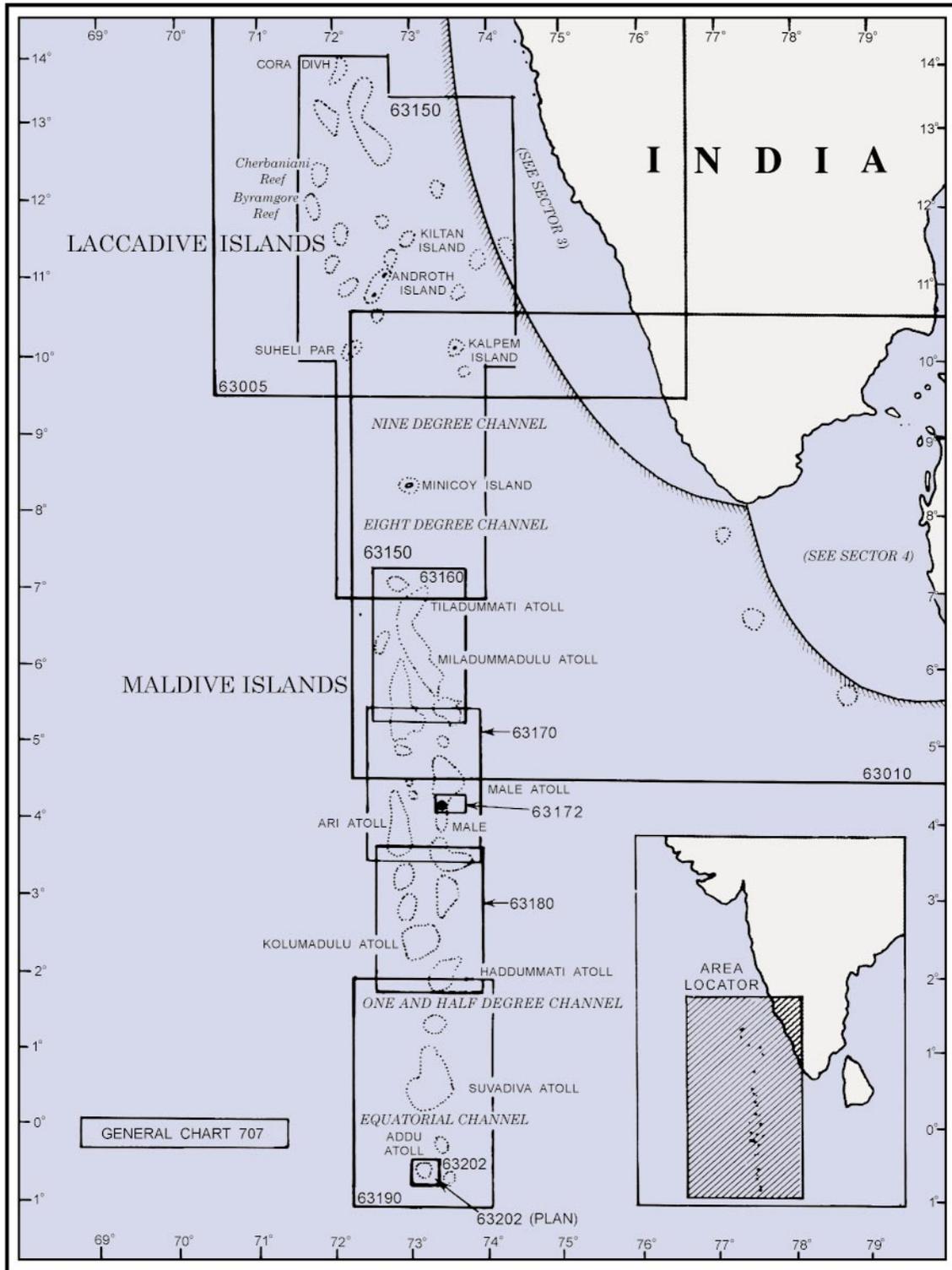
### Palk Bay—West Side (India)

**4.61** The W shore of Palk Bay between the low point S of the **Vellar River** (10°04'N., 79°14'E.) and Devipattana, about 40 miles SW, is generally low and level. Depths of 5.5m and less extend from 3 to 5 miles off this coast.

Pasipattanam Mosque stands on the coast, about 17.5 miles SW of the above low point.

**Tondi** (9°45'N., 79°01'E.), about 5 miles farther SW, is a small port for local coasting craft. Two white masonry beacons, 4.5m high, mark the port limits.

Anchorage may be obtained, in 8.2m, mud, with Tondi Light bearing 295°, distant 5 miles, but this position is exposed to all but offshore winds. Small vessels anchor nearer the town, in about 4.9m, stiff mud.



Additional chart coverage may be found in NGA/DLIS Catalog of Maps, Charts, and Related Products (Unlimited Distribution).

**SECTOR 5 — CHART INFORMATION**

## SECTOR 5

### THE LACCADIVE ISLANDS AND THE MALDIVE ISLANDS

**Plan.**—This sector describes the islands, atolls, and reefs which make up the Laccadive Islands and the Maldive Islands. The arrangement of the sector is from N to S.

#### The Laccadive Islands

**5.1 The Laccadive Islands** (10°00'N., 72°30'E.), meaning the hundred thousand islands, consist of a group of coral atolls lying between 115 and 215 miles off the SW coast of India; several detached shoals and banks lie off the islands.

The islands are divided into two groups, N and S, separated approximately by the parallel of 11°N. The N group, known as the Amindivi Islands, consists of Chetlat, Bitra, Kiltan, Cardamum, and Amini. The S group, known as the Cannanore Islands, consists of Agatti, Androth, Pitti Islet, Kavaratti, Suheli Par, and Kalpeni, on the N side of Nine Degree Channel, and **Minicoy** (8°18'N., 73°02'E.), on the S side of Nine Degree Channel. Minicoy lies about 110 miles S of other islands of the S group and is of special importance due to its location in the principal navigational route of the Indian Ocean.

Each of these islands lies on extensive coral shoals and no parts of these formations are more than about 4m high. The outer edges, which generally enclose a regularly formed lagoon, are higher than the body of these shoals; the lagoons remain calm in the worst weather. The receding tide leaves the outer edges of the reef nearly dry and the tide runs out of the lagoon through breaks in the edges, which are large enough to admit light craft into the natural harbor.

Due to the great depths in the vicinity of the islands soundings give no warning of their proximity, and great caution should be taken in thick weather.

As these islets and islands are low, with coconut trees only 18 to 24m high and not discernible for any great distance, they should be avoided. There are, however, some wide and deep channels between them.

#### The Laccadive Islands—North Group

**5.2 Cherbaniani Reef** (12°20'N., 71°55'E.) is the northernmost dangerous reef of the Laccadive Islands. A sand cay, with an islet and some sandbanks on its N and E sides, lies at the S end of the reef, but the greater part of the reef is only visible towards LW. Some boat passages apparently lead into the lagoon.

The NW, N, and E sides NE of Cherbaniani Reef are steep-to, but a bank extends about 1 mile offshore from its W and S sides.

Anchorage may be obtained, in 16.5 to 18.3m, on this bank during the Northeast Monsoon.

**Byramgore Reef** (11°55'N., 71°45'E.) is separated from Cherbaniani Reef to NNE by a channel about 17 miles wide, very deep, and free from dangers.

Byramgore Reef is below-water, except for its SE point, which dries. Shoal depths lie all around this reef, but the shoal area on the N side, with depths of 7.3 to 14.6m, is about 2 miles wide and is indicated by overfalls. This N shoal area should be avoided as it may be shallower and is encumbered with coral reefs which can be plainly seen by a vessel passing over them. The coral rocks forming the reef are discernible at LW.

Bitra Par, about 24 miles SE of Byramgore Reef, is an atoll which encloses a lagoon. The barrier reef, which dries from 0.3 to 0.9m, is narrow on its W and N sides, but it increases in width on its E and S sides. A light is shown from a white framework tower on Bitra Islet.

**5.3 Tree Islet** (11°36'N., 72°11'E.), at the N end of the atoll, is about 0.5 mile long in a NW-SE direction and about 183m wide.

An opening in the reef, close S of Tree Islet, has a depth of 2.7m; boats can enter the lagoon through this opening.

Depths within the lagoon are from 5.5 to 7.3m, but it is encumbered with coral reefs, drying and awash, especially toward the S end.

Anchorage can be taken, in 19.2m, abreast the opening S of Tree Islet, with the NE extremity of the islet bearing 335°, distant about 0.6 mile. A vessel reported this anchorage was unsafe for a vessel 91.5m in length, and that there was no safe anchorage off Bitra.

Tidal currents at springs set strongly in and out of the lagoon; care is necessary when making the anchorage.

**Chetlat Island** (11°41'N., 72°42'E.), about 31 miles ENE of Bitra, is wooded and inhabited. There is a jetty on the NW side of the island. A coral reef stretches around the S and W sides of the island, extending about 0.5 mile from its W side. Shoal water extends about 0.2 mile N and 0.6 mile WNW from the N end of the island, about 0.4 mile W from the coral reef, and about 0.4 mile SSW from the S extremity of the island.

Anchorage can be obtained, in good weather, on the shoal areas extending N from the N end and SSW from the S end of the island.

During the Northeast Monsoon, the best anchorage, in 11 to 18.3m, lies about 0.4 mile offshore, with the SW end of the barrier reef bearing about 338°, and with the SW and SE points of Chetlat Island bearing 011° and 045°, respectively.

When landing on the island, it is advisable to use a local boat. The best landing place is on the S side of the island, near the SE point, where there is a depth of 2.1m at HW and 1.2m at LW.

#### Kiltan Island

**5.4 Kiltan Island** (11°29'N., 73°00'E.), about 20 miles ESE of Chetlat Island, is covered with coconut palms, about 27m high. A reef fringes the W side of the island extending

about 0.4 mile W; shoal water extends about 0.2 mile farther W.

Kiltan Island was reported to be a good radar target at 13 miles.

Rocks and foul ground border the rest of the island, and shoal water extends about 0.3 mile from the N end and about 0.2 mile from the S end of the island. A stranded wreck lies about 0.3 mile NW of the NW end of the island.

Kiltan North Light is shown from a white, round concrete tower at the NW corner of the island. Kiltan South Light is shown from a round stone tower, painted in red and white checkers, situated at the S end of the island.

**Anchorage.**—Anchorage can be obtained off Kiltan Island in fair weather. The best position, in about 9.1m, lies with the light structure bearing 129°, distant about 0.6 mile. During S winds, vessels should anchor a little closer inshore.

Anchorage can also be obtained off the S end of the island, in 9.1 to 11m, about 0.4 mile offshore, if the swell is not heavy.

A boat passage leads through the N end of the reef to a shallow lagoon where there is a jetty on the W side of the island; a gap in the reef, about 0.6 mile S, is sometimes smoother. Each gap is marked by buoys.

In calm weather, there is a good landing at the middle of the E side of the island, where a steep-to sandy beach breaks the fringing foul ground.

**Caution.**—Two patches of discolored water, about 0.5 mile apart and of a light greenish-brown color, were reported (1919) about 45 miles NNE of Kiltan Island.

**5.5 Basses de Pedro** (13°05'N., 72°25'E.), the S end of which lies about 63 miles NNW of Kiltan Island, has depths of 16.4 to 73m. The bank is large, steep-to, and composed of sand, shells, and decayed coral; the water on the bank is not discolored.

In 1974, the bank was reported to lie from 4 to 5 miles SE of its charted position.

**Sesostri Bank** (13°08'N., 72°00'E.), about 11 miles W of Basses de Pedro, has depths of 20m to 77m and is steep-to.

Cora Divh, with its SW point about 21 miles NNE of Sesostri Bank, has depths of 27.4 to 55m, sand, decayed coral, and broken shells.

A depth of 24m was reported (1963) to lie about 13 miles ENE of the S end of Cora Divh.

**Elicalpeni Bank** (11°15'N., 74°03'E.), about 60 miles ESE of Kiltan Island, is about 4 miles in extent, with general depths of 12.8 to 16.5m and a least depth of 10.4m near its SE edge.

Depths from 18.3 to 29m, some unexamined, lie between 16 and 21 miles ENE of Elicalpeni Bank, and a depth of 20.1m, existence doubtful, was reported (1964) to lie 20 miles E of the bank. Depths of 49m (in 1949) and 35m (in 1971) were reported about 5 miles NNW and 47 miles N, respectively, of Elicalpeni Bank. These areas should be avoided, particularly when the Southwest Monsoon is strong enough to raise a considerable sea.

## Cardamum Island and Amini Island

**5.6 Cardamum Island** (Kardamum Island), about 18 miles SW of Kiltan Island, forms the E side of a coral atoll. The ends

of the island are covered with a low growth of scrub. There is a village in the middle of the island.

The drying coral reef, which encloses a shallow lagoon, extends nearly parallel with the island, about 0.8 mile from its W side, and surrounds both the N and S ends of the island. It extends about 0.3 mile N of the N end of the island, and about 0.8 miles S of the S end of the island.

There are two narrow boat passages through the reef, both marked on each side by a stone post; one passage is at the N end of the atoll and the other 3 miles SSW of the N end.

Anchorage in good weather can be obtained off the reef S of Kadmat, in depths of 8m to 20m, and from 0.2 to 0.5 mile from the reef.

Small vessels with local knowledge can anchor, in 31m, near the boat passage, and about 0.2 mile from the reef.

**5.7 Amini Island** (Ameni Island) (11°07'N., 72°44'E.), the most important of the Amindivi Islands, is fringed by a reef from about 0.2 to 0.4 mile wide. The island has a post office and a hospital. The channel between Amini Island and Cardamum Island is safe and deep, but depths of less than 10m project 0.5 mile S from the S tip of the reefs surrounding Cardamum Island.

Amini Island Light is shown on the S point of the island.

The village is in the middle of the W side of the island. A raised stone platform, with steps leading to the beach, is in front of the village. A stone pillar lies behind the platform. Fronting the platform is a narrow passage across the reef which should be navigated with caution; boats approach the steps through a channel marked by pillars.

Anchorage can be obtained off the W side of Amini, in depths of 7 to 15m; outside the 20m depth contour, depths increase rapidly. The recommended anchorage is with the S point of the island bearing 137°, distant 1.1 miles, in a depth of about 15m. In 1948, a vessel approached its anchorage, with the steps in front of the village bearing 107°, and anchored on that bearing, in a depth of 9.1m, about 0.5 mile from the beach.

Peremul Par, about 37 miles W of Amini Island, is a narrow drying reef enclosing a lagoon; at HW, with a smooth sea, much of the reef does not break, making the edge of the reef difficult to distinguish.

Inside the reef, a shoal, with depths of less than 1.8m, extends about 0.8 mile from its SW and N sides towards the middle of the island. The remainder of the lagoon is encumbered with drying coral reefs, with depths of 1.8 to 11m between them.

Several good boat entrances are on the E side of the island; two boat entrances are on the W side of the island.

Anchorage can be obtained, in 18.3m, about 0.3 mile offshore, abreast the boat entrances on the SW side of Peremul Par; local knowledge is necessary. Anchorage can also be obtained, in 18.3 to 22m, off the NE side of the reef, with the sand cay bearing 213°, distant about 0.5 mile.

## The Laccadive Islands—South Group

**5.8 Androth Island** (10°49'N., 73°41'E.), the most fertile of the Laccadive Islands, is densely planted with coconut palms. It is the residence of the Tehsilder, who administers the Laccadive Islands. The village lies about 1 mile from the W

end of the island. There is a small hospital and a leper colony on the island.

A light, with a racon, is shown from a white, square masonry structure, 33m high with black bands, on the E point of the island, and a light is shown from a white concrete tower, 10m high, on the NW corner of the island. A depth of 12.5m is located about 6 miles ENE of Androth.

The island is surrounded by a coral reef, through which there is a small channel for boats on the N side. The S side of this reef is steep-to, but from the N side a coral bank projects about 6 miles N, and has a greatest width of about 10 miles, with depths from 10.4 to 31m. Shoals, with depths of 5m and 5.9m, lie about 0.6 mile SSW and 0.4 mile W, respectively, of the NW end of the island. Several isolated shoals, with depths of 10.5 and 11m, lie up to 1.1 miles N of the N coast of the island.

**Anchorage.**—Anchorage may be obtained, in a depth of about 10m, sand and coral, anywhere off the N side of the island, about 0.5 mile offshore; local knowledge is necessary.

Good anchorage can be obtained, in 9.1m, coarse sand and broken shells, about 0.7 mile N of a flagstaff on the shore close N of a red-roofed mosque at the W end of the village.

Anchorage can also be obtained, in 16.5 to 18.3m, off the E end of the island where the bottom appears to be smoother, but local knowledge is necessary.

During the Northeast Monsoon, vessels can anchor, in 18.3 to 22m, about 0.5 mile offshore on the SW coast of the island, but there is little shelter.

**Caution.**—Elikalpeni Bank, with a least depth of 10.4m, lies about 33 miles NE of Androth Island. Other unexamined depths of as little as 18.3m lie about 20 miles ENE of Elikalpeni Bank.

**5.9 Pitti Islet** (Piti Sand Bank) (10°46'N., 72°33'E.), about 66 miles W of Androth Island, is a low islet. The N and NE sides are sandy. A black rock is on the E side and there were several stone cairns, about 6.1m high, on the islet.

A bank of sand, with charted depths of 11 to 37m, extends about 3 miles S and 24 miles NNE from the islet. The bank has not been fully examined and depths may be less than charted.

**Agatti Island** (10°51'N., 72°12'E.), about 21 miles W of Pitti Islet, lies towards the S end of an unnamed atoll, with Kalputhi Islet (Kalputi Islet) close SSW. A clump of palm lies about 1 mile from the S end of Agatti Island. A light is occasionally shown from the N end of Agatti Island.

The coral reef surrounding Agatti Island and Kalputhi Islet extends about 2 miles offshore on the W side and encloses a shallow lagoon; boats may enter the lagoon through a passage with the clump of palms on Agatti Island bearing 142°. Landing is on the NW side of Agatti Island on a steep-to beach.

Depths of less than 10m extend 0.5 mile S of Kalputhi Islet and the same distance N of the N end of Agatti Island.

Bingaram, an islet in the N part of the atoll, lies 6 miles NE of the N point of Agatti Island; it is 0.7 mile long in a N-S direction and 0.5 mile wide at its widest part.

Tinnakara, another islet 1 mile long, lies 1.5 miles ENE of Bingaram. These two islets are nearly encircled by a steep-to reef which, from a position 2.5 miles NW of Bingaram, trends ESE for 4.5 miles, then SW for 3 miles, and then W for 3.5 miles, lying about 1 mile N and S of Bingaram. The Parali Is-

lets, three small sand cays, lie on the NE corner of the reef and are almost connected to the E end of Tinnakara, which lies about 0.3 mile within the E side of the reef.

Landing can be effected on Bingaram and Tinnakara, but both are uninhabited and have no good water. The area between the W extremities of the encircling reef is shallow, with numerous coral heads with depths of less than 1m; much of the lagoon within the reef dries.

Anchorage can be taken, in 18.3 to 22m, coral, off the entrance to the reef surrounding Agatti Island, but it is not recommended.

Good anchorage can be taken, in depths of 10m to 15m, in an area 2 miles wide between the N end of Agatti Island and the reef encircling Bingaram; this area is apparently free from dangers, but ships should proceed with caution. The recommended anchorage is with the NE extremity of Agatti Island bearing 215°, distant 1.5 miles, in a depth of 13.7m, coral.

On the W side of the atoll, near its N end, there is an entrance to the lagoon about 0.8 mile wide. Good anchorage can be obtained W of this entrance, in 10m, coral, with the N point of Bingaram Islet bearing 078°, distant 3.5 miles.

**5.10 Kavaratti Island** (10°34'N., 72°39'E.), about 61 miles WSW of Androth Island, is low, and was densely covered with palms, about 28m high, in 1964. The N part of the island is more heavily populated; the Administrator for the Laccadive Islands resides on the island. Kavaratti Island Light, a round white concrete tower with black bands and a racon, is situated on the SE point of the island.

On the NW side of the island, a reef lies about 0.6 mile offshore, nearly parallel to the beach, and encloses a shallow lagoon. The reef, steep-to except at its S end, has depths of 183m within 0.2 mile of its edge. There is a boat entrance at the N end of the lagoon, with a least depth of 0.9m. A lighted beacon marks the W side of the entrance; within the entrance, lighted buoys mark the channel between the reef and shoal water fringing the island.

There are two jetties are situated on the N part of the NW side of the island.

**Tides—Currents.**—Tidal currents near Kavaratti Island were observed, in October, to set SE with the flood and NW with the ebb, at a velocity of 0.5 to 1 knot.

**Anchorage.**—Anchorage, during the Northeast Monsoon and in fair weather, can be obtained, in 7.3 to 12.8m, sand and coral, on a shoal about 0.7 mile wide, which extends about 0.7 mile S from the island.

**5.11 Suheli Par** (10°05'N., 72°16'E.), the SW atoll of the Laccadive Islands, consists of a drying barrier reef enclosing a lagoon. North Islet (Valiyakara Islet) and South Islet (Cheriyakara Islet), both uninhabited, lie in the lagoon. The reef was reported to extend 2 miles SW in 1980.

Suheli Par Light is shown from a white metal column, with red bands, on the SE end of South Islet. A light is shown from a white, wooden framework tower on North Islet.

It was reported in 1980 and in 1982, that the reef extended 3 to 3.5 miles SW from the light.

Good radar returns have been reported from Suheli Par at 16 miles.

Two openings are on the NW side of the barrier reef, which are navigable by small vessels with a draft not exceeding 1.8m, but local knowledge is necessary.

Good anchorage was found (1948), in 12m, sand, with the N end of North Islet bearing 163° and the S end of South Islet bearing 201°. In 1979, it was reported that the reef projected 4 miles WSW from the light.

**5.12 Kalpeni** (10°06'N., 73°39'E.), the SE atoll of the Laccadive Islands, lies about 39 miles S of Androth Island. It consists of two narrow, low islands lying on the E side of a reef which encloses a lagoon.

Kalpeni Island, the S and larger island, was densely planted with coconut palms, about 30m, high in 1967. A steep-to bank, with depths between 10 and 20m, extends about 0.4 mile S from the S end of the island. Kalpeni Light is shown from a round stone tower, 40m high, lying 1.8 miles N of the S extremity of Kalpeni Island. A bungalow and a mosque, 3m high, are reported to stand nearby.

Cheriyam Island (Cheria Island), the N island, is also covered in palm trees.

The barrier reef is steep-to and the sea breaks heavily on it. A narrow boat channel leads through the reef into the lagoon. Landing can sometimes be made on the E side of Kalpeni Island.

Good radar returns have been reported from Kalpeni Island at 20 miles.

**Anchorage.**—A vessel anchored (1950) in 12.8m, coral, sand, and rock, about 0.4 mile offshore, off the S side of Kalpeni Island. Anchorage has been reported 0.7 mile N of Cheriyam Island, in 9m, sand and coral.

## Minicoy Island

**5.13 Minicoy Island** (8°17'N., 73°03'E.), forming the SE side of an atoll, is included with the Laccadive Islands for administration, although it lies about 110 miles SSW from the nearest of these. The island lies about 70 miles N of Ihavandiffulu Atoll, the N atoll of the Maldive Islands.

Kodi Point, at the NE extremity of the island, may be identified by a single conspicuous palm; a rock, 0.6m high, lies about 183m NE of the point, and the barrier reef extends about 183m farther NE. A shoal, with a depth of 6.1m, lies nearly 0.5 mile NE of Kodi Point.

The town of Minicoy lies near the center of the island, about 2.5 miles SSW of Kodi Point. There is a dense cover of coconut palms, about 18.9m high, on the E side of Minicoy Island.

Roebera Point forms the SW extremity of Minicoy Island; Wiringili Islet (Small Pox Islet) lies on the barrier reef about 0.5 mile NW of the point.

The W side of the barrier reef dries in places; it dries 0.6m about 1.3 miles N of Wiringili.

The lagoon is encumbered with numerous shoals and dangers, and the SW part dries. Saleh Magu Channel, at the NE end of the atoll, is the principal opening into the lagoon, with depths of 1.8 to 3.7m, but can only be used by small vessels with local knowledge.

Minicoy Island Light is shown from a white tower on the SW end of the island, about 0.4 mile ESE of Roebera Point.

The top of the light structure is obscured by trees on certain bearings and within distances of less than 6 miles.

Good radar returns have been reported from Minicoy Island at 18 miles. It was also reported that the shape of the island becomes identifiable on radar at 15 miles.

It was reported that a racon was established on the light and a conspicuous red and white pylon stood close S of it.

Local boats meet ships and may be summoned through the lighthouse keeper who can communicate with vessels using the International Code of Signals.

**Anchorage.**—The island offers no suitable anchorage, as the bottom rises steeply toward the reef. Ships may drift safely under power in fairly calm water close offshore E of the island during the Southwest Monsoon.

**Caution.**—Minicoy Island should be approached from the S, passing about 4 miles S of the light structure. In bad weather, landfall in morning twilight is considered safe.

Vessels have been wrecked on Minicoy Island due apparently to shaping a course to pass a few miles N of Minicoy Island Light (in some cases after sighting the light from E), instead of passing S of it where the light is a useful guide.

The practice of passing a few miles N of the island, especially at night, is a dangerous one as the island is over 4 miles long in N-S direction, and unpredictable strong S sets are encountered at times.

## Nine Degree Channel

**5.14 Nine Degree Channel** (9°00'N., 73°00'E.) lies between Minicoy Island to the S and Suheli Par about 113 miles NNW, and Kalpeni Island to the N. It is very deep and free from dangers.

**Investigator Bank** (8°32'N., 73°17'E.), NE of Minicoy Island, has a least depth of 217m, with depths over 914m in the vicinity.

## Eight Degree Channel

**5.15 Eight Degree Channel** (7°40'N., 73°00'E.), between Minicoy Island and Ihavandiffulu Atoll, about 70 miles S, is free from known dangers. It is recommended to keep nearer to Minicoy Island than to the Maldive Islands, as the current sets S from the end of September to the end of the year, and there is the added advantage of sighting Minicoy Island Light.

The currents in this channel are much the same as those in the N end of the Maldive Islands, but in the Northeast Monsoon they at times set NW; occasionally they set N with S winds.

## The Maldive Islands

**5.16 The Maldive Islands** (3°30'N., 73°00'E.), a chain of atolls, extend from **Turakuna** (7°06'N., 72°54'E.), the N island of the Ihavandiffulu Atoll to about 40 miles S of the Equator, along the meridian of 73°E.

Much of the detailed information in this sector is very old, as little recent information can be obtained from places so seldom visited. Dates of recent definite information have been included in the text.

Between the different atolls of the Maldive Islands there are several good deep channels. Some of these are intricate and demand local knowledge; such channels should be avoided by low-powered vessels as currents set strongly through them, setting E or W according to the season; marked variations in direction have been reported.

The coral islands on the atolls, although very low, may be detected by radar at ranges over 20 miles, while the arrangement of individual islands may be obtained at about 15 miles, and the breakers at the edges of reefs detected at about 2 miles.

There are numerous deep openings through the barrier reefs, which are difficult to identify beyond a distance of 3 or 4 miles, when the reefs appear as one continuous line. Within 1 or 2 miles, the openings will be distinctly seen when the sun is high and behind the observer.

Extra care should be taken at periods of spring tides when strong rips and eddies in the reef entrances make for difficulty in seeing submerged hazards.

By day and with the sun in a favorable position, even the less readily navigable channels can be negotiated without undue difficulty, as all the underwater dangers are generally visible for some distance from the masthead.

By night, a vessel should pass through only the four larger channels between the atolls, and even these should be avoided unless the vessel has an accurate fix before entering.

Within the atolls good anchorage can be obtained in very smooth water of moderate depth, with a coral and sand bottom.

On the inhabited islands, boat channels leading over the reefs to the villages are marked by distinctive stakes.

## Ihavandiffulu Atoll

**5.17 Ihavandiffulu Atoll** ( $7^{\circ}02'N.$ ,  $72^{\circ}54'E.$ ), the N atoll of the Maldive Islands, is administered with Tiladummati Atoll, and consists of about 24 islands, most of which lie on the circumference of the barrier reef. Seven of the islands were inhabited in 1970.

General depths of 37 to 55m are in the E half and 18.3 to 37m in the W half of the lagoon. Numerous shoals are in the lagoon, particularly in the W half. These shoals, with the sun well up, can easily be seen as pale green against the dark deeper water; they are not readily seen if the sky is overcast.

The main occupations are fishing and the cultivation of coconuts, most of the islands being heavily wooded with palms.

**Tides—Currents.**—Currents at Ihavandiffulu Atoll are only experienced occasionally and are probably influenced entirely by local weather conditions. There appears to be no regular tidal currents.

A current of 2 knots setting N was experienced (December, 1933) about 50 miles E of the atoll, but practically no current in this position was experienced about a month later.

During December and January in the offing, the current generally sets N or W, but it is irregular.

A set to NW between Ulegama and Wagaru, and to W between Ulegama and Murdu, was sometimes observed (December, 1933 and January, 1934). The maximum velocity was about 1 knot. In the middle of the lagoon there was an occasional set to NW.

**5.18 Turakuna** ( $7^{\circ}07'N.$ ,  $72^{\circ}54'E.$ ), the N island of Ihavandiffulu Atoll, was inhabited in 1970 with a small village on its N side. On its S side, landing can be effected through a gap in the encircling reef.

Good radar returns have been reported from Turakuna at 15 miles.

Ulegama, about 1.3 miles SE of Turakuna, is low, level, and thickly wooded. The village lies near the center of the island, surrounded by coconut palms and breadfruit trees. A narrow reef fringes the seaward side of the island; a beacon lies on this reef nearly 1 mile SE of the N end of the island. The reef on the inner side of the island is separated from the shore, forming a lagoon; there are two openings for fishing boats.

Good radar returns have been reported from Ulegama at 15 miles.

Muladu, about 5 miles SE of Ulegama, has a small village on its W side. There is a boat passage, abreast the village, through the otherwise unbroken reef surrounding the island.

Between Muladu and Ulegama lie three, small, thickly-wooded, uninhabited islets known from NW to SE, respectively, as Murdu, Beramundu, and Gumati.

The islet of Gallandu lies about 3.5 miles SSW of Muladu. Sunken reefs lie about 1 and 2 miles, respectively, N of Gallandu.

**Digufuri Reef** (Digfurhi Reef) ( $6^{\circ}56'N.$ ,  $72^{\circ}57'E.$ ), at the S end of Ihavandiffulu Atoll, has an islet at its E end; a small sandbank, with palms on it, lies about 0.8 mile ENE of the islet.

Ihavandu, one of the few islands within the lagoon, lies close N of Digufuri Reef and about 3 miles W of Gallandu. The island is densely populated, and there is a landing on the S side.

Hauwandu, about 0.8 mile W of Ihavandu, lies at the SE end of a section of the barrier reef which extends about 9 miles NW, then 3 miles NE; of the eight islands and islets on this stretch of reef, Umbala and Hatefuri were inhabited in 1970. Umbala, with a large village, lies about 0.5 mile NNW of Hauwandu, and is the principal island of the atoll; its natural harbor, formed between the island and the seaward side of the reef, provides good anchorage for numerous fishing craft. Hatefuri, about 4 miles farther NW, has a fishing village on its NE side.

Matari, about 0.8 mile NW of Hatefuri, was used as a cemetery and had a flagstaff and small temple on it; elsewhere it was well-wooded.

The islet of Kandufuri (Kankolufuri) lies on the above stretch of reef, near the NW point of Ihavandiffulu Atoll. Good radar returns have been reported from the islet at 15 miles.

**5.19 Wagaru** ( $7^{\circ}06'N.$ ,  $72^{\circ}52'E.$ ), near the N end of the atoll, about 4 miles ENE of Kandufuri, is low and well-wooded; it is surrounded by a reef except on its SE side. North Rock, with a least depth of 5.2m, lies about 1 mile W of Wagaru.

**Anchorage.**—The best anchorage, in 28 to 37m, sand and coral, lies W of Ulegama.

There is a good anchorage E of the reef between Hauwandu and Umbala, in the SW part of the lagoon, in 33 to 37m. This is probably the best anchorage during the Southwest Monsoon, but a heavy swell might reach it through Southwestern Entrance.

Good anchorage during the Northeast Monsoon may be obtained, in 46 to 55m, W of Muladu and Gumati in the E part of the lagoon.

Anchorage are also available S of Turakuma and Wagaru.

**Directions.**—Vessels approaching from N enter through North Rock Passage, between Wagaru and North Rock, 1 mile W; through North Western Entrance, between Wagaru and Turakana; or through Northern Entrance, between Turakana and Ulegama.

North Rock Passage may be entered in depths of not less than 18.3m by keeping towards Wagaru; the other entrances have depths of not less than 20.1m in the fairway midway between the islands, but there are shallower depths close within the lagoon in the Northern Entrance. The edges of the reefs on each side of the passage can be seen from aloft at a good distance.

Vessels approaching from E use North Eastern Entrance between Ulegama and Murdu, about 1.8 miles SE, or East Entrance between Muladu and Gallandu. North Eastern Entrance has a least depth of 35m midway between the islands.

In East Entrance, there is a shoal patch midway between the flanking islands and a second patch farther SSW. If using this entrance, bring the NE end of Medfuri to bear 287° and enter the lagoon on this heading. When the S end of Muladu bears 070°, steer for the N end of Hauwandu bearing 250°, and then to the anchorage off that island.

**Caution.**—Collingrufuri, Medufuri, and Manafur, three islands surrounded by rocky heads, foul ground, and shoal water, lie about 3.3 and 3 miles N, and 2.3 miles NNE, respectively, of Ihavandu. Two drying rocks lie on a rocky shoal close N of Medufuri.

Endeavour Shoal, a large coral patch with a least depth of 6.1m, lies about 3.3 miles SSW of Ulegama.

Ormonde Rock, with a least depth of 4.6m, lies about 2 miles SW of Ulegama.

In addition, there are numerous shoals and rocky patches in the lagoon, particularly toward the NW and SW sides; under suitable conditions all can be easily seen from aloft.

## Gallandu Channel

**5.20 Gallandu Channel** (6°54'N., 72°57'E.), between the S end of Ihavandiffulu Atoll and the NW end of Tiladummati Atoll, about 2.8 miles S, is very deep and free from dangers in the fairway. Passages on each side of the channel lead into the lagoons, where anchorage may be obtained.

**Tides—Currents.**—Tidal currents set ENE through the channel with the flood tide and WSW with the ebb.

## Tiladummati Atoll

**5.21 Tiladummati Atoll** (6°45'N., 73°00'E.) consists of about 40 islands and islets; most lie farther apart and are larger than those in the Maldives farther S. The islands in the NE part of the atoll are the largest.

There are fewer islets but more reefs on the W side of the atoll than on the E side. The passages through the barrier reef on the W side are navigable but should be avoided. Safe passages leading into the lagoon are on the E side of the atoll, but the vessel must be conned from aloft.

**Caution.**—Aerial photographs show the shapes and size of islands to differ substantially from surveys originally dated from 1940. In addition, some features charted as reefs are, in some cases, dry at HW and wooded.

**5.22 Maduni Faro** (6°51'N., 72°57'E.), a lagoon reef, forms the NW extremity of the atoll. The islets of Marandu, Tukandu, and Miledu, the first two inhabited in 1970, lie, respectively, on the barrier reef between the N end of Maduni Faro and the islet of Gafuri, about 5 miles ESE. Gafuri lies on the W side of a detached reef with an unnamed lagoon reef close W.

An unnamed lagoon reef, the islet of Dedu, and Warifuri Faro lie about 2.5, 4, and 6 miles, respectively, NE of Gafuri. Warifuri Faro is a large lagoon with the islet of Warifuri at its S end. A lighted beacon lies on the N side of Warifuri Faro. The islets of Dedu and Warifuri are inhabited; the islet of Noradu lies between the latter two islets.

**5.23 Kelai** (6°58'N., 73°13'E.), at the NE extremity of the atoll, was inhabited in 1970. Good radar returns have been reported from Kelai at 14 miles. The islet of Tinadu lies about 3 miles WSW of Kelai.

The island of Filadu has an opening between it and Kelai, 1.5 miles N, and between it and Baura, 3 miles SSW, but the latter is encumbered by several rocky patches in the fairway.

The barrier reef extends from Baura to the island of Mavaidu, about 20 miles SSW. From N to S, the islands of Hanimadu, Noliwang Faro, Nuriwari, Kuludu Faro, and Komangdu form the E side of the atoll, and have wide openings into the atoll on each side of them. All the islands on this side of the atoll were inhabited in 1970, as well as ten others within the lagoon.

Kuludu Faro has a large village fronted by a sandy beach and lagoon, which is enclosed by a coral reef on its W side. The boat channel to the small harbor (1942) was wider and deeper than those usually found in these islands.

**Muradu** (6°33'N., 72°54'E.) lies on a circular reef near the W edge of the atoll; the latest maps prepared from aerial photography (1968) show that this island has joined the islet charted 0.8 mile W of it. Some rocky patches lie S and SE of Muradu.

Naguri, an island with a circular lagoon reef, lies about 7 miles N of Muradu; two large reefs lie between these islands.

A lighted beacon lies at the NW point of a reef, about 3.3 miles NW of Muradu.

Nawadu, about 5 miles NNE of Naguri, was populated in 1970.

There is an opening into the lagoon, about 4 miles wide, between Rufuri, a small islet, 0.5 mile N of Nawadu, and Maduni Faro, at the NW corner of the atoll.

## Miladummadulu Atoll

**5.24 Miladummadulu Atoll** (6°10'N., 73°08'E.) lies on the same submarine plateau as Tiladummati Atoll and is the continuation S of it. The N boundary of this atoll approximately follows the parallel of 6°29'N.

Miladummadulu Atoll contains about 100 islands and islets lying principally on the E side; over 40 of these were populated in 1970, and almost all are wooded, with palms predominating.

The lagoon can be navigated in daylight with ease as there are few dangers, especially in the N part, but the vessel must be conned from aloft. Depths in the lagoon are moderate; the bottom is sand, with clay in places.

**Tides—Currents.**—Tidal currents at Miladummadulu Atoll set ENE with the flood and WSW with the ebb, attaining a velocity of 1.5 to 2 knots at springs. The tidal currents are greatly influenced by the prevailing monsoon currents.

The island of **Numara** (6°26'N., 73°03'E.), with the islet of Nu close NNW, lies at the NE corner of Miladummadulu Atoll.

A very wide opening into the lagoon lies between Numara and Fivaku, about 9 miles ESE. Fivaku was inhabited in 1970.

The barrier reef then extends about 13 miles SSE from Fivaku to the S end of a detached reef on which lies the island of Farukolu, with Furnadu on the S part of the reef. The island of Makandudu lies about 2 miles NW of the reef. The latter three islands were inhabited in 1970. The islands of Nalandu and Milandu lie farther N. There are deep wide openings into the lagoon between all these islands and also between Makandudu and Farukolu.

From the S end of Furnadu, the barrier reef extends about 8.5 miles S and 6 miles ESE to Kuludu (Kendikolu), the largest island of the atoll and inhabited in 1970. Many of the islets on this stretch were inhabited in 1970. The passage into the lagoon S of Kuludu is wide and safe.

Ma Faro (Mafarru), a reef, lies about 4.5 miles SE of Kuludu; an island of the same name occupies the S part of this reef on the seaward side.

Edu Faro (Edufarru), a reef enclosing a lagoon, lies about 5 miles SSW of Ma Faro.

**5.25 Manadu** (5°47'N., 73°24'E.), close within the lagoon between Ma Faro and Edu Faro, was densely populated in 1970, when the main village was near the middle of the N side of the island. The island is profusely covered in vegetation, including coconut palms, banyan, breadfruit, and almond.

Good anchorage may be obtained on the N or S side of Manadu according to the season.

A boat channel passes through the reef, which extends the whole length of the N side of the island; the passage is narrow, about 1.8m deep, and fringed by large boulders of coral rock. Inside the reef is a deep channel, from 18 to 28m wide, skirting the beach.

Ten other islets within 9 miles of Manadu, and also within the lagoon, were inhabited in 1970.

The islet of Karema lies about 5 miles SW of Edu Faro.

**Kandudu** (Kharndudu) (5°39'N., 73°16'E.), inhabited in 1970, lies on the barrier reef at the S extremity of Miladummadulu Atoll, about 2 miles W of Karema.

From Kandudu, the barrier reef extends 12 miles NW to Mavila (Malwillarwaru); the latter islet and the islets of Rafari, Watedu, Didu, and Fadu on this SW face of the atoll were inhabited in 1970.

Between Mavila and Kumandu, about 16 miles NNW, are several lagoon reefs and islets. The island of Kumandu was inhabited in 1970; from about 1 mile SE of the island to about 3 miles farther SE, banks of sand and coral lie along the seaward side of a large lagoon reef. Close N of Kumandu, two small islets lie on the E side of a detached reef; the latest maps show the islets to lie N and S of each other.

The NW part of the barrier reef consists almost entirely of reef, enclosing separate lagoons.

Tree Sand Bank, about 6 miles NNW of Kumandu, extends about 2.5 miles into the lagoon and has an islet near its center; about 1 mile S lies another detached sandbank. A lighted beacon lies on the N side of the reef, 2 miles N of the W extremity of Tree Sand Bank.

**Goadu** (6°25'N., 72°55'E.) and Kandute, about 1 mile NW, lie within the main lagoon and were inhabited in 1970; the main village was in the center of each island. It was reported that landing can be made anywhere along the SE side of Kandute, where the fringing reef has depths of 1.2 to 1.8m.

## Makunudu Atoll

**5.26 Makunudu Atoll** (6°20'N., 72°36'E.), once known as Malcom Atoll, is a large reef encircling a deep but reef-encumbered lagoon, and is administered as part of Tiladummati Atoll; it is separated from the NW side of Miladummadulu Atoll by a deep channel, about 9 miles wide. Two openings on the E face of the lagoon can only be used by boats.

Faro Doru (Defarudorhi), an islet on the E side of the atoll, about 6 miles SSW of Makundu, was wooded in 1970. The S and W sides of the atoll have only the surf and an islet at its NW extremity to indicate their outline.

## Fadiffolu Atoll

**5.27 Fadiffolu Atoll** (5°25'N., 73°30'E.) consists of about 30 islets, only four of which were inhabited in 1970. The principal occupations are sail weaving and coir making. The depths in the lagoon are moderate and the bottom is sandy; there are many drying and submerged coral heads with depths of 1.8 to 3.7m.

**Tides—Currents.**—Tidal currents set strongly through the openings into the lagoon.

**Fehingili** (5°33'N., 73°29'E.) is the N islet of the atoll. There is an opening into the lagoon between Fehingili and Kuredu, about 0.8 mile W; there are moderate depths in the entrance, but about 0.8 mile within the opening, some reefs lie in the fairway. Furifaro, about 4 miles SSE of Fehingili, lies in the center of an opening into the lagoon. The islet, with a rocky shoal close NW, lies on a reef.

The barrier reef, with several islets on it, extends about 7 miles ESE to Difuri (Divepure), at the NE end of the atoll. The latter islet and Faidu, about 1 mile NW, were inhabited in 1970.

From Difuri, an unbroken line of barrier reef curves SW to Aligau, at the S extremity of the atoll; several islets are on this section of reef.

During the Northeast Monsoon, the sea breaks with violence upon this unbroken stretch of barrier reef; coral rock and sand banks appear at low water along this stretch.

There is a wide opening into the atoll between Aligau and Lowalfuri, about 3.5 miles NNW; the islet of Madewaru lies near the middle of the opening.

From Lowalfuri, the barrier reef, enclosing several islets, extends about 7 miles NW to Dehu, a group of islets. Several good channels lead into the lagoon between the islets on the barrier reef. Kanifuri (Kanifurhi), about 2 miles W of Dehu, forms the W extremity of the atoll.

From Kanifuri, the barrier reef extends about 7 miles NNE to Fallwaru (Faileweru). The islet of Naifarō, the most densely populated of the atoll in 1970, lies on the reef about 2 miles SSW of Fallwaru.

Between Fallwaru and Hurawali, about 4.5 miles NE, several islets and detached reefs lie some distance SE of the enclosing reef. There are several channels into the lagoon between islets in this section of the atoll.

## Malosmadulu Atoll

**5.28 Malosmadulu Atoll** ( $5^{\circ}30'N.$ ,  $72^{\circ}55'E.$ ) consists of North Malosmadulu Atoll and South Malosmadulu Atoll, which are separated by Moresby Channel, about 1.8 miles wide. These two atolls are similar in character, their W sides being composed of a series of lagoon reefs, some prominent and others in the background. This is a feature common to the N atolls of the Maldive Islands.

**5.29 North Malosmadulu Atoll.—Maduni Faro** ( $5^{\circ}53'N.$ ,  $72^{\circ}54'E.$ ), a lagoon reef, lies at the N of the atoll. Wadu, inhabited in 1970, lies about 3 miles ESE of Maduni Faro, at the S end of a large lagoon reef.

A wide opening into the lagoon lies between Maduni Faro and Wadu; it is free of known dangers in the middle of the fairway, with depths of 37 to 44m, sand. Some rocks lie about 3 miles NNW of Wadu.

**Anchorage.**—There is good anchorage in the channel between Wadu and Maduni Faro or farther S in the lagoon.

The **Powell Islands** ( $5^{\circ}58'N.$ ,  $72^{\circ}55'E.$ ) consists of two islands on a detached reef. Etingili is the NW island and Alifuri is the SE island; the latter island was inhabited in 1970.

The channel between the Powell Islands and Maduni Faro, about 3 miles S, is deep and free from known dangers.

The E side of North Malosmadulu Atoll consists of about 20 islands and islets separated by good passages leading into the lagoon. About 5 per cent of the above islands and islets were inhabited in 1970.

Navigation in the central part of the atoll is impracticable due to the numerous coral heads.

The S side of the atoll is formed by reefs lying between **Berriam Faro** ( $5^{\circ}26'N.$ ,  $73^{\circ}00'E.$ ) and Mamanago Faro, about 7 miles SW; three islets lie on this section of the barrier reef.

The SW face of the atoll is formed by Mamanago Faro, at its SW extremity, and three similar lagoon reefs farther N.

**Maregiri** ( $5^{\circ}31'N.$ ,  $72^{\circ}49'E.$ ) lies at the S end of the NW side of the atoll. From this islet the barrier reef, consisting of a series of lagoon reefs, some with small unnamed islets, extends about 25 miles NNE. These reefs lack above-water features and are therefore difficult to identify; the channels between them are therefore better avoided, especially since the central part of the lagoon is unsafe for navigation.

Moresby Channel, separating North Malosmadulu Atoll and South Malosmadulu Atoll, has depths over 183m and is free from known dangers. The W entrance to this channel has no wooded islet near it and is difficult to identify.

**5.30 South Malosmadulu Atoll.—Hanikandu Faro** ( $5^{\circ}17'N.$ ,  $72^{\circ}51'E.$ ), at the NW extremity of the atoll, is

separated from Kari Faro, about 0.8 mile S, by an opening into the lagoon. Dukandu, an island, lies in the middle of the inner end of the opening. Kari Faro is a reef enclosing a lagoon, with the islets of Iwafuri and Fahris on its S side.

From the opening between Hanikandu Faro and Medu Faro, about 1.3 miles NE, a deep channel leads E to the NE side of the atoll.

Islets and reefs on the S side of the channel extend E from Hanikandu Faro. Fendu was reported inhabited in 1970. Sudaroa, about 6 miles farther E, lies at the E entrance of the channel. Kumadu lies 1 mile E of Sudaroa.

The N part of South Malosmadulu Atoll is triangular in shape. There are numerous openings into the main lagoon on the N and E sides of the atoll.

**Anchorage.**—Anchorage can be obtained off the N side of Hitadu.

There is a wide opening into the lagoon between Olugeri, close W of Hitadu, and Boduffnur, about 2.8 miles farther W. A rock shoal, with a depth of 12.8m, lies in the opening.

## Horsburgh Atoll

**5.31 Horsburgh Atoll** (Goidu Atoll) ( $4^{\circ}52'N.$ ,  $72^{\circ}55'E.$ ), about 6 miles S of South Malosmadulu Atoll, is considered as part of the latter atoll for administrative purposes. Horsburgh Atoll was reported (1987) to lie approximately 2 miles SE of its charted position.

Goidu, at the NE end of the atoll, is the largest islet, and was inhabited in 1970. It has been reported (1994) that the shape of the island changes over time.

Fehendu and Furudu, about 1 mile and 3 miles, respectively, W of Goidu, were inhabited in 1970, when both were wooded, with palm trees predominant. The villages on the N sides of these islands are visible from seaward.

Inafuri (Furhi), an islet, 15m high and bushy, lies on the reef about 3 miles W of Furudu.

The islet of Fehenfuri, reported (1994) difficult to identify, lies on the S side of the barrier reef, about 4 miles SSE of Inafuri. The islet of Mafuri lies about 1.3 miles W of Fehenfuri.

The lagoon is fringed with dangers, but the center of the lagoon is clear.

**Anchorage.**—Anchorage, in 27 to 42m, good holding ground of sand, mud, and clay, can be obtained in the lagoon.

The only opening into the lagoon lies between Mafuri and Fehenfuri. The Dorukandu, as the channel through this opening is known, lies on the W side between the barrier reef and the shoal water extending nearly 0.8 mile W from the reef on which Fehenfuri lies. The channel is about 183m wide, with a least depth of 18.3m. Depths in the opening E of the Dorukandu are shoal and irregular; a 4.3m patch lies near the edge of the Dorukandu, about 0.3 mile E of Mafuri.

The E part of Fehendu, bearing  $052^{\circ}$ , leads from SW towards the opening.

**Caution.**—Vessels should not attempt to enter the lagoon except through the Dorukandu.

## Kardiva Channel

**5.32 Kardiva Channel** ( $5^{\circ}00'N.$ ,  $73^{\circ}30'E.$ ), deep and free from dangers in the fairway, lies between Fadiffolu Atol, South

Malosmadulu Atoll, and Horsburgh Atoll to NW, and Male Atoll and Ari Atoll to SE.

**Tides—Currents.**—The tidal current sets ENE through Kardiva Channel with the flood and WSW with the ebb, at a velocity of 2 knots.

During the Northeast Monsoon, the tidal current is inappreciable during the flood, but the ebb is reinforced by the surface current generated by the monsoon. Similarly, during the Southwest Monsoon the ebb current is weak or absent and the flood current is strong.

**Aspect.**—The N side of the E entrance of Kardiva is well-defined by Olivelifur (5°17'N., 73°36'E.), at the SE end of Fadiffolu Atoll. Kardiva, about 19 miles farther SSW, is a good landmark from the E, having two conspicuous palm trees on the N side of the reef upon which it lies. Gaha Faro Reef, on the S side of the entrance to Kardiva, has no landmarks on its N and S sides.

The W entrance of Kardiva Channel is not easily identified as the wooded islets on Ari and Horsburgh Atolls lie several miles within the salient points of their barrier reef. However, **Toddu** (4°26'N., 72°58'E.), an island off the N end of Ari Atoll, can be sighted at a considerable distance, and forms a good landmark in the approach from W.

**Caution.**—Kardiva was reported (1974) to lie about 2.3 miles SSE of its charted position.

**5.33 Kardiva** (4°58'N., 73°27'E.), formerly known as Karidu, was thickly covered with coconut palms, 14 to 20m high in 1974. There is a township on its N side; its SE side is steep-to.

A reef on the N side encloses a lagoon where local craft are moored. The entrance to the lagoon lies about 0.5 mile NW of the NE point of the island. Landing can only be made on Kardiva by entering the lagoon, as there is generally a heavy surf around the island and reef, except at the lagoon entrance.

## Gaa Faro Reef

**5.34 Gaa Faro Reef** (4°44'N., 73°26'E.), in the form of a small atoll, lies about 1.5 miles N of Male Atoll, from which it is separated by a deep channel, free from dangers in the fairway. **Gaa Faro** (Gafaru) (4°44'N., 73°29'E.), an islet at the E end of the reef, was inhabited in 1970. A clump of trees lies on the reef about 1 mile WSW of this islet.

Two very small openings lead into the lagoon, one on the NW side and another on the N side, about 4 miles E. Above-water rocks mark the E side of the N opening and apparently, the S side of the NW opening.

## Male Atoll

**5.35 Male Atoll** (4°25'N., 73°30'E.), the principal atoll of the Maldive Islands, contains about 50 islets and islands. Several islets, especially in the S part of the atoll, are developed as tourist villages.

The depths within the lagoon are from 40 to 50m; the bottom is of coarse sand except over coral reefs. Shoals within the lagoon are easily discernible in favorable conditions of sun and sea.

**Olahali** (4°41'N., 73°26'E.), a low bush-covered islet, marks the NW point of Male Atoll. A major channel into the main lagoon lies close E of the islet; it was reported, in 1974, that there appeared to be a least depth of 50m in the center of the channel and that the reef edges could be clearly seen.

**Tides—Currents.**—During the Northeast Monsoon, a 2 to 3 knot western current sweeps through the channel between Male Atoll and Gaha Faro Reef, causing strong eddies and turbulence where it meets tidal currents from the lagoon. During this season, it is advisable to pass through the N reef at about slack water.

Kagi, a small wooded islet, lies about 3 miles ESE of Olahali, and 1.5 miles within the lagoon. A good unobstructed channel through the reef lies N of this islet; its entrance is marked by drying rocks, and in 1974, by the stump remains of a pile beacon.

Helengili, a long low wooded islet, lies on the barrier reef about 4.5 miles SE of Kagi. Openings through the reef lie on each side of the islet; in 1974, the N opening was narrow and appeared to have a least depth of 20m, while the S channel was broader, with a least depth of 40m.

Lighted Beacon No. 1, a gray framework tower on a concrete base, lies on the S side of a reef 4 miles SW of Helengili.

Between Helengili and **Mirufuri** (4°27'N., 73°42'E.), there are several deep channels without landmarks to identify them; a vessel may pass through in favorable conditions and keeping a good lookout.

Asdu, in the lagoon, about 3 miles W of Mirufuri, was covered with coconut palms in 1974.

Mirufuri was inhabited in 1974 and wooded with coconut palms. Difuri, close S, was inhabited in 1974 and thickly wooded.

Between Difuri and Male, 20 miles SW, a chain of islands lies upon the reef which is sharply marked by change of water color or, in swell conditions, by breakers upon it.

**5.36 Imma** (4°18'N., 73°34'E.), inhabited in 1970, and Lankanfushifinolu, about 1.8 miles SW, lie on the same reef with a low islet about midway between.

The best and widest opening in the barrier reef lies between Lankanfushifinolu and Kaduogiri, an island 1.8 miles SW. There are depths of 54m in this channel about 0.6 mile S of Lankanfushifinolu, but a bank with depths of less than 29m extends 1.3 miles N into the channel from Furranafushi (Furena), an island about 0.5 mile SE of Kaduogiri.

A shoal area, about 1.3 miles W of Lankanfushifinolu, has a least depth of 14m. A reef lies 0.5 mile WNW of Kaduogiri, with numerous shoal patches S of it.

An uncharted lagoon lies off the W side of Furranafushi, entered at the SW corner of the fringing reef. Within the lagoon are depths to 9m, with a bottom of sand and coral heads. This lagoon provides good anchorage for small craft. A stone jetty extends from the W end of the island.

## Male (4°10'N., 73°30'E.)

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**5.37 Male**, at the S end of Male Atoll, is the capital of the Republic of Maldives and is the seat of office of the President

whose residence is on Arah (Aramh), a wooded islet about 3.5 miles NNW. A tower, from which a light is shown, lies at the center of Arah. The island is thickly wooded with many modern houses, particularly on its N side. It is almost entirely built up with a network of earth roads. The harbor facilities are on the N side of the island.

**Tides—Currents.**—From the few observations made in the vicinity of Male, it seems likely that the water movement there is far more influenced by the monsoon currents than the tidal currents. When the currents are flowing strongly, it seems likely that the tidal currents are only strong enough to increase or decrease the resulting flow and rarely strong enough to reverse its direction. Due to the probability of strong and unpredictable currents, an approach by night was not recommended (1987).

In the channel E of Male, the currents from Wadu Channel set across. During the Northeast Monsoon, a component of the current sets NW through this channel, setting a vessel towards the reef fringing the E side of Male. The flow turns W between Male and Funadu.

It was reported (1972) that this flow commenced 1.5 hours before HW, and ran until 1.5 hours before LW, attaining a maximum velocity of 2.5 to 3 knots at about HW N of Male breakwater, where it sets strongly across the N face of the breakwater. At the same time the flow was weak and variable E of Funadu. Strong sets have also been reported during the Northeast Monsoon in Male Harbor.

During the Southwest Monsoon, a component of the current enters the lagoon through the channel S of Giravaru, flowing out principally through the channel W of Male and between Male and Funadu, and then S into Wadu Channel.

It was reported (1972) that an E set existed until within the line joining Male and Hulule, then slack water between Funadu and Dunidu, when a strong E set was experienced to the anchorage. Four hours after LW, with the flood current tending to oppose the current, a moderate NE flow was experienced in the lagoon.

No observations have been made during the change in the monsoons when the currents could be weak and variable at times, but strong sets may always be encountered.

**Aspect.**—Male is identified from N and NE by a white mosque and minaret, and radio masts at its SE corner.

The E, S, and W coasts of Male are fringed by an unbroken reef, awash, extending from 23m to 0.2 mile from the S coast.

The N side of the island is protected by a breakwater, about 1.2m high and 4m wide, which is connected to the land at each end. Six passages lead through the breakwater into the harbor with another into a shallow pool at the W end. Lights are shown from beacons, painted in black and white bands, lying on each side of the five E passages.

The inner harbor is used by small local craft and has depths of 1.8 to 3m. The main passage, in the middle of the breakwater and 0.5 mile WNW of Miller Point, the NE point of the island, is 17m wide. In 1975, reclamation was underway on the reef off the E end of Male.

A rough breakwater of heaped coral extends 0.15 mile from the SW extremity of Male. It has been reported (1994) that the reclamation work to the S edge of the barrier reef had been completed. This new harbor area, when functional, would be

for the use of inter-island trading boats, cargo lighters, and deep-draft vessels at anchor.

The Custom House lies on the main quay facing the main passage through the breakwater.

Red obstruction lights are shown from the radio masts at the SE end of Male.

Lighted buoys mark the reef SW of Hulule and the reefs extending E of Funadu (Funidu) and Dunidu.

In 1983, it was reported that a conspicuous white house with green roof lies on the SE end of the island, and a prominent red and white TV tower is situated in approximate position 4°10'16"N, 73°30'51"E. Various landfill and reclamation projects are in progress on the W side of Male.

Funadu lies about 0.3 mile N of the E end of Male, and is surrounded by a reef which dries in places. In 1983, it was reported that on the N of the island there is a small tank farm with three large and about six smaller tanks. Dunidu, a wooded islet, lies about 0.8 mile NW of Funadu. In 1983, there was a large tank reported to lie on the E central part of the island, and a breakwater extending about 24.4m N on the N of the island.

Hulule, about 0.6 mile E of Funidu, bears some tall coconut palms; an airstrip runs the full length of the island and joins it to an islet close S. Airport buildings and a small village lie along the central part of the W side of Hulule. The airport is undergoing construction.

A channel, with a depth of 1.5m, gives access to small piers on the W side of Hulule. In 1987, entrance to this channel was prohibited; two large yellow mooring buoys were laid close W. A radio mast, marked by red obstruction lights, lies near the piers. In 1983, it was observed that the runway has been extended approximately 0.6 mile to the N and 0.2 mile to the S; the control tower is a conspicuous landmark. Breakwaters extend N and S from the entrance to the 1.5m channel.

Wilingili, a low wooded islet, lies 1 mile W of Male and is used as a tourist village. It is surrounded by steep-to foul ground extending up to 0.3 mile offshore. The light on the islet is reported to be a good landmark.

The channel between Wilingili and Male has a 5.5m shoal in the middle with a 15.4m patch about 0.4 mile N of it. Tidal currents in this channel are strong and tide rips form near the shoals; navigation of the channel is not recommended.

Ferdo, a bare sandy islet, surrounded by a steep-to reef which dries in places, lies 2.3 miles N of Wilingili. Breakwaters extend from the islet, and in 1974, reclamation work had started and some trees and shrubs had been planted.

A circular reef, about 1 mile SE of Ferdo, appears to contain deep water.

**Tulusdu** (Thulusdhoo) (4°22'N., 73°38'E.) was reported (1987) to be developing a port; the lagoon has been deepened and its entrance widened with a jetty built. Vessels up to 2,000 dwt were reported using the port. Warehouses were also under construction.

Viligili (Mathidhahuraa) lies 0.5 mile ENE and another islet, with some palms and covered with bush, lies about 1.5 miles WSW.

**Pilotage.**—Pilotage is compulsory for all vessels over 100 grt and is available daily from 0630 to 2200 Saturday through Thursday, and from 0630 to 0900 and 1430 to 2100 on Friday.

Vessels must report their ETA 48 hours, 24 hours and 3 hours in advance.

Pilots board in position 4°10'N, 73°32'E.

Vessels sailing from Male should request a pilot from the agent 3 hours prior to sailing.

The ETA message should contain the following information:

1. Vessel's name.
2. Master's name and nationality.
3. Agent's name.
4. Owner's name.
5. Last and next port of call.
6. Type of vessel.
7. Port of registry and number.
8. Dwt, grt, nrt.
9. LOA and maximum draft.
10. Call sign.
11. Details of dangerous cargo for discharging or in transit.
12. ETA at Male.
13. Cargo for the Maldives or in transit.
14. Air draft.

The ETA must be confirmed or amended not less than 3 hours before arrival.

**Regulations.**—Approval is required from harbor control for any work that could immobilize a vessel for 2 hours or more.

Vessels must get written approval from the Port Authority for any hot work to be done in port.

All trade must be made through Male. Surrounding atolls cannot trade with foreign vessels due to customs regulations.

**Anchorage.**—Vessels anchor in the designated anchorage areas best seen on the chart.

Small vessels, during the Southwest Monsoon, can moor on the E side of the circular reef about 0.8 mile NW of Dunidu. A vessel can secure to an anchor set in the coral of this reef, with a stern anchor laid out to E. Two anchors on the SE side of Dunidu can be used in the same way.

**Directions.**—The channel close E of Male is the recommended channel. The fairway is about 0.4 mile wide between the reefs extending SE of Male and S of Hulule airstrip. The channel W, between Male and Wilingili, is not recommended.

Male Passage is approached with the E side of Dunidu bearing 337°, and open NE of Funadu until the S end of Hulule runway bears 085°. Then steer through the middle of the channel between Funadu and Hulule, and as required round the N side of Funadu to approach the anchorage. The outline of the reefs is very distinct.

If approaching Male from W, enter Kaashidoo (Kardiva) channel between **Toddu** (4°26'N., 72°57'E.) and Horsburgh Atoll, 25 miles N of it. Pass close N clear of Toddu and then steer SE for Wadu Channel. When Male island is identified and approached, follow the directions as mentioned above.

In 1983, it was reported that because of the extended runway S on Hulule Island, a more appropriate approach through Male Passage should be made from farther SE, maintaining a mid-channel course. A vessel, at the approach on course 345°, reported observing a current setting NNE at 3.5 knots until the S tip of the runway was abeam to starboard, when a strong S to SW set of 4 knots was encountered with numerous eddies between Miller and Wild Points. To remain in mid-channel and to counteract the set and drift, a course of 008° was steered, thereafter, adjusting as necessary to the anchorage.

It was reported (1978) that the reef surrounding Wild Point, the SE tip of Male, had extended E and a depth of 5.9m was reported 0.3 mile E of the point.

Low-powered vessels, sailing vessels, and vessels arriving from E, may use the opening in the reef 6 miles NNE of Male. Steer to pass about 0.6 mile S of Lankanfushifinolu, then N and W of the reef lying 0.5 mile NW of Kaduogiri. Then steer S to pass W of Vehemanafushi (Vehamafuri), a wooded islet 3 miles N of Male, and thence W of Dunidu to the anchorage.

**5.38 Giravaru** (4°12'N., 73°24'E.), an islet covered in scrub and with a few coconut palms, lies on the SW side of Male Atoll, about 0.5 mile within the outer edge of the barrier reef. In 1974, a small bare islet lay at the extremity of the reef extending 1 mile W of Giravaru; a similar islet lies 1 mile S of Giravaru.

A good, easily discernible channel, S of Giravaru, with a least depth of 48m in its center, leads through the barrier reef. A wider, less deep channel lies NW of Giravaru; a shoal patch, with a least depth of 3.4m, lies in the channel, about 0.7 mile NW of Giravaru, where it broadens out into the lagoon.

Between Giravaru and Akirifuri, about 26 miles N, several low bush-covered islets, about 7m high, lie on the W fringing reef, giving effective warning of the reef lying about 0.2 mile outside them.

Several openings into the lagoon lie along this stretch of coast. The largest opening is abreast Hembadu, a heavily-wooded islet, about 17 miles N of Giravaru and 2 miles within the lagoon; the latest maps (1970), based on aerial photography, indicate dangers in the entrance to the W of those charted near Hembadu.

A low islet, covered in trees and scrub in 1970, lies on the barrier reef 6 miles SSW of Hembadu; a sandbank, similarly wooded, lies about 2 miles farther SSE.

**Akirifuri** (4°38'N., 73°24'E.) is low and covered with bushes; there is a small but safe opening on each side of this islet and another 1 mile ENE of it.

Maps based on 1968 aerial photography indicate that other openings between Giravaru and Akirifuri have dangers within the channels or close within the atoll abreast them. A survey vessel observed similar indications of such dangers in 1974.

## Waddu Channel

**5.39 Waddu Channel** (4°09'N., 73°27'E.), between the S end of Male Atoll and the N end of South Male Atoll, about 2.3 mile S, is very deep and free from dangers.

The tidal currents in the channel are very strong, the flood setting E and the ebb W. During the monsoons, the tidal current accelerated by the prevailing current, setting W during the Northeast Monsoon and E during the Southwest Monsoon, attains a velocity of 4 knots, causing severe tide rips.

## South Male Atoll

**5.40 South Male Atoll** (4°00'N., 73°25'E.) comprises about 25 islets, of which five were inhabited in 1970. Most of the islets lie along the E side, but some are on the W side. Safe passages are on one or both sides of all these islets, except for

the four or five islets on the SE part of the atoll. Almost all the islets are wooded, with many palm trees.

The lagoon is deep, but is encumbered with coral reefs, which may be avoided in favorable light with a good lookout at the masthead.

**Wadu** (4°07'N., 73°27'E.), in the middle of the N side of the atoll, has good openings in the reef on each side. There are some sandbanks on the reef between Wadu and Huras, about 4.5 miles ESE.

A good passage, with a depth of 20m in the fairway, lies about 1 mile S of Huras. This channel was reported (1917) to be narrower than charted and this is confirmed by the latest maps (1970) based on air photography; it should therefore be used with caution. Hembunda (Eboodhoo) is an uninhabited islet about 1.5 miles SW of Huras (Eboodhoofinloho). A shoal depth of 5m is reported to lie SE of Hembuda, between the island and the reef, therefore restricting passage to the S.

Between the S side of this opening and the SE extremity of the atoll, there are a few openings with several islets and sand banks on the E side of South Male Atoll.

**5.41 Guru** (Gulhi) (3°59'N., 73°30'E.), Mafuri and Guradu, about 3 and 5.5 miles, respectively, farther SSW, were inhabited in 1970.

A good channel, 0.5 mile wide with a least depth of 37m, lies at the SW end of the atoll; this channel lies between the W end of the reef forming the S side of the atoll, and the E side of a detached reef NW and on which Rocky Islet lies. Rocky Islet, according to the latest maps (1970) prepared from aerial photography, may be much smaller than charted or may have disappeared. In 1987, this islet was reported to be nearly submerged at HW.

Warigili, an islet remarkable for a bushy sandbank extending from its W side, lies about 8 miles N of the above opening. The widest of several openings in the W side of the atoll lies about 4 miles N of Warigili; a sand bank lies on the S side of this opening.

## Ari Atoll

**5.42 Ari Atoll** (3°55'N., 72°50'E.) consists of many islands and islets, of which 22 were inhabited in 1970. The principal occupations are catching turtles and weaving sails.

There are many good passages into the lagoon on all faces of the encircling reef, except the S face, where there is only one break.

The atoll lagoon is much encumbered with coral reefs, some with depths of 3.7 to 5.5m; others dry, leaving lagoons within. The coral heads may be avoided on a clear day with a good lookout aloft.

The influence of spring tides is felt in the lagoon.

The channel between Ari Atoll and South Male Atoll is deep and sheltered from the ocean swell.

**Toddu** (4°26'N., 72°57'E.), an island about 12.5 miles NE of the N end of Ari Atoll, was inhabited in 1970 and partially wooded. The island may be sighted from a considerable distance. It was reported (1934) to be larger than charted, and this is confirmed by the latest maps (1970) based on aerial photography. These also show the reef to extend about 0.6 mile farther W than charted.

## Rasdu Atoll

**5.43 Rasdu Atoll** (Rasdho Atoll) (4°16'N., 73°00'E.), about 5.5 miles S of Toddu, is connected with the NE part of Ari Atoll by a submarine plateau with depths of 183 to 274m. It forms part of Ari Atoll for administrative purposes.

In 1987, Rasdho was reported visible from a distance of 20 miles.

The channel between Rasdu Atoll and Toddu was reported (1963) to be about 1.3 miles wider than charted.

**Rasdu** (4°16'N., 73°00'E.) and Kuramati, both inhabited in 1970, are islets on the S side of the atoll; the opening between them can be used only by vessels if local knowledge is available. In 1963, Rasdu had trees 24m high, and Kuramati was thickly wooded with some very tall trees.

Weligandu, about 2.5 miles NNE of Rasdu, had trees 14m high in 1963. The other opening into the lagoon lies about 1 mile N of Weligandu, and has a least depth of 14.6m in the fairway.

The lagoon is deep, but it is encumbered with coral reefs.

**Gaha Faro** (4°16'N., 72°45'E.), a large reef with a lagoon within, forms the N side of the W side of the atoll; a similar but smaller reef lies about 2.5 miles E. Observations in 1940 revealed depths of 16 and 23m in place of much greater depths in the original survey and thus the probability that the above reefs are joining by a ridge of fast growing coral.

**Caution.**—Caution is necessary in the vicinity of the N end of Ari Atoll, because of the changes reported.

**5.44 Ukulahu** (Ukulhas) (4°13'N., 72°51'E.), at the NE end of the atoll, was inhabited in 1970; a good channel lies W of the islet. An islet about 1 mile N of Ukulahi had almost disappeared in 1970. A sandbank lying about 1 mile E of Ukulhas was reported (1987) a good radar target.

From an islet about 1 mile E of Ukulahu, a chain of small reefs extends about 6.5 miles SSE to Toroka (Beyrumadivaru), the N islet on the E side of the atoll. A red obstruction light was reported (1987) shown from a radio mast on Bathala (Butala), lying about 3.8 miles S of Toroka, was visible from a distance of 12 miles.

Midu, about 15.5 miles S of Toroka, had a landing place about the center of the S side abreast a village; there appears to be another at the W end. A strong current sets through the channel S of Midu.

Aumedu, about 3.5 miles S of Midu, was inhabited in 1970 and had breakwaters on its N side. Mahiadu, about 2 miles farther S, was inhabited in 1970 and had breakwaters on its N and S sides.

**Digura** (3°33'N., 72°55'E.), on the SE side of the atoll, and Kurafuri and Didu, farther SW, were inhabited in 1970.

Numerous passages lead into the E side of the lagoon and are about 1 mile apart. Some are narrow, but all are safe if a good lookout is kept. The passage N of Digura is the widest and has a 3.7m patch on its S side.

**5.45 Mamigili** (3°30'N., 72°50'E.) and Ariyaddu, about 0.5 mile E, lie at the S extremity of the atoll and were inhabited in 1970. The channels into the lagoon on either side of Ariyaddu, though narrow, are free from dangers. The E channel has a

least depth of 51m and the W channel a least depth of 48m in the fairway. A small reef lies about 1.5 miles N of Mamigili.

The W side of the atoll, in a general N-S direction, is composed of large reefs enclosing lagoons. The passages between are mostly wide and deep.

Mandu, 15 miles NNW of Mamigili; Himendu, 12 miles farther N; Malos, 4 miles N of Himendu; and Feridu, 4 miles farther N, were all inhabited in 1970.

An opening in the reef about 7.5 miles WNW of Mamigili is narrow, as are the openings 2 and 3 miles farther N.

Passages, about 2 miles wide, lie N and S of the reef on which Mandu lies. All the rest of the passages on the W side are deep and safe.

**Matiwari** (4°12'N., 72°44'E.) and an unnamed islet, about 1.8 miles ESE, were inhabited in 1970. Good anchorage was obtained in 1942 about 2 miles E of Matiwari.

### Fulidu Channel and Ariyaddu Channel

**5.46 Fulidu Channel** (3°45'N., 73°25'E.), between the S end of South Male Atoll and the N end of Felidu Atoll, about 7 miles S, is deep and free from dangers.

**Ariyaddu Channel** (3°25'N., 72°53'E.), between the S end of Ari Atoll and the N end of Nilandu Atoll, about 9.5 miles S, is also deep and free from dangers.

**Tides—Currents.**—Tidal currents, which are very strong during spring tides, set E through Fulidu Channel and Ariyaddu Channel with the flood, and E with the ebb. The tidal currents are periodically retarded or accelerated by the current.

### Felidu Atoll

**5.47 Felidu Atoll** (3°30'N., 73°30'E.) consists of several islets, seven of which were inhabited in 1970. The principal occupation is net weaving.

**Fulidu** (3°41'N., 73°24'E.), an islet at the N point of the atoll, is well-wooded, with a conspicuous clump of trees at its center, and was inhabited in 1970.

There are several safe but narrow openings along the N and NE sides of the atoll. The opening 1.5 miles E of Fulidu has a least charted depth of 9.1m in the fairways. In 1987, it was reported that patches with minimum depth of 6m existed and the area was breaking heavy seas. Two miles further ESE another opening has a submerged rock in mid-channel. There is a channel 1 mile E of **Digeri** (3°38'N., 73°28'E.), and on each side of Alimata, about 3 miles S. In 1987, the N channel was not recommended.

Tinadu, about 6.5 miles SSE of Alimata, with Felidu and Keadu farther SSE, are three islets at the head of the bight on the NE side of Felidu Atoll. The three islets were inhabited in 1970; Felidu is the island of the Chief of the Atoll. The openings between these islets and the reefs between are narrow and a heavy swell sets on them during the Northeast Monsoon; the currents and tidal current are strong.

Between Keadu and Foteo, at the E extremity of the atoll, there are other openings, narrow and without landmarks. This part of the barrier reef as well as the whole S face of the atoll may be considered one continuous reef.

Foteo was inhabited in 1970 and has some tall trees on it.

**Caution.**—The latest maps confirm earlier reports that the NE edge of the reef N of Foteo extends about 1 mile farther NE than charted.

**5.48 Rakidu** (3°19'N., 73°27'E.), the S islet of the atoll, was inhabited in 1970. There is a very narrow and deep channel, leading into the lagoon, on each side of Rakidu; both are free from dangers in the fairways.

From the W channel at Rakidu to the W point of the atoll, there are nine openings in the barrier reef, but there are no landmarks to help locate them. Lighted Beacon No. 2 lies on the reef at the W point of the atoll.

Several openings in the NW side of the atoll are not easily seen. Gunawari, about 4 miles SW of Fulidu, has two conspicuous palms showing over dense scrub; an islet, about 1 mile ESE, has eight coconut palms.

The latest maps (1970), based on aerial photography, confirm an earlier report that the reef between Gunawari and Fulidu has extended about 1 mile NW.

### Wataru Channel

**5.49 Wataru Channel** (3°15'N., 73°30'E.), between Felidu Atoll and Mulaku Atoll, about 8 miles S, is divided into two channels at its W end by Wataru Reef. The S channel is wider and both channels are deep. The currents and tidal currents are strong. Off Wataru Reef, heavy W swells are experienced.

Wataru Reef is a small atoll with a small opening at its S end, which can only be used by boats. An islet lies on each side of the opening; the E islet had palms on it in 1970. According to the latest maps, the W islet may have disappeared; they also show the reef to be about 1 mile longer in an E-W direction than charted.

Rakidu, the S islet of Felidu Atoll, marks the N side of Wataru Channel.

### Mulaku Atoll

**5.50 Mulaku Atoll** (3°00'N., 73°29'E.) consists of several islets, ten of which were inhabited in 1970. All the islets lie on the barrier reef, except Mulaku, the largest islet, which lies close within the E side of the lagoon.

There are many coral reefs in the lagoon, which has a sandy bottom.

The reefs on the S and E sides of the atoll were reported (1920) to be extending seaward; the latest maps prepared from aerial photography confirm this.

Between the NW extremity of the atoll and Digeru, about 11 miles ESE, there are three narrow openings without nearby islets to identify them. Digeru and Maduwari, about 0.8 mile ESE, were inhabited in 1970. Close SE of the latter two islets are channels about 45.7m wide, with a least depth of 9.1m

Raimandu, inhabited in 1970, lies about 1 mile SSW of the NE point of the atoll.

An opening in the barrier reef lies between the islets of Vevaru and Muli, about 8.5 and 10.5 miles, respectively, SSW of Raimandu. The opening is narrowed to about 0.6 mile by the reefs extending from both islets. There is a deep channel through the opening, but the entrance is intricate, with a least

depth of 5.5m in places. Mulaku lies close NW of the opening; a village lies on the N side of the island.

Landing can only be made on the W side of the islets. The nearest entrance to the lagoon lies 2 miles W of Kolufuri.

From **Kureli** (2°47'N., 73°21'E.), inhabited in 1970, the reef extends N for 24 miles, with 14 safe openings into the lagoon. Some of these openings are small, but none has a depth of less than 18.3m.

Tuvaru, about 7 miles N of Kureli, was inhabited in 1970. An opening, close S of the islet, forms a good channel with depths 55m, but there are coral reefs just within the entrance.

## Nilandu Atoll

**5.51** Nilandu Atoll consists of North Nilandu Atoll and South Nilandu Atoll, separated by a deep channel 3.5 miles wide. This channel is free from dangers. The islands of both atolls are mostly covered by vegetation with many coconut palms.

**5.52 North Nilandu Atoll** (3°31'N., 72°56'E.) has few islets on the barrier reef. There are several islets in the lagoon, which is deep but encumbered with drying coral reefs.

The islet of **Ari Faro** (3°20'N., 72°54'E.) marks the N end of the atoll. An opening, with depths of 27 to 37m, lies about 1.3 miles W of Ari Faro, and a broad deep opening, with a reef in the middle, lies on the E side of Ari Faro.

From the latter opening, around the E boundary of the atoll to its S point, there are openings from 1 to 4 miles apart; all have moderate depths except the narrow passage S of Farna (3°19'N., 72°59'E.), which has a charted depth of 5.5m.

**Biladu** (3°09'N., 72°59'E.), about 2 miles within the lagoon, was inhabited in 1970 and had a boat harbor on its NW side.

**Nilandu** (3°05'N., 72°54'E.), the S island of the atoll, was inhabited in 1970. The S opening into the lagoon, E of Nilandu, is 1 mile wide with depths of 12.8 to 37m in the fairway. Daumbuda, about 2 miles ENE of Nilandu, lies on the reef bordering the E side of the opening. Hekara, Maguda (the chief's island), and Daumbuda were inhabited in 1970.

A wide, deep passage lies at the N end of the reef extending 4 miles NNW from Nilandu. On the N side of this passage is a circular reef, N of which is a deep narrow passage.

Hemiti, about 12 miles NNW of Nilandu, is the W islet of the atoll and was inhabited in 1970. An opening, with a depth of 24m, lies N of Hemiti and is bounded by the edge of the reef projecting 1.5 miles N of the islet and the reef N.

There are some shoals in the opening about 6 miles SSE of Farna, between Feartu and Mawafuri. The latter island is much smaller than charted due to erosion by the sea, but there were a few palms on it in 1970.

**5.53 South Nilandu Atoll** (2°50'N., 72°56'E.) has many islets on the barrier reef on the E side of the atoll, but few on the W side. The islets on the SE side of the atoll are closely grouped.

The atoll has many openings in the barrier reef but is inaccessible on its SW side.

The lagoon is deep but encumbered with large and small coral reefs, some of which dry; these reefs are steep-to and

easily discernible. Most of the many islets in the lagoon are in the N part and about 3 miles within the lagoon.

**Furi** (3°01'N., 73°01'E.), the N islet on the E side of the atoll, was uninhabited in 1970. There is an opening close SE of Furi.

From the latter opening the reef, with six other openings and about 20 islets upon it, extends to Kandimas, about 16 miles S.

A narrow opening on the reef, between Kandimas and Wani, about 1 mile SW, has a least depth of 37m in the fairway. The latter islet was inhabited in 1970.

Another opening, about 2.8 miles farther SW and NE of Maimbudu, has a least depth of 12.8m in the fairway.

**5.54 Kuda Huvadu** (2°41'N., 72°54'E.), at the S extremity of the atoll, was inhabited in 1970 and is the atoll chief's island. The opening, E of the island, is about 1.5 miles wide with a least depth of 16.5m in the fairway.

Huludali, about 12 miles NNW of Kuda Huvadu, was inhabited in 1970 and has openings N and S of it. The S opening, about 0.2 mile wide between the edges of the reef, has a least charted depth of 27m. The N opening, between Huludali and Madali, about 1.3 miles NW, is about 0.8 mile wide between the reefs, and has a least depth of 35m in the fairway; this opening is better defined than the opening S of Huludali. A reef extends about 0.8 mile E of Madali.

There are three openings on the barrier reef between Madali and Furi, about 12.5 miles NE, but there are no other islets on this part of the reef. The NW side of the atoll is unsafe to approach, as some islets inside the lagoon have trees on them visible from a distance, but they lie too far within to provide safe navigational marks.

Dures and Rimbudu lie within the lagoon, about 3 and 4 miles, respectively, NE of Madali; they are called the Jeweller's Islands because the inhabitants were at one time the chief jewellers of the Maldive Islands. Rimbudu was inhabited in 1970.

Anchorage NE of Rimbudu is more comfortable in a SW swell than that S of the island.

## Kudahuvadu Channel

**5.55 Kudahuvadu Channel** (2°40'N., 73°15'E.), between Mulaka and Nilandu Atolls to N, and Kolumadulu Atoll to S, is deep and free from dangers. It is about 15 miles wide at its E entrance and about 9.5 miles wide at its W entrance.

The W entrance of the channel is well-defined on its N side by Kuda Huvada; the S side of the entrance is not so well-marked.

**Tides—Currents.**—Currents in Kudahuvadu Channel are more obstructed than those in the channels farther S because of the nearby atolls, and consequently are more uncertain in direction and their velocities are greater.

Tidal currents set E through the channel with the flood and W with the ebb.

## Kolumadulu Atoll

**5.56 Kolumadulu Atoll** (2°23'N., 73°08'E.) has several openings in its barrier reef; there are islets on its E, S, and W sides, but very few on its N side. The lagoon is encumbered with numerous drying coral reefs.

The few islets on the N side of the atoll were wooded in 1970, and had many coconut trees.

**Kandufuri** (2°32'N., 73°00'E.) has openings in the reef about 1.3 miles WSW and close E; both openings are deep. Kandufuri was reported to be a good radar target at 15 miles.

Buruni, about 8 miles E of Kandufuri, has a channel close E with a depth of 12.8m. Another opening, about 2.5 miles E and close W of Koragandu, has a least charted depth of 29m, but care must be taken to avoid reefs about 1 mile S of the opening.

Olugeri lies about 6 miles ESE of Karagandu. The E entrance on the N side of the atoll lies close E of Olugeri, and has a least charted depth of 9.1m.

Wilifuri, at the NE end of the atoll, was populated in 1970.

From close N of Wilifuri, the reef extends about 12 miles S to Diyagili and has no openings. Diyagili and Mudifuri, about 2 miles NE, are inhabited.

A good channel, about 0.7 mile between the reefs and with a least depth of 14.6m, lies close SW of Diyagili; there is a tide rip across the entrance.

Guradu, on which there is a village, lies 1 mile SW of Diyagili.

Between Guradu and Timarafuri, about 13 miles SW, there are no openings in the barrier reef; numerous islets lie on this reef.

There are three openings between Timafuri and Veimandu, about 3 miles WSW; the latter two islets are inhabited. The channel close W of Timafuri has a least charted depth of 68m and is free from dangers. The channel, about 1 mile farther W, is not recommended; it has a least depth of 11m and care must be taken to avoid rocks on its E side. A broad, deep channel lies about 1 mile farther W and close E of Veimandu, but a large coral patch, with off-lying rocks, lies about 0.8 mile within the entrance.

The barrier reef then extends from Veimandu to Naraka, about 8 miles W, and then about 5 miles NNW to Hirilandu.

The most convenient entrance from the W, and the only one on the W side, lies between Hirilandu and Kandudu, about 2 miles N. The entrance is constructed by a reef, partly above-water, in the middle of the opening, with an islet about 1 mile E. Vessels may best avoid the reef by keeping well to the S or N sides of the opening, while maintaining a sharp lookout for the reefs extending N from Hirilandu and S from Kandudu.

**Anchorage.**—There is anchorage, according to the prevailing wind, on the E side of Hirilandu or the E side of Kandudu, but care must be taken to anchor clear of coral patches.

## Veimandu Channel

**5.57 Veimandu Channel** (2°10'N., 73°20'E.), between Kolumandulu Atoll and Haddummati Atoll, about 16 miles SE, is deep and free from dangers, but it is inadvisable to proceed through it at night.

**Tides—Currents.**—Tidal currents in this channel have a velocity of about 2 knots at springs, but this velocity may be accelerated or retarded by the prevailing current.

A current of 1.8 to 3.5 knots, setting in 070° direction, was experienced in Veimandu Channel in October, 1960.

## Haddummati Atoll

**5.58 Haddummati Atoll** (1°55'N., 73°25'E.) has six openings in the barrier reef surrounding it, four of which are suitable for large vessels. The lagoon is encumbered by many coral reefs, but these can be seen by a lookout at the masthead on a clear day with the sun behind.

**Isdu** (2°07'N., 73°35'E.), at the N extremity of the atoll, had several villages on it. It was reported (1963) that Isdu lies about 3 miles NNW of its charted position.

The inhabited islet of Mabadu lies about 5.5 miles SSW of Isdu. Passages lie N and S of Mabadu; the N passage is shallow, but the S passage is about 0.2 mile wide, with depths of 14.6m.

From the latter opening, the barrier reef extends about 12.5 miles SSW to close W of Gadu, at the E opening of the S entrance to the lagoon. Of the several islets on this section of reef, **Mandu**, Baresdu, Gang, and Funadu are inhabited. Gang and Funadu were reported (1970) to lie about 2 miles NW of their charted positions.

Funadu was reported to be a good radar target at 18 miles.

The S opening into the lagoon lies between the reef extending 0.5 mile SW of Gadu and the reef close E of Hitadu, about 2.5 miles SW. The opening is divided into two passages by three reef-fringed islets lying just within and on the W side of the entrance. The E passage has a least depth of 55m and the W passage has a least charted depth of 27m. Several coral reefs lie in the fairway W of the three islets, and care must be taken if using the W passage.

**5.59 Hitadu** (1°48'N., 73°25'E.), on the W side of the S opening, is the atoll chief's island; with Kunahandu, close W, the two islands appear as one. In 1984, a light was reported on the W end of Hitadu Island.

The barrier reef extends from close E of Hitadu for about 12 miles NW to about 1.5 miles N of Mavaru. The latter island, at the W extremity of the atoll, is the principal island.

**Anchorage.**—Convenient anchorage has been reported, in 44m, N of Hitadu. Landing was easily made on a sandy beach after passing over the reef which extends about 183m offshore.

Good anchorage, sheltered from W winds, can be found, in 31 to 37m, about 0.8 mile E of Mavaru.

## One and Half Degree Channel

**5.60 One and Half Degree Channel** (1°30'N., 73°20'E.), between Haddummati Atoll and Suvadiva Atoll, about 52 miles S, is deep and free from dangers.

A detached shoal, with a depth of 15.5m, was reported (1963) to lie about 21 miles N of the N of Suvadiva Atoll.

Currents setting E, with velocities up to 3.5 knots, have been experienced in October and November. During the Northeast Monsoon period (December to March), a set W of nearly 4 knots was reported in 1972.

## Suvadiva Atoll

**5.61 Suvadiva Atoll** (Huvadatu Atoll) (0°30'N., 73°15'E.) is one of the largest of the Maldive Islands, and also one of the unhealthiest of the atolls. Elephantiasis is said to be common

and cases of leucoderma have been reported; isolation of such cases is strictly enforced by the government.

Many islets are on the barrier reef and within the lagoon, but not all are inhabited. The lagoon has greater depths than the other atolls of the Maldive Islands, and is less obstructed by coral reefs.

The atoll is the center of the Maldivian mat industry, as the rushes from which the mats are made are found in great quantities.

The N of the atoll is bounded by detached reefs, with a few islets about 2 miles within. There are several safe passages, but as there are no islets on this portion of the barrier reef to provide landmarks, a careful lookout is necessary.

From its N point on the E side, the barrier reef extends about 11 miles SSE and is impassable. Mametu, about 4.5 miles from the above N point, consists of two islets, and are the first islets to be seen when approaching from NE.

**Wiringili** (0°45'N., 73°23'E.), densely inhabited in 1970, lies at the S end of the impassable reef. Kudu lies about 0.5 mile farther S. There are passages N and S of Kudu. The N passage is about 0.2 mile wide with a least depth of 22m, and the S passage is about 0.3 mile wide with a least depth of 24m.

Between Kudu and Kandu Huludu, about 23 miles SSE, there are a number of openings in the reef and numerous islets lying on it. Of the islets, Nilandu, Dandu, Hura Mula, Kondai, Diaddu, Mawaru, and Kandu Huludu were inhabited in 1970.

It was reported (1963) that the islands between **Diaddu** (0°29'N., 73°30'E.) and Kubura, about 5.5 miles S, were about 3 miles E of their charted positions.

A passage, about 0.5 mile wide, with depths of 12.8 to 14.6m in the fairway, lies between Kandu Huludu and Huluwarolu, about 1 mile WSW.

From the NE end of Huluwarolu, the barrier reef extends about 5.5 miles SW, and just within its SW end is an islet called Gadu, inhabited in 1970. Several islets are on this part of the reef, and from the offing appear as one. A narrow passage SW of Gadu has a least depth of 3.6m in the fairway.

**5.62 Gan** (0°17'N., 73°22'E.), inhabited in 1970 and the largest island of the atoll, lies about 1 mile W of Gadu.

Gan Channel, W of Gan, is about 1.5 miles wide, with a least depth of 55m in the fairway. An islet, about 2 miles NNW of the SW end of Gan, can be passed on either side, but care must be taken to avoid a reef extending 1.3 miles SSW of it, and also Low Bushy Island off the W end of this reef. Inside the entrance of this channel, the lagoon is encumbered with islands and reefs all plainly visible from aloft in favorable light.

Several channels are in the barrier reef, between the W side of the entrance to Gan Channel and Wadu, about 7 miles WSW. The channel between Rasfanu, 6 miles W of Gan, and Kuri, about 1.8 miles farther W, has a least depth of 37m and leads N.

Wadu, inhabited in 1970, is the site of ancient mosques and burial places; the barrier reef extends about 2.5 miles WSW of Wadu. The channel into the lagoon, close W of the latter reef, has a least depth of 12.8m in the fairway.

Matoda, about 6 miles W of Wadu, lies on the W end of the S coral reef of the atoll. This reef contains several islets and extends about 4.3 miles ESE from Matoda.

**Fiori** (0°14'N., 73°05'E.), inhabited in 1970, lies about 1 mile W of Matoda. A deep channel, about 0.3 mile wide and fringed by reef, lies between the two islets.

From Fiori, the reef extends about 7 miles NW to Nadale, and then about 10 miles NNW to Madaveli; this portion of reef is so densely encumbered with small islets as to appear as a single large island from some directions.

Kandudu Channel, between Madaveli and Kandudu, about 1 mile N, is the more convenient and principal entrance into the lagoon. It is about 0.8 mile wide, with a least depth of 11m.

Havaru Tinadu, about 4 miles N of Madaveli, is well-wooded, very low, and swampy in parts. It is densely populated and reported to be the seat of government of the atoll, with radio communication with Male. From SW or W, this islet may appear as the N point of the atoll, because none of the low-lying islets N of it are wooded.

Between Havaru Tinadu and Mafuri, about 21 miles NNE, the barrier reef recedes to form a bight. There are numerous openings into the lagoon on the NW side, but no useful landmarks; however, a vessel might pass through one of these openings in an emergency with a good lookout at the masthead and with favorable light conditions.

**5.63 Mafuri** (0°50'N., 73°08'E.), the principal islet on the NW side of the atoll, was densely inhabited in 1970. Its fringing reef extends about 1 mile N of the islet. Landing is at the village near the middle of the E side of the islet. The boat channel is not marked and only boats of shallow draft can land here at LW.

Hibadu, within the lagoon and about 3.5 miles E of Mafuri, was uninhabited in 1970 and very unhealthy. It lacks palm trees but is marked by tall luxuriant trees.

**Anchorage.**—During the Northeast Monsoon, sheltered anchorage can be found on the W side of **Nilandu** (0°38'N., 73°23'E.). Vessels with local knowledge can enter the lagoon on either side of the reef on which Nilandu lies; care must be taken to avoid a coral reef that lies in the middle of the N channel. Anchorage can also be found on the W side of Kondai about 10 miles SE, but local knowledge is necessary.

Good anchorage can be obtained about 0.5 mile NW of Gadu and also off Gan.

**Hondedu** (0°27'N., 72°57'E.), S of Madaveli, affords good anchorage, in 49 to 64m, on its E side during the Southwest Monsoon; local knowledge is necessary.

Anchorage may be obtained in the NW part of the lagoon, in 18.3m, with Mafuri bearing 267°, distant 1 mile.

## Equatorial Channel

**5.64 Equatorial Channel** (0°00', 73°15'E.) is the name generally applied to the channel between Suvadiva Atoll and Addu Atoll, about 46 miles S, but the name should be more properly applied to the channel between the S point of Suvadiva Atoll and Fua Mulaku, which lie about 12 miles N and 16 miles S, respectively, of the Equator. There are no known dangers between Suvadiva Atoll and Addu Atoll.

**Tides—Currents.**—Strong E and W sets, with velocities up to 5.5 knots, have been reported in Equatorial Channel, but in its S part the easterly counter equatorial current, with a velocity up to about 4 knots, seems to prevail.

## Fua Mulaku Island

**5.65 Fua Mulaku Island** (0°17'S., 73°26'E.) is wooded and inhabited. In 1968, the island was reported to lie about 3 miles WNW of its charted position. In 1963, the island was reported to extend 1.5 miles more in a NW-SE direction than shown on the chart; recent air photography (1969) confirmed an extension in these directions of 1 mile.

**Tides—Currents.**—Tidal currents in the vicinity of Fua Mulaku set W on the ebb and E on the flood, but are little felt except in retarding or accelerating the current.

Fua Mulaku is steep-to on its W, N, and E sides, but a shelving bank, on which the sea breaks heavily up to 0.8 mile offshore, extends about 1.5 miles SSE from the S end of the island. This bank, composed of hard sand, with small coral rock is steep-to.

**Anchorage.**—Anchorage can be obtained during moderate weather, in 11 to 12.8m, on the S end of the shelving bank.

A landing place on the E side of the islands can be recognized by a collection of boat sheds. Landing on the W side is dangerous and should not be attempted.

## Addu Atoll

**5.66 Addu Atoll** (0°39'S., 78°10'E.), the S atoll of the Maldive Islands, is fertile and consists of many islands and islets lying on a barrier reef enclosing a lagoon which provides good anchorage.

The barrier reef, which dries, extends about 0.5 mile seaward of the islands. Four deep channels lead through the barrier reef into the lagoon, which has general depths of 18.3 to 75m.

The islands and islets on the W side are more densely wooded than those on the E side, which are covered with scrub.

Good radar returns have been reported from Addu Atoll at 11 miles

**Winds—Weather.**—Wind direction has a seasonal pattern not conforming to that of the monsoon. Winds from NNE predominate in January and February, backing to W in March, April, and May and to S in July and August. In September, the predominant direction veers to become W in October and November, and N by December. Wind speeds are generally below 15 knots, with greatest mean speeds in May and October. Occasional gusts exceeding 40 knots occur at any time of year in association with rain showers from SW or NW.

Winds from E are rare and usually light.

**Tides—Currents.**—Addu Atoll and Equatorial Channel lie in the N fringe of the Equatorial Countercurrent. The predominant direction of the current appears to be E or NE throughout the year, but observations are scanty and marked variations no doubt occur.

Observations suggest the current increases in strength within 50 miles from the atoll.

Approaching Addu Atoll from W in approximate latitude 0°45' S, a vessel reported (1965) that the countercurrent was running at 1 knot or less. When E of meridian 72°E, the current increased setting ENE at an estimated 3 knots and possibly increasing to 5 knots when about 30 miles W of Gan.

The flood current sets strongly into the lagoon through Wilingili Channel and out of the lagoon through Gan Channel.

The ebb current sets out through both channels; thus the current through Gan Channel is continuously out of the lagoon.

In Kuda Kanda Channel, the current sets in with the flood and out with the ebb, but in Man Kanda Channel it sets continuously out of the lagoon. The tidal current in Man Kanda Channel is reported to attain a velocity of 5 knots.

The current sets strongly across the entrance to Gan Channel, usually in an E direction, but after a spell of E winds a set to the SW is experienced.

The tidal rise at Addu Atoll is 1.2m at MHWS and 0.8m at MHWN.

**5.67 East side.**—**Midu** (0°35'S., 73°14'E.), the NE islet of the atoll, is thickly wooded (1973), except near the village at its NW end and near the village of Huludu at its S end.

Heratera, a narrow island, thickly wooded (1973) in its N part, extends about 2.5 miles S from the S end of Midu.

Kalu Hera and Mulikadu, islets about 0.2 mile and about 1 mile S, respectively, of the S end of Heratera, each had a prominent coconut palm on it in 1973. The barrier reef extends about 0.8 mile SW of Mulikadu.

Wilingili, an island with its N end about 1.4 miles SW of Mulikadu, lies on a detached reef. The NE part of the island is covered with scrub and is heavily wooded. The island was uninhabited in 1973, but is sometimes visited by fishermen. Wilingili Channel, an opening into the lagoon, lies NE of Wilingili. Gan Channel, another opening, lies SW of Wilingili.

**5.68 Gan** (0°41'S., 73°10'E.), at the S end of Addu Atoll, lies about 1 mile W of the SW end of Wilingili. The island was lent in 1960 to the British Government as a staging post for the Royal Air Force. The British presence on the island ceased on March 31, 1976.

**Aspect.**—The island is very fertile, with many palm and casuarina trees on its NW side, but the S part is covered with scrub. The N shore is lined with buildings associated with the airfield on the island. A conspicuous clump of casuarina trees stood at the SE end of the island in 1973.

Numerous radio masts, with elevations of 40m, some of which are marked by red obstruction lights, are situated on the S side of the island. In the same area is a lattice tower, with an elevation of 30m, and fitted with reflector devices, the upper rectangular and the lower crescent-shaped. A black lattice tower, fitted with crosstrees, lies close NE of this tower.

Two blue square towers, with elevations of 9.1m, lie on the N side of the island about 0.8 mile farther NW; they are conspicuous from N and E, but obscured from the NW. A similar tower and several radio masts, all with an elevation of 29m, lie about 0.2 mile W of the water towers; the tower and some of the masts are marked by red obstruction lights.

A concrete pier, 135m long and 13.4m wide, is situated about 0.3 mile E of the NW end of the island. There is a channel 15.2m wide, with a depth of 2.3m on both sides of the jetty. There is a least depth of 2.7m at the seaward end of the jetty.

An oil pier, about 0.2 mile ESE of the concrete pier, extends 134m to the edge of the barrier reef. Tankers using the oil pier anchor off and secure the stern to moorings buoys off the head of the pier.

**Pilotage.**—No licensed pilot is available.

**Anchorage.**—Anchorage can be taken, in about 40m, good holding ground of coral and sand, from 0.4 to 0.5 mile ENE of the jetties on the N side of Gan. There is very little swell here, but farther inside the lagoon it may be moderate to heavy.

Ships up to 12,000 grt anchor regularly in this area. Ships formerly anchored farther WNW, but this area is now fouled by a submarine cable.

**Caution.**—The lighted buoys and buoys in the channels and the lagoon should not be relied upon.

**5.69 West side.**—The barrier reef, with several islands on it, extends about 7.5 miles NW of Gan.

Fedu, close NW of Gan, to which it is connected by a ruined causeway, was thickly wooded in 1973.

Maradu, thickly wooded in 1973, lies close NW of Fedu and is connected to it by a causeway.

Hankada, about 183m NW of Maradu, is connected to it by a causeway and also to Abuherra farther NW.

Abuherra is connected by a narrow isthmus to Hitaddu, the NW and largest island of Attu Atoll. The latter island is thickly wooded N of its junction with Abuherra. Two radio masts, exhibiting red obstruction lights at an elevation of 73m, lie near the S point of Hitaddu. Close S of the masts is a radome, conspicuous to seaward from S and W, with numerous unlit radio masts, with elevations of about 36m, extending 0.5 mile NW. A large village, with three mosques, is situated on the N part of the island.

**Demon Point** (0°35'S., 73°05'E.), the N extremity of Hitadu, lies about 3.3 miles N of the radome.

**5.70 North side.**—From Demon Point, the outer edge of the barrier reef trends SE and E for about 3.5 miles to the W entrance point of Kuda Kanda Channel. Man Kanda Channel, about 0.8 mile farther E, is separated from Kuda Kanda Channel by two sandy cays; the E cay, known as Bushy Islet, has a prominent group of trees on it.

From the E entrance point of Man Kanda Channel, the barrier reef extends about 5.5 miles ENE to the NE extremity of Midu. Mahira Island, on this reef, extends to about 1 mile W of the NW extremity of Midu.

**5.71 Lagoon.**—The reef fringing the islands extends about 0.5 mile into the lagoon, except in the SW corner, where it is less than 0.2 mile off Gan and Fedu. The fringing reef extends much farther in the NE and NW parts of the lagoon, which are encumbered with coral reefs; the NE part has not been thoroughly examined, and vessels should not approach these areas too closely.

Medagala and Aruhal are two coral heads which dry, lying in the middle of the lagoon, about 3 and 3.5 miles, respectively, N

of the NW extremity of Gan. A shoal, with a least depth of 4.9m, lies about 183m S of Medagala, and is marked at its W edge by a lighted buoy.

A coral shoal, with a depth of 1.8m, lies about 1.3 miles NNW of the NW extremity of Gan; a lighted buoy marks the E side of this shoal.

A shoal, with a least depth of 8.5m and marked by a lighted buoy, lies about 1 mile farther N.

**Anchorage.**—Anchorage, during E winds, can be taken off the W side of the E islands, and in W or S winds off the NE side of the SW islands; local knowledge is necessary. These are the most convenient anchorages for communication with the inhabitants. Anchorage off Gan was previously described in paragraph 5.68.

Swell may be experienced in the lagoon throughout the year, but most often and most severely with W or S winds, when refueling alongside a tanker or loading and discharging a ship may be difficult.

**Caution.**—A submarine cable, on the W side of the lagoon, is laid between the NW end of Gan and Hitaddu. Vessels are warned not to anchor within 0.5 mile of this cable, which carries high voltage.

**5.72 Gan Channel and Wilingili Channel,** the S channels, are to be preferred to the N channels, as they are broader and less intricate. A daylight approach is recommended, even in the case of Gan Channel and Man Kanda Channel, which are marked by lighted buoys, as the lighted buoys tend to be difficult to identify among the airfield lighting until close aboard. Aircraft runway lights at each end of the runway at Gan are switched on when it is in use; the lights are in line 098.5°, but have no navigational significance for ships.

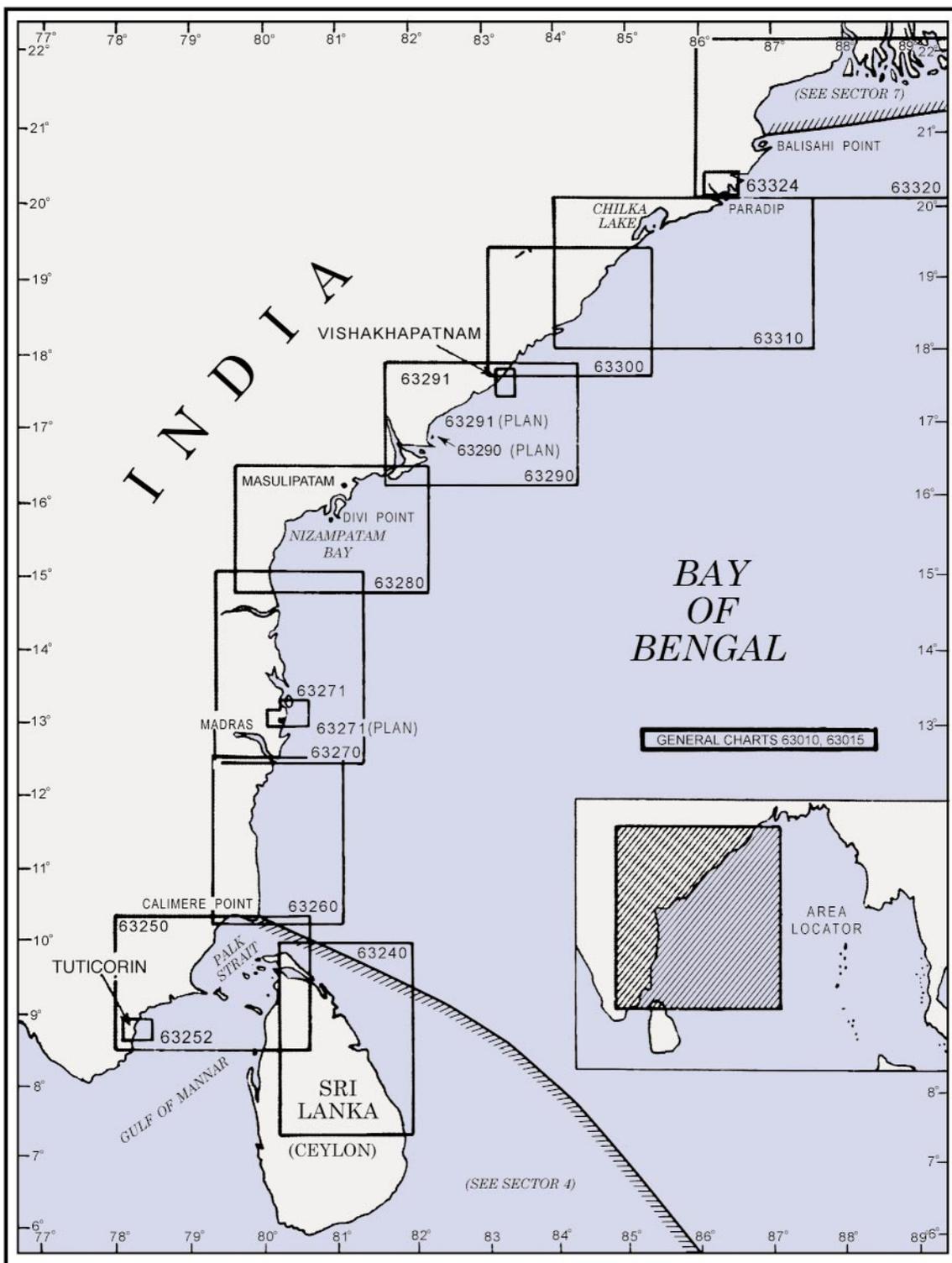
Gan Channel is about 0.4 mile wide, with depths of 16.5 to 18.3m in the fairway.

Wilingili Channel, about 0.4 mile wide between the reefs, has a least depth of 18.3m and is entered on a NW course. Care should be taken to avoid a 12.2m shoal at the lagoon end of the channel close off the reef on the SW side and Medagala Reef with the shoal S.

Man Kanda Channel and Kuda Kanda Channel, the N channels, are not easy to distinguish from N.

Man Kanda Channel, about 0.2 mile wide between the shoal ground extending from the reefs on either side, has a least depth of 12.2m in the fairway. A SSE course leads through the channel between lighted buoys.

Kuda Kanda Channel, about 0.1 mile wide between the fringing reefs, has a least depth of 24m in the fairway. Kuda Kanda Channel is longer and narrower than Man Kanda Channel, and is unlit.



Additional chart coverage may be found in NGA/DLIS Catalog of Maps, Charts, and Related Products (Unlimited Distribution).

**SECTOR 6 — CHART INFORMATION**

## SECTOR 6

### INDIA—EAST COAST—POINT CALIMERE TO BALISAHU POINT

**Plan.**—This sector describes the E coast of India, from Point Calimere to Balisahi Point, and includes the Coromandel Coast and the Orissa coast within its limits; Madras and Vishakhapatnam are the main harbors. The descriptive sequence is from S to N as far as Cocanada and then NE to Balisahi Point.

#### General Remarks

**6.1** The E coast of India, from Point Calimere N to Cocanada, is about 500 miles long and is known as the Coromandel Coast. That part of the coast between Cocanada and Balisahi Point, about 364 miles NE, is known as the Orissa Coast.

The low sandy coast fronting the W side of the Bay of Bengal is exposed to a very heavy surf. As a result, there is little or no shelter provided for vessels other than small craft. The harbors at Madras and Vishakhapatnam are the only large ports providing shelter and berthing facilities for all classes of vessels. The coast S of Madras appears to have been encroached upon by the sea to a considerable extent.

Between Pondicherry and Madras, scattered hills rise to heights of 46 to 198m, at distances of 2 to 16 miles inland. Similar hills lie in the vicinity of Nellore, and as far N as the Gundlakamma River.

Between Godavari Point and Shortt Island, about 360 miles NE, the coast is low and barren in places and relatively high and densely wooded in other places. With the exception of Cocanada and False Bays, there are no indentations of any appreciable size.

The depth curves generally parallel the coast with the 200m curves lying about 15 to 25 miles offshore between Godavari Point and the mouth of the **Devi River** (19°59'N., 86°24'E.).

**Winds—Weather.**—Changes in the monsoons are usually accompanied by bad weather. Cyclonic storms, although rare, sometimes occur near the middle of November or the beginning of April. The rainy season commences toward the end of June and ends in the latter part of November.

**Tides—Currents.**—The direct effect of the Northeast Monsoon and the Southwest Monsoon winds on the surface waters of the Bay of Bengal is the development of seasonal currents in opposite directions.

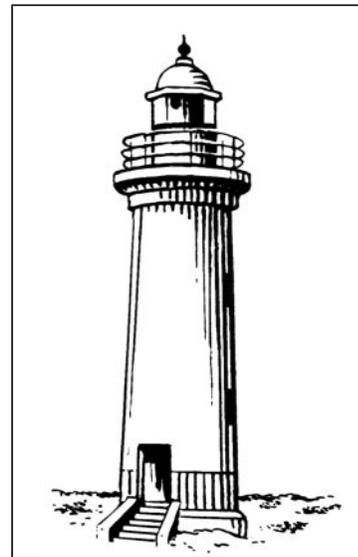
Along the E coast of India, on the W side of the bay, it is not unusual to experience currents setting with velocities of 2 to 3 knots. From February through May, a strong current sets to the N, and from September through December, a similar current setting to the S may be experienced. A survey party found currents with velocities of 1 to 2 knots outside the 45m curve, less current between the 35 and 18m curves, and little or no current inside the latter curve. Close to the shore, the current was occasionally reversed.

When the current was setting to the N in the offing, a set out of Palk Strait was usually found, and presumably the reverse takes place when the current sets to the S. Tidal currents are experienced close offshore and they vary the strength of the current in the neighborhood of Middle Banks in Palk Strait.

#### Point Calimere to Madras

**6.2 Point Calimere** (10°18'N., 79°52'E.) is the southernmost extremity of the Coromandel Coast and the NW entrance point of Palk Strait. The following conspicuous objects lie in the vicinity of the point:

1. Point Calimere Light.
2. Kodyakkarai Bungalows, about 3 miles WSW of the point.
3. Two dark-colored pagodas about 5 miles N of the point and 1 mile inland. These pagodas are shaped like oblong haystacks and are in range 270°.



Point Calimere Light

**Depths—Limitations.**—Between Point Calimere and Madras, there are no charted or known dangers seaward of the 35m curve.

The 120m curve lies about 2 to 16 miles offshore, lying at its greatest distance off the E of Point Calimere.

An 8.7m detached shoal lies about 7.5 miles ENE of Point Calimere. A drying sand bank extends about 2 miles NE of the same point. During bad weather small craft shelter inside this bank.

Nagapattinam Shoal, about 5 miles long and composed of hard sand and stones, lies parallel to the coast about 4 to 5 miles offshore. The N end of this shoal lies about 6.8 miles SE of Nagapattinam Light. Depths over this shoal range from 6.1 to 8.5m.

Several 18.3m patches lie outside the 18m curve, about 12.5 to 17.5 miles NE of Pondicherry Light.

The coast between Point Calimere and Nagapattinam, about 28 miles to the N, is low and fringed by trees. Sand ridges, 3 to 10m high, also fringe the coast.

The two dark-colored pagodas, previously described above, and the church at Velanganni, about 5 mile S of Nagapattinam, are the only distinguishable landmarks between Point Calimere and Nagapattinam.

**6.3 Nagapattinam** (Negapatam) (10°46'N., 79°51'E.) (World Port Index No. 49350), the principal port of the Thanjavur District, lies at the mouth of the Uppanar River. Vessels anchor in the roadstead off the port to work cargo.

**Nagapattinam Home Page**

<http://www.indiaport.com/minorports/nagapatti.htm>

Nagapattinam has been reported to be a good radar target up to 17 miles.

During the Northeast Monsoon, the predominant wind is from the NE at a force of 6 to 7. The port is closed to shipping at this time. During the Southwest Monsoon, the wind is W a force 6.

In general, the currents off Nagapattinam set with the wind and vary with its direction and force. The tides off the port are semidiurnal.

A minaret at Nagore, 46m high, about 3.3 miles N of Nagapattinam, can be seen before the adjacent coast becomes visible. Upon closer approach, Nagapattinam Light, the tall church spire to the NW and two chimneys at the railway workshop to the SW, are conspicuous from the offing.



**Nagapattinam Light**

The 10m curve lies about 2 miles off the port; the depths shoal gradually toward the shore.

There is a least depth of 1.2m over the bar which crosses the mouth of the Uppanar River. The river channel leading to the river quays has a dredged depth of 2.4m. Cargo lighters must

have a draft of less than 1.2m to cross the bar and enter the river. The sea breaks over the bar in nearly all weathers and crossing can be dangerous for boats unless carefully handled. Boats are not permitted to cross the bar after dark.

**Anchorage.**—The anchorage off Nagapattinam is open to all but W winds; the holding ground of mud and sand is good. Vessels usually anchor according to drafts and the state of the weather, with the lighthouse bearing between 290° and 260°. Vessels of moderate draft can take good anchorage, in a depth of 7.8m, about 1.3 miles E of the lighthouse. In heavy weather, a short broken sea is encountered; during the Northeast Monsoon it is inadvisable to anchor in depths of less than 9.1m.

A signal station which vessels at anchor can communicate with using the International Code of Signals by day, and the Morse Code by night, is located 0.1 mile NNE of the old lighthouse. Flags of the International Code of Signals are displayed from the station to assist vessels in anchoring on the most suitable bearing from the lighthouse; Flag K indicates a bearing of 260°, with each subsequent letter indicating a 5° increase to Flag Q, which indicates a bearing of 290°.

Storm signals are displayed from the lighthouse in accordance with the Indian Extended System. Further information on these storm signals may be found in Pub. 160, Sailing Directions (Planning Guide) South Atlantic Ocean and Indian Ocean under “India—Signals.”

All cargo is handled at the anchorage by lighters. About 114 of these lighters are available, each with a capacity of 40 tons. These lighters unload and load at the river’s quays at HW.

**6.4 Nagore** (10°50'N., 79°50'E.) lies at the mouth of the Vettar River, about 3.3 miles N of Nagapattinam. The river mouth is obstructed by a bar with a least depth of 1.2m.

Anchorage can be taken about 1 mile E of Nagore, in depths of 6.4 to 8.2m. The holding ground is good, but the anchorage is considered dangerous during the Northeast Monsoon.

The coast up to 9 miles N of Nagapattinam remains very flat and low. Two rivers, obstructed by bars at their mouths, flow into the sea between Nagore and Karikal. These rivers can be navigated by flat-bottomed boats only after heavy rains.

**Karikal** (10°55'N., 79°51'E.) (World Port Index No. 49370), a small town about 6 miles N of Nagore, lies on the N bank of the Arasalar River, about 1 mile within the entrance. Vessels anchor in the open roadstead off the river mouth and use local boats to handle cargo. The bar, which obstructs the river mouth, has a depth of 2.4m at HWS and is marked by breakers. It is dangerous to cross the bar in October, November, and December.

Depths off the port shoal gradually from the 18m curve, about 6 miles offshore, to a depth of 9.1m about 0.8 mile E of the port.

The lighthouse and the dome of the church at Karikal are conspicuous from the offing. The high minaret at Nagore is a good mark for vessels coming from the S.

Anchorage can be taken, in depths of 9.1 to 11m, mud and sand, with Karikal Light bearing 264°. This is reported to be the best anchorage along this coast. Vessels working cargo should anchor in suitable depths with the lighthouse bearing 285°.

The coast between Karikal and Cuddalore, about 50 miles to the N, is low with but few distinguishing features. Vessels

occasionally anchor off the towns of Tranquebar, Tirumullaivasal, and Porto Novo.

**6.5 Tranquebar** (11°01'N., 79°51'E.), a small town about 6.5 miles N of Karikal, lies on the N bank of a river used only by native boats. An old fort and several white houses, visible from seaward, serve as landmarks. A grove of trees lies on the S side of the town.

The port of Tranquebar has been closed to commercial shipping.

Anchorage can be taken about 1 mile offshore, in depths of 10 to 11.9m, sand and mud, with the fort bearing 281°.

Two pagodas lie in the village of Kaveripatnam, about 7 miles N of Tranquebar. North of this village the coast commences to rise slightly.

Tirukkadaiyur Port, lies 3.3 miles N of Tranquebar. An SPM, with a safety zone with a radius of 500m surrounding it, lies in position 11°04'N, 79°53'E. It is connected to the shore 1.3 miles W by a submarine pipeline.

A conspicuous chimney with a height of 98m stands 1.2 miles inland in position 11°04.4'N, 79°50.2'E.

The harbor limits are defined by the following coordinates:

- a. 11°04.4'N, 79°51.5'E (shore).
- b. 11°05.5'N, 79°52.5'E.
- c. 11°05.5'N, 79°56.0'E.
- d. 11°03.3'N, 79°56.0'E.
- e. 11°03.3'N, 79°52.5'E.
- f. 11°04.4'N, 79°51.5'E (shore).

**6.6 Tirumullaivasal** (11°15'N., 79°51'E.), a small town about 6.5 miles N of Kaveripatnam, lies on the N bank of the Kaveri River near the entrance. A flagstaff, 18m high, lies close N of the low customhouse building. This flagstaff is the only land-mark visible on this part of the coast, and can be seen over the tops of the trees when approaching from the S.

Anchorage can be taken, in depths of 9.1 to 11m, mud, with the flagstaff bearing between 270° and 247°.

A shoal, about 1.5 miles long and lying parallel to the coast, was reported to lie about 7 miles N of Tirumullaivasal and 1.5 miles offshore.

The Coleroon River discharges into the sea through two mouths about 10 and 13.5 miles N of Tirumullaivasal. Coleroon Point is the N end of a long sandy spit which extends N between the two mouths. This point has been reported to be a good radar target up to 19 miles. The Coleroon River Bridge has been reported to be a good radar target up to 24 miles.

A shoal, over which the sea breaks heavily during the North-east Monsoon, was reported to extend about 2 miles offshore between the S mouth of the Coleroon River and a position NE of Coleroon Point. Vessels should not shoal to a depth of less than 27.4m by day or within a distance of 4 miles by night along this section of coast.

The four pagodas, although about 7 miles inland, can be seen over the trees when abeam of the Coleroon River, and have been reported to be good radar targets up to 20 miles.

**Caution.**—An oil field development area, best seen on the chart, lies about 10 miles SW of the mouth of the Coleroon River.

**6.7 Porto Novo** (11°30'N., 79°46'E.), a town about 3 miles NW of Coleroon Point, lies on the N bank of the Vellar River about 1 mile within the mouth. A white flagstaff on the N bank of the river entrance and the two white boundary markers, one N and one S of the town, are conspicuous landmarks.

A light is shown from a white tower with red bands, 30m high, 0.8 mile N of the flagstaff.



**Porto Novo Light**

Anchorage should be taken, in a depth of 16.5m, about 3 miles offshore, from the middle of October until nearly the end of December. During fine weather in the other months, anchorage can be taken closer to shore according to draft. All cargo is handled by native craft at the anchorage.

The coast between Porto Novo and Cuddalore, about 13 miles to the N, is low and marked by scattered trees. From the offing, the few sand hills which are visible appear as islets.

**6.8 Cuddalore** (11°43'N., 79°46'E.) (World Port Index No. 49410) port area comprises the open anchorage off the town and the backwater formed by the confluence of the estuaries of the Gadilam River and the Uppanar River, both of which are subject to heavy flooding in the rainy season. The old town, which shows up well from the N, especially the buildings to the E, lies on the Uppanar Backwater; the new town lies on the Gadilam River, about 1 mile N of the old town.

Cuddalore Light is exhibited from a white round concrete tower 0.2 mile W of the mouth of the Uppanar River. A white flagstaff, 31m high and conspicuous, stands 0.6 mile NNE of the lighthouse.

Cuddalore has been reported to be a good radar target up to 21 miles.

Depths off the port shoal gradually from the 18m curve about 3.5 miles E of the port, to the 5m curve about 0.3 to 0.5 mile offshore.

A shifting boat channel, marked by range beacons, crosses the bar at the entrance of the Uppanar River 0.8 mile S of the lighthouse. This channel has a least depth of 1.2m.

A signal station, by which vessels can communicate by Morse code, lies close S of the lighthouse. Storm signals are displayed in accordance with the Indian Extended System. Further information on these storm signals may be found in Pub. 160, Sailing Directions (Planning Guide) South Atlantic Ocean and Indian Ocean under "India—Signals."

When surf conditions require the closing of the channel across the bar, flag K of the International Code of Signals is



**Cuddalore Light**

displayed. Flag M indicates a strong ebb current, and flag S, a strong flood current.

Anchorage can be taken, in a depth of 11m, about 1 mile offshore, with the lighthouse bearing between 295° and 310°. An anchor boat will indicate the approximate position where vessels may anchor clear of the two dangerous wrecks shown on the chart.

An anchorage for vessels carrying dangerous cargo is situated 2.5 miles E of the S breakwater.

During the Northeast Monsoon, vessels are advised to anchor N of the river entrance and S of the entrance during the Southwest Monsoon.

All cargo is handled by boats and lighters at the anchorage. About 350 lighters, from 15 to 45 tons, are available for day-light use only.

**6.9 Pondicherry** (Pondicherry) (11°56'N., 79°50'E.) (World Port Index No. 49430), the capital and seat of government of the Union Territory of Pondicherry, lies about 13 miles N of Cuddalore. All cargo is handled by lighters at the anchorage off the town.

The low sandy shore S of the town is marked by trees. The land, from 3 to 5 miles NW and N of the town, is 45 to 73m high and helps to identify the locality.

**Pondicherry Light** (11°54.9'N., 79°49.9'E.), with a racon, is shown from a white tower with a black band. A ruined iron pier projects E about 0.2 mile from the shore, 1 mile NNE of the light.

The following landmarks are conspicuous from the offing:

1. Rodiar chimney, 56m high, about 1 mile WNW of the light.
2. Two square towers and cupola of the cathedral about 1 mile NNE.
3. The port flagstaff about 0.5 mile NNE of the light.
4. A conspicuous TV tower lying 0.4 mile WSW of the port flagstaff.

Pondicherry has been reported to be a good radar target up to 18 miles. Pondicherry Hills, which lie 3 to 5 miles NW and N of the town, have been reported to be good radar targets up to 24 miles.



**Pondicherry Light**

Depths surrounding the port range from the 20m curve, which lies about 2.5 miles E of the port, to about the 5m curve, which lies about 0.3 mile from the shore.

During the Northeast Monsoon, which usually prevails from October through January, rough seas are raised, hampering cargo operations. During the rest of the year the prevailing wind is from the W in the morning; a choppy sea is raised by the SE wind in the afternoon.

A signal station lies at the inner end of the new pier at the S end of the town. Vessels can communicate with the station by using the International Code of Signals by day and Morse code at night.

Storm and weather signals are displayed from the signal station; the General System is used. Further information on these storm signals may be found in Pub. 160, Sailing Directions (Planning Guide) South Atlantic Ocean and Indian Ocean under "India—Signals."

Local quarantine and port regulations are in force in Pondicherry. A copy of these regulations can be obtained from the local port authorities.

The new pier is located about 0.7 mile S of Pondicherry Light. The pier is about 287m long and 15.2m wide across the outer face. Cargo is handled by lighters between the anchorage and this pier. About 50 small lighters, with a capacity of 2.5 tons each, are available for cargo handling.

During good weather, anchorage can be taken, in depths of 9.1 to 11m, about 0.8 mile off the coast at Pondicherry. From October to December, when bad weather may be expected, it is advisable to anchor about 1 mile farther offshore, using a good scope of chain. The holding ground is not very good.

Anchorage can also be taken, in depths of 9.1 to 11m, about 0.5 mile E of the head of the new pier. At this anchorage the

powerhouse chimney and Rodiar Chimney are in line, bearing 276.5°.

**6.10** The coast between Pondicherry and Madras, about 76 miles NNE, is low and backed in several places by hills which are conspicuous for some distance seaward.

**Allamparwa Fort** (12°16'N., 80°01'E.), in ruins, lies on the N entrance point of Kaliveli Lagoon about 22 miles NNE of Pondicherry. A dark prominent grove of trees lies close N of the fort. Some hills, which rise to heights of 73 to 198m, lie NW of the fort about 6 to 16 miles inland.

The **Palar River** (12°28'N., 80°10'E.), marked by some tall coconut trees on the N side of its entrance, is obstructed by a bar. A shoal spit, marked by breakers, extends about 1 mile E from the entrance.

Sadras, a small village abreast hidden by trees, lie about 3 miles N of the Palar River. A brick fort, in ruins, lies on the coast abreast of the village and is visible from seaward.

The Sadras Hills, the most conspicuous hills on this part of the coast, lie about 7 to 10 miles WNW of the entrance of the Palar River. The highest peak rises to an elevation of 215m. Finger Peak, 152m high, lies 1.3 miles ESE of this peak. A conspicuous temple lies on Finger Peak. Several other conspicuous peaks lie in the vicinity.

Mahabalipur, a rocky point with several pagodas on it, lies about 6 miles NNE of Sadras Fort. A light stands on a conspicuous rock about 0.5 mile within the extremity of the point. The lighthouse has been reported to be a good radar target up to 16 miles.



**Mahabalipur Light**

**Tripalur Reef** (12°37'N., 80°12'E.), a rocky ledge with a depth of 7.9m at its outer edge, extends about 0.8 mile E from Mahabalipur.

**Rockingham Patches** (12°41'N., 80°15'E.), a group of shoal patches with a least depth of 4.6m, lies up to 1.5 miles offshore about 4.5 miles NNE of Mahabalipur Light.

**6.11 Covelong Point** (12°47'N., 80°15'E.), a small projection with a village on it, lies about 11 miles NNE of Mahabalipur Light. The point has been reported to be a good radar target up to 13 miles.

Open anchorage can be taken, in a depth of 12.8m, about 1 mile E of the village on Covelong Point. Care should be taken to avoid the rocks, awash, which extend about 0.3 mile NE from the point.

The low coast between Covelong Point and Madras, about 18 miles to the N, is clear of dangers.

**Caution.**—About 30 miles ESE of Covelong Point lies a firing practice area centered at position 12°41'N, 80°45'E.

**Ottivakam Hill** (12°48'N., 80°07'E.), 167m high, sharp and conspicuous, lies 8 miles W of Covelong Point at the S end of a low range of hills which extend along this coast for 7 miles. Panchapandavar Malai (Pallavaram) Hills, high and double peaked, lie about 10 miles N of Ottivakam Hill. A temple lies on the highest peak and is prominent. St. Thomas Mount, about 3 miles farther NE, is crowned by some conspicuous white buildings.

Perumbakam Hill, 80m high and flat-topped, lies about 7 miles NW of Covelong Point and is a fair landmark.

A Submarine Exercise Area lies with its center about 20 miles ENE of Covelong Point. A good lookout should be maintained in the vicinity.

## Madras (Chennai) (13°06'N., 80°18'E.)

World Port Index No. 49450

**6.12** Madras (Chennai), the capital and seat of government of Madras State, is the principal harbor on the Coromandel Coast and the third largest port in India. The harbor area, which is entirely artificial, fronts the center of the city, and contains ample berthing facilities for all classes of vessels.

**Port Authority of Madras**

<http://www.chennaiporttrust.com>

**Winds—Weather.**—Cyclones at Madras usually commence with the wind between NNW and NNE, the wind direction changing to the E or W according to whether the port is in the right-hand or left-hand semicircle of the storm. The Madras coast is normally frequented by cyclones during May, October, and November.

Rainfall is almost entirely confined to the period from November to January during the Northeast Monsoon. In April and May, there are occasional squalls from the NW, usually in the early part of the night.

Weather reports are broadcast by the radio station at Madras.

The climate of Madras is considered quite hot. Even in the cooler months of December and January, the mean temperature is about 25°C.

**Tides—Currents.**—The tides at Madras are semidiurnal and subject to a diurnal inequality which may advance or retard the times of HW and LW; this inequality may increase or diminish the rise by as much as 0.3m.

Vessels may encounter a strong S current when making the approach to the harbor.

**Depths—Limitations.**—The approach channel, marked by the IALA Maritime Buoyage System (Region A), is dredged and maintained at a depth of 19.2m. Vessels are to keep at least 0.5 mile off the channel entry unless a pilot is on board.

The harbor entrance is maintained to a depth of 18.6m, and there is a swinging basin, 0.3 mile in diameter, lying immediately inside the harbor entrance with a maintained depth of 18m. In 1986, it was reported the port could accommodate vessels up to 274m length, with a draft of 16.2m.

Bharathi Dock, the N part of the harbor, is protected by the North Breakwater and East Breakwater, and a light shows near the head of East Breakwater. Oil terminal berths with alongside depths from 16 to 17.4m are located on the E side of Bharathi Dock for tankers up to 274m long with a draft of 14.6m. An iron ore berth with a depth of 17.4m alongside and with fully mechanized handling facilities is located at the NW corner of the dock. It was reported (1988) to have a handling capacity of 8,000 tons per hour. Plans (1990) is to deepen the ore berth, turning circle and the approach channel to accept bulk carriers up to 170,000 dwt.

A fully mechanized container terminal having an alongside depth of 11m is located close NW of North Pier. The berth is 400m long; work was in progress (1994) to increase the length by an additional 290m.

The S part of the harbor, forming the Inner Harbor is protected by East Quay. The entrance lies between North Pier and a spur projecting from East Quay; it is 122m wide with a depth of 9.4m and marked by lighted beacons at each side of the entrance. The protecting breakwater N of the spur is known as the sheltering arm, and a light shows at the head of the arm. In 1965, the inner harbor had a least depth of 9.4m over the greater part of it. Vessels with a draft of 9.1m can enter harbor at all states of the tide. The inner harbor contains twelve berths alongside the quays and five vessels at fixed moorings. At the moorings, vessels between 107 and 229m long, having drafts between 7 and 9.6m, can berth.

Jawahar Dock, entered along the mid-section of South Quay of the inner harbor, has eight berths. In 1983 Jawahar Dock was extended to an overall length of 655m. The berths can handle vessels of 200m length and drawing 11m draft. The S end of the dock is used by LASH barges.

Madras Fishing Harbor is located 1 mile N of Bharathi Dock and is sheltered by two extensive breakwaters which provides berths for up to 500 fishing vessels.

In 1986, an area between the root of Fishing Harbor East Breakwater and the root of Bharathi Dock North Breakwater was being reclaimed.

Depths off the harbor shoal gradually from the 20m curve, about 1.5 to 2 miles offshore, to a depth of 11m less than 0.3 mile E of the breakwaters.

The surf N and S of the harbor generally breaks about 122m from the beach in fine weather and about 183m in squally weather. During gales from the E, breakers were observed about 244m offshore; with an offshore wind, the surf is often

very high and in the form of a heavy roller. During normal weather the surf wave is about 0.9 to 1.8m high, and during a gale from 3 to 3.7m high.

**Aspect.**—In the vicinity of Madras, the low sandy shore is marked by casuarina and palm trees N and S of the city.

The following landmarks are conspicuous from the offing:

1. The main tower of the Court House standing about 1.3 miles SW of the outer harbor entrance.
2. Fort St. George, with its 52m high flagstaff about 0.5 mile S of the Court House.
3. A building, 57m high, about 1.5 miles SW of Fort St. George.
4. The spire of San Thome Cathedral, 49m high, almost 3 miles S of Fort St. George.
5. The 40m high University Clock Tower, about 0.8 mile S of Fort St. George.
6. Two high radio masts close N of Fort St. George.
7. Three high cooling towers about 1.5 miles NW of the Court House.
8. A white-domed building, 23m high, standing at the mouth of the Adyar River.

Madras Breakwater has been reported to be a good radar target up to 8 miles. The Court House has been reported to be a good radar target up to 22 miles. Madras Harbor is formed by two breakwaters; contained within is the inner harbor in the S. The inner harbor extends farther S and connects into two separate basins, on the W with the boat basin having a yacht club, on the E with Jawahar Dock. The harbor is protected from the N and NE by North Breakwater and East Breakwater, which extend about 0.5 mile SE, then 0.4 mile SSW from a position 2.3 miles NNE of the Fort St. George flagstaff. From the E and SE of the entrance, it is protected by East Quay and New Outer Arm, which extends about 2 miles NE from the same flagstaff. A light shows from the New Outer Arm and the approach channel entrance lies about 3.5 miles ENE of the light.

Foul areas are centered 2 miles N and 2 miles ESE from the harbor entrance.

**Pilotage.**—Pilotage is compulsory for vessels over 200 grt. No merchant vessel is allowed to enter or leave Madras Harbor without a pilot on board, unless prior permission has been given in writing by the Conservator of the port.

Vessels are taken in or out of the harbor at any time of the day or night. Movements in and out of Jawahar Dock are restricted to the hours between 0600 and 2200 daily.

Vessels less than 230m long await the pilot in Waiting Area No. 1, about 1 mile NE of the harbor entrance. Vessels 230m long and over board the pilot in Waiting Area No. 2, about 1.5 miles further NE.

Vessels bound for the Chemical Pipeline Terminal board the pilot in the waiting area centered on position 13°13'N, 80°22'E.

A strong, reliable pilot ladder, equipped with man-ropes, must be provided, otherwise the pilot will not board. Masters of vessels are cautioned to leave ample room for the pilot to maneuver the vessel for entering the harbor.

When approaching the harbor or the anchorage, a sharp watch should be kept for signals from the Port Signal Station. Ships' agents normally pass berthing messages to vessels through the Port Signal Station and only in case of failure do they contact vessels by radio.

**Regulations.**—Copies of the port regulations for the Port of Madras are available to entering vessels. Instructions and regulations which masters should be cognizant of before arrival are, as follows:

1. Only one vessel at a time may enter or leave the harbor.

2. Ballast, bilge water, and trash shall not be pumped or thrown overboard within the limits of the port.

3. All ocean-going vessels entering or leaving the port between sunrise and sunset must fly their national flag, and when entering, each vessel must show her number.

4. Vessels remaining outside the harbor, but within the roadstead or port limits, are required to take positions, with allowances made for swinging room, well clear of the entrance of the harbor.

5. The master of any vessel arriving at Madras Roadstead, with explosives on board as cargo, must give immediate notice thereof to the pilot or harbormaster.

6. Vessels arriving with explosives on board are not permitted to enter the enclosed harbor. They are moored at the explosives anchorage E of the harbor entrance, where the explosives are discharged into lighters. The maximum quantity of explosives which can be handled is 125 tons.

7. Vessels carrying explosives in transit are not permitted to enter the harbor, nor will they be allowed to discharge the cargo at the explosives anchorage.

Vessels may obtain radio pratique upon request, not more than 12 hours or less than 4 hours prior to arrival. Otherwise, pratique is granted by the Port Health Officer upon arrival.

Customs officials board a vessel at its berth or mooring inside the harbor.

**Signals.**—The Port Signal Station is located on the Harbor Office on the seaward end of the Transit Shed and Passenger Terminal on North Pier. International Code of Signals Flags and Morse code are employed. It has been reported that at a distance of 2 or 3 miles from the harbor, the signal tower can easily be mistaken for one of the breakwater light structures.

A black ball, displayed at the Port Signal Station, indicates a vessel in the harbor is getting underway and will be leaving the harbor. Vessels approaching the harbor should, until the pilot assumes control, remain clear of the outer end of the sheltering arm and allow sufficient sea room for the outbound vessel.

Vessels about to leave should display the International Code flag N at the fore; vessels about to enter should display International Code pennant 4 at the fore. Neither of these signals should be displayed until the pilot is aboard.

Storm and weather signals are displayed at the signal station on North Quay in accordance with the Extended System. Further information on these storm signals may be found in Pub. 160, Sailing Directions (Planning Guide) South Atlantic Ocean and Indian Ocean under "India—Signals."

During the prevalence of suspicious or threatening weather, or upon the warning signal being displayed, the master of every vessel anchored within the limits of the roadstead is required:

1. Not to be absent from the vessel between sunset and sunrise.

2. To keep the vessel prepared in every respect to proceed to sea on short notice.

3. To proceed to sea without waiting for instructions should it be deemed it prudent to do so.

4. When the danger signal is displayed, to take such measures for securing the safety of the vessel as may be considered necessary. No further instructions on that point will be furnished by port authorities.

Masters of vessels must use their own discretion whether to proceed to sea or remain in the harbor in cyclonic weather. Preference for mooring berths will be given to vessels with bulk cargo and to those vessels which have broken their cargo.

**Anchorage.**—Madras Roadstead is open to all except offshore winds. There is usually a swell from seaward which causes vessels to labor or roll considerably.

Vessels which are not awaiting berth on arrival are not to anchor N of latitude 13°06'N., and within Pilot Boarding Area No. 1 or Pilot Boarding Area No. 2, without prior approval from Port Control.

A dangerous wreck, with masts exposed, lies about 0.8 mile SE of the harbor entrance. It is marked by a lighted buoy lying 0.2 mile E.

An Examination Anchorage area is shown on the chart.

Vessels of less than 230m in length should embark the pilot in Waiting Area No. 1, located about 1 mile E of the harbor entrance; those of more than 230m in length should embark the pilot in Waiting Area No. 2, located 3.3 miles ENE of the harbor entrance.

At night, vessels should not anchor, in depths of less than 16.5m. A second anchor should be ready to let go and all anchors should be buoyed.

A submarine cable extends offshore from a position approximately 1 mile S of the Fort St. George flagstaff.

Vessels carrying explosives must anchor in the explosives anchorage located about 1 mile E of the harbor entrance. Such vessels are required to display a red flag by day and a red light at night.

Vessels unable to enter the harbor during periods when cyclones may be expected should anchor well offshore and be ready to put to sea before the wind shifts to the NE. Vessels remaining at anchor or anchoring too far in during such times may find it impossible to get away and are likely to be driven ashore.

**Caution.**—Vessels are advised to be on the lookout for pirates attempting to board at night, especially in the vicinity of the pilot boarding area.

The roadstead fronting the harbor area is subject to a heavy surf.

**6.13 Ennore** (13°18'N., 80°19'E.) is a port located about 7 miles N of Chennai. The first phase of Ennore, consisting of two coal berths, became operational in 2001. It is planned that the port will handle VLCCs after 2004. Ennore is a 24-hour port.

**Ennore Home Page**

<http://www.ennoreportltd.com>

The port has two breakwaters. North Breakwater is 3,080m long. South Breakwater is 1,080m long.

Pilotage is compulsory. The pilot boards in the following positions:

- a. 0.1 mile S of Fairway Lighted Buoy (13°12.9'N., 80°22.4'E.).
- b. 13°14.8'N, 80°23.3'E.
- c. 13°13.0'N, 80°22.0'E.

Vessels should report their ETA 48 hours, 24 hours, and 3 hours in advance. Any changes of more than 2 hours should be immediately reported. The ETA message should contain the following information:

1. Vessel's name, call sign, grt, nrt, dwt, loa, and beam.
2. Draft forward and aft.
3. Cargo grade and quantity on board.
4. ETA at Fairway Lighted Buoy.
5. Local agent.

## Madras to Machilipatnam

**6.14** The coast between Madras and Machilipatnam, about 240 miles N and NE, is low, sandy, and marked by a number of small towns.

**Ennur Shoal** (13°17'N., 80°23'E.), with depths of 0.9 to 8.5m, extends 2.5 miles NE from a position on the coast about 10.5 miles NNE of Madras Harbor.

**Pulicat Shoals** (13°22'N., 80°23'E.), a chain of hard, sandy patches with depths ranging from 4.3 to 9.1m, extends about 7.5 miles NNE from the N end of Ennur Shoal. Several detached patches, with depths of 8.2 to 11m, lie within 3.8 miles N and NNW of the N end of Pulicat Shoals. These shoals were reported to be extending to the E.

**Armagon Shoal** (13°54'N., 80°18'E.), with depths ranging from 3 to 9.1m, extends about 15 miles N from a position 1.5 miles NE of Point Pudi. A narrow, detached shoal, about 2.5 miles long, with depths of 10 to 11m, lies close N of the N end of Armagon Shoal. The sea sometimes breaks over the shallowest part of Armagon Shoal.

A shoal, with a least depth of 4.9m, lies about 2.3 miles offshore abreast of **Tummalapenta** (14°54'N., 80°04'E.). The depths are very irregular in the vicinity of this shoal and up to 7 miles N of it.

**6.15 Mutapoli Bank** (15°26'N., 80°21'E.), with depths of 6.4 to 11m, lies centered about 11 miles E of Kottapatnam. Overfalls usually mark this bank. Two detached shoals, with depths of 10 to 11m, lie within 5.8 miles SW and three detached shoals, with depths of 9.1 to 11m, lie within 11.3 miles NE of this bank.

**Caution.**—Care should be taken when navigating along this section of coast between Madras and Machilipatnam because the land is often obscured by haze.

The currents N of Madras vary considerably in velocity and direction and sometimes set toward the land. Great caution is necessary.

In the vicinity of Pulicat Shoals, the current is weak and sets parallel to the coast.

In the approach to Blackwood Harbor, the current along this part of the coast, which includes Armagon Shoal, usually sets with the prevailing wind, but at times reverses itself.

The current off False Divi Point sets parallel to the coast with the prevailing monsoon, having its greatest velocity near the 185m curve about 8 miles offshore.

In Nizampatam Bay, weak tidal currents are experienced inshore only at spring tides.

During March, the current off Divi Point has been found to set E at a rate of 1.5 knots. The coast between Madras and Ennur, about 9.5 miles NNE, is bordered by plantations of casuarina and palm trees. A conspicuous white temple, 10.7m high, lies about 6 miles NNE of Madras Light. A factory and a conspicuous water tower lie 7.5 miles NNE of the same light. A prominent water tower, 35m high, lies 0.5 mile NE of the above-water tower.



**Pulicat Light**

The coast between Ennur and Pulicat, about 10.8 miles to the N, is backed by an extensive plain which is densely wooded near the beach. The town of Pulicat lies on an island at the S end of Pulicat Lake and is visible from the offing. A tall conspicuous monument lies close N of the lighthouse near the beach.

Anchorage can be taken, in depths of 11.9 to 12.8m, with Pulicat Light bearing 270°, distant 2.5 miles.

**6.16** The **Nagari Hills** (13°34'N., 79°37'E.) lie about 30 to 45 miles inland abreast Pulicat and the coast to the N. Nagari Nose, a sharp peak 858m high with its upper part crooked, lies about 45 miles W of Pulicat Light. This peak is visible only in clear weather.

A beacon lies about 13 miles NNW of Pulicat Light but is not conspicuous from seaward.

The coast between Pulicat and Point Pudi, about 22 miles NNW, is marked by casuarina plantations for about 11 miles N of Pulicat Lake. A conspicuous clump of coconut trees, 24m high, lies on a sand hill about 1 mile S of Point Pudi.

**Point Pudi** (13°47'N., 80°15'E.), a low, sandy point, is marked by clumps of palm trees. Armagon Shoal, which extends N from Point Pudi, has been previously described in paragraph 6.14.

Armagon Light is shown from a white round concrete tower with red bands, lying near the coast 7 miles NNW of Point Pudi.

**Gudali Hill** (14°01'N., 80°01'E.), about 13 miles NW of the disused lighthouse, is flat and 90m high with a pagoda near its center. The hill is conspicuous except from positions near the outer part of Armagon Shoal.

A beacon lies on the shore about 13 miles NNW of the disused lighthouse.

An anchorage, formerly known as Blackwood Harbor, lies between Armagon Shoal and the coast to the W.

Anchorage can be taken, in a depth of 9.1m, good holding ground, with the disused lighthouse at Armagon bearing between 282° and 290°. During the Southwest Monsoon, anchorage can be taken with the disused lighthouse bearing 259°, distant 2.8 miles.

Vessels approaching the anchorage should not shoal to a depth of less than 30m until the disused lighthouse bears 207°, or Gudali Hill bears 259°. Gudali Hill should then be steered for on this heading, passing N of Armagon Shoal in depths of 11m.

**6.17 Krishnapatnam** (14°17'N., 80°08'E.), an ore-loading port, lies near the mouth of the Upputeru River about 28 miles NNW of Point Pudi. Cargo is handled by lighters in the roadstead fronting the river. Coasting vessels usually anchor about 2 miles seaward of the river entrance, in depths of 10.1 to 11m, but this anchorage is only safe during good weather.

Storm signals are shown; the Brief System is used. Further information on these storm signals may be found in Pub. 160, Sailing Directions (Planning Guide) South Atlantic Ocean and Indian Ocean under "India—Signals."



**Krishnapatnam Light**

Casuarina plantations line the coast up to 3 miles N of the mouth of the Upputeru River, then abruptly changes to sand

hills for 5 miles and becomes low and sandy as far N as the Penner River, about 13 miles farther N.

**Shallinger Shoal** (14°23'N., 80°12'E.), a spit with depths of 3.2 to 4.6m, extends about 2.5 miles NE from the coast, 7.5 miles N of the mouth of the Upputeru River. A detached 5.5m patch lies 1.5 miles S of the NE extremity of Shallinger Shoal.

The **Penner River Entrance** (14°35'N., 80°11'E.) is not easily distinguished as the river enters the sea behind a sandy point which is only 1m high. Nellore, the chief town of the district, lies on the S bank of the river about 15 miles inland. A white pagoda lies on a high hill about 6 miles W of Nellore, but is not very prominent. The pagoda is sometimes visible between the bearings of 248° and 293°.

During fine weather with offshore winds, anchorage can be taken off the mouth of the Penner River, in depths of 9.1 to 12.8m, sand and mud, about 1.5 miles offshore.

A flagstaff, visible above the trees, lies on the beach at Isakapalli Village about 10 miles NNW of the mouth of the Penner River.

**Nishanbotu** (14°42'N., 79°56'E.), the N end of a mountain range which parallels the coast, lies 10 miles WSW of Isakapalli.

Anchorage can be taken off Isakapalli, in depths of 12.8 to 14.6m, sand and mud, about 1 mile offshore SE of the flagstaff. The holding ground is good, but a heavy surf sets onto the beach.

Between Isakapalli and Ramaypatnam, about 19 miles to the N, the coast continues low and sandy for 7 miles, but becomes tree covered for the remaining distance.

**6.18 Ramaypatnam Village** (15°03'N., 80°03'E.) is marked by a church and some high clumps of casuarinas. The red church spire is visible over the trees. Tettu Temple, white in color and 41m high, lies 2 miles W of the village, but is not very prominent. Ramaypatnam Light is shown from a hexagonal concrete tower lying on the coast 0.8 mile NE of the church at Ramaypatnam.



**Ramaypatnam Light**

Between Ramaypatnam and the town of Kottapatam, about 25 miles NNE, the coast remains low and sandy. Several detached clumps of casuarinas lie near the coast between Ramaypatnam and the entrance to the Upputeru River, about 10.5 miles to the N. Singarayakonda Temple, painted red, lies on a 51m high hill about 3.5 miles W of the Upputeru River, and is one of the few conspicuous landmarks between Ramaypatnam and Kottapatam. The rising ground near the temple is visible in places between the trees.

The **Paleru River** (15°19'N., 80°06'E.), marked by a beacon on its S entrance point, discharges about 6 miles N of the Upputeru River mouth.

Kandalur and Konijedu, two hills connected by a ridge, lie about 11 miles W of Kottapatam and are useful marks. Chima-kurti, 638m high, lies 22 miles WNW of Kottapatam and is also a useful mark.

**Kottapatam** (15°26'N., 80°10'E.), of little importance commercially, lies about 1 mile inland. A prominent white obelisk, about 15m high, lies about 1 mile NW of the town.

A shoal, with a least depth of 2.7m, lies about 1.5 miles offshore and from 3 to 5 miles NE of the town. Depths of 7.3m and less lie between this shoal and the shore. Shoal patches, with depths of 5.5 to 8.5m, lie up to 7 miles E of the town. Mutapolli Bank has been previously described in paragraph 6.15..

During good weather, anchorage can be taken 2.3 miles offshore, in a depth of 9.1m, with Kottapatam bearing 295°. Depths should not be shoaled to less than 18.3m until certain of the vessel's position.

**6.19 Nizampatam Bay** (15°42'N., 80°33'E.) lies between Kottapatam and False Divi Point, about 41 miles ENE, and recedes about 14 miles to the N. Except for the shoals in the vicinity of Mutapolli Bank, the bay is free from dangers and its shores may be approached with safety to a depth of 9.1m.

A backwater is formed 4 to 6 miles NNE of Kottapatam by the confluence of the Mudigorda Yeru River and the Gundlakamma River. During fine weather, the latter river is available to small boats.

A beacon lies about 0.5 mile within the Mudigorda Yeru River..

From the mouth of the Gundlakamma River, the bay shore curves NE for about 35 miles to the entrance of a creek leading to the town of Nizampatam. Dindi House, a large building with a big, high tree close E of it, lies on the N entrance point of the creek.

Between Dindi House and False Divi Point, almost 13 miles to the SE, the coast remains low and sandy. A beacon lies on the NW entrance point of a boat creek about 5 miles E of Dindi House.

**False Divi Point** (15°43'N., 80°50'E.) is low and covered by small mangroves.

A bank, which dries in patches, extends about 1 mile S and about 3 miles W of False Divi Point.

Anchorage can be taken in Nizampatam Bay, in a depth of 9.1m, mud, about 6 miles offshore, with Dindi House and the conspicuous tree at Nizampatam bearing 021°.

Coastal vessels can anchor, in 9.1 to 11m, sand and mud, about 1.5 miles off the village of Vadarevu, 19 miles NNE of

the Gundlakamma River. A flagstaff and a conspicuous bungalow lie on the shore fronting the village.

A submarine cable and pipeline area has been established between the Godavari River entrance and False Divi Point. The limits of this area, known as the Ravva Oilfield Development Area, may best be seen on the chart. Anchoring and fishing are prohibited.

The **Krishna River** (15°45'N., 80°54'E.) rises in Bombay State and flows E across the peninsula of India, into the Bay of Bengal by several branches, the mouth of one being near False Divi Point.

The enormous amount of silt carried by the river has formed a wide alluvial delta which extends seaward between the towns of Nizampatam and Machilipatnam. Divi Point is the SE extremity and False Divi Point is the SW extremity of the delta. Ocean-going local craft use the river for about 6 months of the year.

Krishna Old Light, a white masonry tower 44m high, lies about 9.5 miles ENE of False Divi Point. Another old lighthouse, a similar structure 15m high, lies 2.3 miles NW of Divi Point and is maintained as a landmark.

## Machilipatnam to Godavari Point

**6.20** The coast between Machilipatnam and Godavari Point, about 97 miles distant, is generally low, sandy, and intersected by several rivers. The shore in places is densely wooded, and between the mouth of the Gautami Godavari and Godavari Point, the terrain is very low. Along this latter section of coast distances judged by eye may be in error because of sand haze.

Ravva Oil Field Development Area, best seen on the chart, extends up to 15 miles offshore. There are numerous lit and unlit structures and submerged obstructions in the area. Not all hazards may be charted.

Between Machilipatnam Point and Godavari Point, no other dangers exist seaward of the 20m curve which lies between 1.5 and 10 miles offshore. Between the mouth of the Guatami Godavari and Godavari Point the 15m curve never lies more than 2.5 miles offshore.

**Sacramento Shoal** (16°32'N., 82°20'E.), hard shifting sand, lies off the entrance to the Guatami Godavari and extends about 4 miles SE and 3.5 miles E from Sacramento Light. Depths over this breaking shoal range from 2.7 to 5.5m. This shoal is subject to frequent changes in position and depth.

**Tides—Currents.**—The current from January through April sets steadily to the NE along the coast between Machilipatnam and Godavari Point. In the vicinity of Sacramento Shoal a rate of 4 knots is usually experienced about 5 miles offshore.

The current in the bay to the W of Narasapur Point is weak and variable.

**6.21 Machilipatnam** (Masulipatam) (16°09'N., 81°09'E.) (World Port Index No. 49460), the only port of the Krishna District, lies about 5 miles within the mouth of the creek of the same name about 11 miles N of Divi Point. Vessels anchor in the roadstead to handle all cargo to and from native lighters.

New Machilipatnam Light is shown from a white, round, concrete tower with black bands, 3.8 miles NNE of the mouth of Machilipatnam Creek.

There are six lighter wharves, with a total length of 675m, within the port area; three of these wharves lie on the tidal side of the lock; the remainder are in Machilipatnam Canal.

Groynes are under development to protect the entrance to the creek and to increase depths at the entrance.

Depths in the approach to the port range from 11m, about 5.3 mile E of the entrance of the creek, to a depth of 1.8m about 1 mile offshore.

When approaching the port, the following objects are prominent:

1. Karameda Beacon, 13.7m high, about 2 miles N of the main lighthouse.

2. A chimney, with an elevation of about 29m, 1.5 miles NNW of Karameda Beacon. This chimney is reported to be the first object sighted when approaching from the E.

Storm and weather signals are displayed at Machilipatnam; the General System and the Brief System are used. Further information on these storm signals may be found in Pub. 160, Sailing Directions (Planning Guide) South Atlantic Ocean and Indian Ocean under "India—Signals."

**Anchorage.**—The roadstead is large and the holding ground, fine sand and mud, is good.

From January through September, vessels should anchor according to draft, with the lighthouse bearing 270°, and from October through December, with the lighthouse bearing 288°.

The coast between Machilipatnam and Narasapur Point, about 32 miles ENE, is low, sandy, and densely wooded in places.

An inconspicuous beacon, about 6.1m high, stands on the coast 11.5 miles NE of Machilipatnam Light. A beacon stands on the coast 19.3 miles NE of the same lighthouse.

**6.22 Narasapur Point** (16°18'N., 81°43'E.), low and wooded, lies on the E side of the mouth of the Vasishta Godavari, which is the southernmost branch of the Godavari River. An obelisk, 24.4m high, lies about 1 mile N of the point.

Antarvedi Light is shown, and a radiobeacon transmits, from a white square masonry tower, with red bands, lying 0.3 mile ENE of the obelisk.

Between Narasapur Point and the mouth of the Vanteyam Godavari River, about 15 miles ENE, the low coast is densely wooded. The entrance to this river is known as Warreo; during freshets, a spit forms off it. Two large prominent clumps of casuarinas lie on the E side of the river entrance. This section of coast may be approached safely to depths of 18.3m.

During January and February, the current sets W at a maximum rate of 2 knots off the coast between Narasapur Point and the mouth of the Vanteyam Godavari.

The entrance of the Gautami Godavari lies about 23 miles ENE of the entrance of the Vanteyam Godavari. Only small craft with local knowledge can enter the river in fine weather.

The river is joined by two tributaries close within its mouth; during the rainy season the ebb current may attain a rate of 4 knots.

The coast between the mouth of the Gautami Godavari and Godavari Point, about 24 miles to the N, is very low and intersected by many small outlets.

Sacramento Shoal, which lies off the mouth of the Gautami Godavari, has been previously described in paragraph 6.20.

**Masanutippa Temple** (16°39'N., 82°19'E.) stands near the coast, about 3 miles N of the Gautami Godavari, and is one of the few objects that can be identified between the entrance of the Gautami Godavari and Hope Island to the N. The temple is not conspicuous.

**Hope Island** (16°49'N., 82°20'E.), one of a chain of similar islands which form part of the delta of the Godavari River, is low, swampy, and covered with jungle. A black and white banded, disused lighthouse stands on Hope Island.

Anchorage can be taken by small vessels with local knowledge E of Masanutippa, in a depth of 7.3m, mud, about 1 mile offshore. Anchorage can also be taken 2 miles S of Sacramento Light in a similar depth.

## Godavari Point to Vishakhapatnam

**6.23 Godavari Point** (16°59'N., 82°20'E.) is the N extremity of a low, sandy spit and narrow sandbank, which forms a part of the coast N of Hope Island. It had been reported (1974) the point had extended to a position 0.8 mile NW of Godavari Point light, shown from a white pillar with black bands on Godavari Point.

The coast between Godavari Point and Ganjam, about 215 miles NE, is mostly low, sandy, and backed by conspicuous hills at various distances inland. Between Pudimadaka, about 50 miles NE of Godavari Point, and Kalingapatam, about 80 miles farther NE, the coast is broken and rocky. Some of the headlands in the vicinity of Vishakhapatnam are bold and prominent. The coast between Kalingapatam and Ganjam becomes fairly regular with a few slight indentations.

**Tides—Currents.**—The current between Godavari Point and Bimlipatam lies farther offshore than off Sacramento Shoal, but its velocity is less. Inshore of this current, slack water is usually found. Tidal currents will sometimes be experienced close offshore. In July and August, the velocity of the offshore current is less than 1 knot.

The currents off the coast from Bimlipatam to Gopalpur, between December and June, are mainly influenced by the wind, the tidal current, even at springs, having very little effect. In December and January, when NE winds prevail, the current about 1 mile offshore sets steadily SW parallel to the coast at a velocity of 0.5 to 0.8 knot.

Toward the end of February, the wind hauls around to the SW, and in March, blows steadily from that quarter. In the morning the wind is generally light, but freshens during the afternoon to a force of 5 to 6. The current at this time sets NE parallel with the coast; its velocity close inshore is about 0.5 knot. At 10 miles or more off the coast, its velocity is frequently 2 to 3 knots.

The greatest velocity of the current observed between Santapilli Rocks and the mainland was 1 knot.

**Depths—Limitations.**—Between Godavari Point and Ganjam there are no known or charted dangers between the 18m and 35m curves. The former curve lies between 0.5 and 6 miles offshore and the latter curve between 2 and 9 miles offshore.

**Santapilli Rocks** (Chintapalli Rocks) (18°01'N., 83°43'E.), with a least depth of 1.5m and dangerous wrecks close E, lie between 5.5 and 6 miles SE of Santapilli Light. The sea breaks heavily over these dangers with a moderate swell, but not in good weather.

The channel between these rocks and the mainland is safe only during daylight. At night, vessels should keep in depths of over 35m when Santapilli Light bears between 322° and 290°.

The summit of an isolated bare red double-peaked hill, 117m high, about 2 miles N of Santapilli Light, in line bearing 304° with Kandivalasa Peak, leads N of Santapilli Rocks. Santapilli Light in line bearing 322° with Kandivalasa Peak, leads S of these rocks.

**6.24 Cocanada Bay** (Kakinada Bay) (17°00'N., 82°19'E.) (World Port Index No. 49470), a shallow body of water filled with extensive drying mud flats at its head, is entered between Godavari Point and the coast about 2.8 miles WNW. For many years the bay has been silting up because of the discharge from the Godavari River, about 8 miles S of the entrance, but is the safest natural harbor on the E coast of the Indian subcontinent. The town and port of Cocanada lie on the W side of the bay, about 2 miles within the entrance of the Cocanada River.

The low bay shores are subject to periodic inundations during cyclonic storms.

The port of Cocanada comprises a partly exposed anchorage located about 3 to 4 miles NNE of the entrance of the Cocanada River and is suitable for ocean-going vessels; cargo is transported by lighters between the anchorage and the wharves on the river bank abreast of the town.

Tidal current effects are noticeable nearly 0.5 mile off Godavari Point. The current follows the contour of the land, with the flood current having a maximum velocity of 0.5 knot and the ebb current having maximum velocities of 1.5 to 2 knots.

In Cocanada Bay, the flood current sets SW and the ebb current sets NE. These tidal currents are strong at springs, especially from October to February, and must be taken into consideration when approaching in this vicinity.

Tides at Cocanada are semidiurnal.

The coastal waters in the approach to Cocanada Bay have shoaled considerably more than shown on the chart. Depths are reported to be 2.7m less than charted.

Depths S of a line drawn between Godavari Point and Vakalapudi Light to the NW shoal gradually to a depth of less than 1.8m about 4 miles to the S. Depths N and E of this line range from 7.3 to 11m, about on the meridian of Godavari Point. Depths in the dredged buoyed channel leading to the barge facilities on the banks of the Cocanada River average about 2.1m. Depths alongside the lighter wharves range from 1.2 to 2.1m.

North of Cocanada, the land appears bold, with high land extending NE; S of the port, the low sandy coast is marked by some sand hills and trees.

In the approach to the port, the disused lighthouse on Hope Island, Godavari Point Light, and Vakalapudi Light are conspicuous landmarks.

A signal station is located at Vakalapudi Light. Vessels can communicate with the station by Morse code.

Anchorage in the bay, E of Vakalapudi Light, is subject to considerable ground swell from the SE, even when there is no wind. During the Northeast Monsoon, good anchorage for vessels of suitable draft can be taken, in a depth of 5.9m SW of Godavari Point, with Vakalapudi Light bearing 316°, distant 3.8 miles.

Safe anchorage can be taken, in a depth of 5.5m, soft mud, with Vakalapudi Light bearing about 321°, distant 2.8 miles. Vessels anchor here in all seasons, about 3 miles from the mouth of the Cocanada River, communication is seldom impeded. The sea within the bay is usually smooth. Additional anchorage is provided with Vakalapudi Light bearing 318°, distant about 1.5 miles. Little current is experienced at these anchorages. During the flood, the tide is usually slack and sets NE during the ebb.

**Caution.**—Vessels are advised not to anchor between 1 mile and 1.8 miles N and NW of Godavari Point Light, because of the numerous wrecks which lie in this area. Some of these wrecks are dangerous to surface navigation.

There is a foul patch about 0.4 mile NNW of the point, with dangerous wrecks within 0.5 mile N of the foul patch. Other foul areas, best seen on the chart, lie NNE and NE of Godavari Light.

During the Northeast Monsoon, vessels should make a land-fall near Pentakota, 30 miles NE of Cocanada, and should then run along the coast in depths of not less than 21.9m. By day, when Vakalapudi Light bears about 248°, course should be shaped for the anchorage. At night, Vakalapudi Light should be kept on that bearing until the depths decrease to 18.3m, when course should be altered to 230°, keeping the Cocanada River Entrance Light on that bearing when sighted until reaching the channel lighted buoys.

Extensive developments, including the construction of wharves and breakwaters and the establishment of dredged areas and dumping grounds, have taken place in Cocanada Bay. Depths may also be less than charted.

It has been reported (1998) that three deep-water cargo berths, one for liquid cargo and two for general cargo, have been constructed and that vessels up to 25,000 dwt can be accommodated.

**6.25** The coast, up to 10 miles NE of Vakalapudi, is low and marked by numerous villages and coconut trees. Low sand hills then appear and continue as far as Pentakota, about 16 miles farther NE.

**Round Hill** (17°22'N., 82°16'E.), 653m high, lies about 22 miles N of Vakalapudi Light and shows up well from positions near Cocanada.

**Upada** (17°04'N., 82°20'E.), a port of call for small local coasters, lies on the coast about 4.5 miles NE of Vakalapudi Light.

Pentakota, a small village, lies at the mouth of a river about 21 miles NE of Upada. A coconut grove lies near two fairly high sandhills near the entrance of the river. A white temple stands on a high hill about 4 miles NW of the village. Sudi-konda, a high cone-shaped hill, lies 2.5 miles N of the same village. Both the temple and the hill are good landmarks. The hill is the most conspicuous because of its shape and color.

Between Pentakota and the Dolphins Nose, about 45 miles ENE, the coast is backed by a series of rounded hills which lie on a plain and show up well at night. A prominent white obelisk stands on rising ground about 4 miles NE of Pentakota and 0.5 mile inland.

A beacon stands on a small very prominent rocky eminence at Pata Polavaram, about 13 miles ENE of Pentakota. Sanjib Peak, a remarkable conical mountain with a flattened broken

summit, rises to a height of 652m about 11 miles NW of Pata Polavaram.

**Wattara** (17°25'N., 82°52'E.), a small village, lies at the common entrance of three small rivers, about 3.4 miles ENE of Pata Polavaram.

A beacon stands on a 185m high hill abreast of Rambilli Village about 4.8 miles ENE of Wattara.

**Pudimadaka Village** (17°30'N., 83°00'E.) lies on the shore of a bight about 4 miles NE of Rambilli Beacon. A red stone temple, with three towers, lies in the village.

**6.26 Pillar Rock** (17°29'N., 83°01'E.), 9.1m high, lies about 0.3 mile SSE of Pudimadaka Village. This rock and some dark cliffs on the coast show up prominently against the white sandy beaches. A ledge of rocks lies between Pillar Rock and the coast, and serves as a breakwater during the Southwest Monsoon.

Anchorage can be taken, in a depth of 9.1m, with Pillar Rock bearing 214° and the sheds on the beach bearing 282°.

The coast between Pudimadaka Village and the Dolphin's Nose, about 20 miles NE, is rocky and backed by a hilly plain. Conspicuous sandy patches mark the SW sides of some of these hills. A rock on the beach, about 4 miles NE of Pillar Rock, appears as a low, black, double rock when viewed from the NE. Kutu Konda, a prominent small rocky headland marked by a beacon, lies about 10.5 miles ENE of Pillar Rock.

**Pigeon Islet** (17°37'N., 83°14'E.), 21m high and rocky, lies in a small bay 5 miles NE of Kutu Konda.

**Dolphin's Nose** (17°41'N., 83°17'E.), a bluff headland 163m high, is conspicuous when viewed from the NE or SW. A lighthouse, two radio masts, and a flagstaff stand on Dolphin's Nose.

Dolphin's Nose has been reported to be a good radar target up to 17 miles.

**Caution.**—A wreck, whose charted position is approximate, and which is dangerous to navigation, lies about 3 miles E of Dolphin's Nose.

Submarine Exercise Areas lie centered 20 miles SSE and E of Dolphin's Nose. A good lookout should be maintained when transiting these areas.

## Vishakhapatnam (17°41'N., 83°18'E.)

World Port Index No. 49480

**6.27 Vishakhapatnam**, a port of growing importance and the fourth largest port in India, lies at the mouth of the Meghadri River, close NW of Dolphin's Nose. Port limits extend from Dolphin's Nose Light in the direction of 160° for 4.3 miles, then in the direction of 038° for 7.5 miles, then in the direction of 270° to a pillar on Scandal Point, 2 miles NE of the harbor entrance. Petroleum and iron ore products are the principal exports. The only shipyard in India capable of building ocean-going merchant vessels is in operation within the harbor area.

Ample berthing facilities are available to accommodate all classes of vessels. Extensive works are in progress to increase these facilities.

**Winds—Weather.**—Southwest winds prevail from March to August; NE winds prevail from October to December.

During the day, the NE winds are fresh, but at night they are light and westerly. Heavy, windy, rain squalls occur during October and November, but most of the rainfall occurs from June through November.

A considerable swell is experienced almost all year in the vicinity of the port. Vessels have remained in the harbor with safety during cyclonic weather.

The climate is subtropical and varies from warm to hot, with high humidity throughout the year. Maximum temperatures occur in May, while minimum temperatures are usually recorded in December and January. Through May, June, and July, temperatures often exceed 38°C.

**Tides—Currents.**—From about August to November, the current sets SW; from about the middle of December through June, it sets NE. Inside the 35m curve, the current is much weaker than farther offshore. Close offshore tidal currents will sometimes be experienced.

**Depths—Limitations.**—In the seaward approach to the harbor, a depth of 18.3m exists about 0.8 mile E of the head of South Breakwater.

The entrance to the outer breakwater is 183m wide and dredged (1991) to a depth of 19m. The entrance to the inner harbor is dredged to a depth of 18m. In 1986, it was reported that there was a draft restriction of 10m in the port and only daytime navigation was allowed.

The ore berth, in the outer harbor, is dredged to a depth of 17.5m on its NE side and 17m on its SE side, and can accommodate two bulk carriers of 150,000 dwt. It has been reported that draft on the SW side of the ore berth was restricted to 15.3m. The entrance to the inner harbor isn dredged to 18m.

A turning basin, dredged to 17.5m lies at the N end of the entrance channel to the inner harbor. The three basins which project from the turning basins are all dredged to 17.5m. The entrance to the inner harbor is dredged to a depth of 18m.

A turning circle, dredged to 18m in 1991, lies between the berths and the entrance channel.

Berth Q1 to Berth Q4, which lie on the E side of the N arm, have alongside depths of 9.4m. Berth Q5 and Berth Q6 have alongside depths of 10.4m. The berths on the W side of the N arm, J1 to J3, have alongside depths of 9.4m and are used for oil, coal, and molasses.

There is a shipbuilding yard SW of the turning basin and a fitting out wharf lies on the S side of the W arm. Opposite this wharf, on the N side, are two berths connected by pipeline to the oil refinery. There is a fertilizer wharf close W of the oil berths which can accommodate vessels with lengths to 168m and 9.1m draft. Vessels whose length exceeds 171m or whose draft exceeds 9.1m, may only enter the harbor at HW between the hours of 0600 and 1800. Smaller vessels may enter at any time.

The mooring berths, which lie adjacent to the turning basin, have depths of 10.7m alongside the buoys. M1 Berth, between mooring buoys, lies close E of the turning basin.

A general cargo berth, accommodating vessels up to 232m long and 15.2m draft, is located SW of the ore berth; facilities at the berth include a conveyor system for the importation of coking coal. It has been reported (1996) that during the North-east Monsoon, the berth may be subject to considerable swell and vessels may have to be moved.

A berth for discharging oil is located close NW of South Breakwater. Tankers of 260m length and 14.3m draft can be accepted. A submarine oil pipeline is laid from the berth, W to a trestle bridge, then leads to the coast.

A new offshore oil berth has been added to accommodate tankers up to 150,000 dwt, 280m in length, and with a draft of 17m.

**Aspect.**—The landmarks which lie on Dolphin's Nose have been previously described in paragraph 6.26.

Vishakhapatnam Fishing Harbor is separated from Outer Harbor by Groyne No. 2 which connects to East Breakwater and it is entered between N end of the East Breakwater and North Breakwaters. A light shows at the end of the North Breakwater. Several jetties extend NE from Groyne No. 2 with a depth of 4.5m alongside the quayage.

Lights in line, bearing on 234.5°, located 0.2 mile SW of the North Breakwater Light, leads into the fishing harbor. A short breakwater extends SW from a position on the shore 0.3 mile NE of the head of North Breakwater and a light shows from its head.

In 1988, the work in the shipyard was completed and the ferry berths were in use.

A conspicuous white chapel, 67.7m high, lies on the summit of Ross Hill on the N side of the harbor entrance channel about 1 mile NNW of Dolphin's Nose Light. A conspicuous minaret lies on the E side of Dargah Hill about 0.2 mile E of the chapel. A conspicuous signal station lies at an elevation of 65m on Sand Hill about 1.25 miles NE of the chapel.

North of the port area, Circuit House flagstaff, 2.8 miles NNE, and the University clock tower, 3.5 miles NE of Dolphin's Nose Light, are also conspicuous from the offing.

**Pilotage.**—Pilotage is compulsory for power-driven and ocean-going vessels over 100 grt who wish to enter, depart, or shift berth within the harbor area. Pilots board 1.3 miles SE of South Breakwater Light.

Vessels bound for this port are required to request a pilot at least 48 hours prior to arrival with a 4-hour notice before ETA. Vessels planning to enter the harbor on the same day of arrival should arrive off the entrance prior to 2100.

**Regulations.**—The following local port regulations are in force:

1. Only one vessel may enter or leave the harbor at a time.
2. Tugs are maintained to assist vessels, as necessary, in entering the harbor or shifting berths.
3. A pilot is required to be on board a vessel whenever a tug is employed.
4. Sailing vessels of 100 grt or greater shall not enter or leave the harbor unless towed by one or more tugs.
5. No ballast may be thrown or discharged overboard within the harbor limits.

**Signals.**—Signal Station No. 1, with a flagstaff 26m high, lies midway on the East Breakwater about 1 mile E of Ross Hill.

Signal Station No. 2 (Dufferin Signal Station), with a flagstaff, lies on the W side of Ross Hill, close E of another flagstaff, 68m high.

Sand Hill Signal Station lies about 1.8 miles NNE of the Dolphin's Nose Light.

These stations communicate visually with vessels approaching or departing the harbor.

The following signals are displayed for the use of entering and departing vessels:

1. Signal Station No. 1, upon sighting a vessel approaching the port, displays the International Code Flag P until the pilot answers by the entering signal
2. Vessels entering the harbor must display International Code Pennant 4 and enter only after Signal Station No. 1 has repeated the signal hoist. A green metal pennant with a white circle hoisted at Signal Station No. 1 and Signal Station No. 2 indicates the channel is clear for shipping.
3. A vessel waiting to enter the harbor should, if International Code Pennant 1 is displayed at Signal Station No.1, keep well clear of the entrance to allow the departing vessel plenty of room.
4. Vessels about to leave should display International Code Pennant 1 and proceed only after Signal Station No. 2 has repeated the signal hoist.
5. A vessel entering or departing at night and requiring a pilot displays a white light over a red light where it can best be seen by the signal stations.

Storm and weather signals are displayed; the General System is used.

**Anchorage.**—Vessels awaiting to enter the harbor should anchor, in a depth of 22m, about 1.5 miles E of Dolphin's Nose Light.

Because of the currents and shoaling on the N side of the entrance channel, vessels should not approach inshore of the anchorage without a pilot.

Vessels anchoring in the roadstead must leave sufficient room for vessels entering or departing. Anchors should be buoyed.

Anchorage is prohibited in an area at the inner end of the entrance channel, as shown on the chart.

An Examination Anchorage Area is enclosed by a line as shown on the chart.

Anchorage for petroleum tankers are situated 1.5 and 3 miles SE of Dolphin's Nose Light. A gas and explosives anchorage lies 3.5 miles SSE of the light.

It has been reported (1996) that during the Northeast Monsoon, vessels at anchor lie to the current, bow NE, regardless of wind and swell.

**Directions.**—Vessels approaching the harbor should pass through a position about 7 miles bearing 135° from Sand Hill Light, then steer 315° until a depth of 18.3m is sounded. Course should then be altered to bring the lighted entrance beacons in line bearing 280°, which lead through the entrance channel between the breakwater heads and into the harbor. The alignment of the various channel reaches leading into the inner harbor are well defined by lighted range beacons.

The coast between Vishakhapatnam and Bhimunipatnam, about 16 miles NNE, continues hilly.

**Caution.**—There have been a number of pirate attacks on merchant vessels in this area. Mariners are advised to keep a sharp lookout, especially at night, for pirates attempting to board their vessel.

## Vishakhapatnam to Ganjam

**6.28 Waltair Point** (17°44'N., 83°21'E.), about 4.3 miles NE of the Dolphin's Nose Light, is low, sandy, and backed by red sand hills which show up well from the offing at times. Two houses on the side of a small hill about 4.5 miles NE, and the ruins of two houses on the summit of the Kailasa Range almost 4 miles N, respectively, of the N entrance point of Vishakhapatnam Harbor, are prominent. Rushi Hill, 154m high, conspicuous and topped by a beacon, lies 3.8 miles NNE of Waltair Point. Oppadu Konda, about 3.5 miles farther NNE, are 127m high and have the appearance of flat table lands with steep seaward faces. The high land terminates about 4 miles N of Rushi Hill and continues low as far as the Gostani River about 4 miles farther NNE. A few isolated, conical hills mark this latter stretch of coast. A large high conspicuous sand hill lies 2 miles SW of Bhimunipatnam Hill.

**Caution.**—Vessels should not anchor in foul ground which surrounds Waltair Point within a depth of 15m. Also, vessels should keep clear of spoil ground lying 0.5 mile SE of East Point Light.

A Submarine Exercise Area, in which submarines frequently exercise, lies with its center about 5 miles ENE of Waltair Point.

**Bhimunipatnam** (17°54'N., 83°29'E.) lies on the S side of the mouth of the large, shallow, Gostani River. Vessels anchor in the open roadstead off the town to work cargo. The town is built on the E slopes of a hill, 166m high, which is topped by some trees and a pyramidal obelisk. A white temple lies about midway up the E slope of the hill and shows up well when the sun shines on it. A tall factory chimney lies about 2.5 miles NNW of the town, and is a good mark.

In the approach to the roadstead, the depths shoal gradually from the 18m curve about 2 to 3 miles offshore to a depth of 11m at the anchorage 1 mile offshore.

Two wharves lie on the S shore of the river but are available only to lighters. Cargo is carried to these wharves from vessels at the anchorage.

Weather signals are displayed from a flagstaff close SW of the lighthouse; the General System is used. Further information on these storm signals may be found in Pub. 160, Sailing Directions (Planning Guide) South Atlantic Ocean and Indian Ocean under "India—Signals."

Anchorage can be taken, in depths of 11 to 12.8m, sand and mud, with good holding ground, about 1 mile offshore abreast of the town. During the Southwest Monsoon, a vessel should anchor with the lighthouse bearing 264°; during the Northeast Monsoon, anchorage should be taken with the lighthouse bearing between 249° and 259°.

The coast between Bhimunipatnam and Konada, about 10 miles to the NE, is sandy and broken about midway along its length by some low red cliffs which show up well when the sun shines on them.

**Amnam** (17°57'N., 83°29'E.), a prominent flat-topped hill 254m high and bare, lies about 3.8 miles NNE of Bhimunipatnam Light. Kaulvada, a high hill topped by a beacon, lies about 2 miles farther ENE.

**6.29 Konada** (18°01'N., 83°34'E.) lies at the mouth of a small river. Several white buildings and some trees lie on the N side of the river.

Anchorage can be taken, in depths of 9.1 to 11m, sand, off the river mouth.

The coast between Konada and Kalingapatam, about 37 miles ENE, consists of a sandy beach backed by low sandhills. Kandivalasa, the highest and most prominent peak in this locality, rises to an elevation of 537m, about 7 miles N of Konada and appears nearly conical on all bearings from seaward.

Santapilli Rocks, which lie about 8.8 miles E of Konada, have been previously described in paragraph 6.23.

Ramachandrapur, a flat-topped hill 164m high surmounted by a beacon, lies about 10.3 miles NE of Konada.

**Agra Rock** (18°07'N., 83°46'E.), with a least depth of 5.5m, lies about 3.5 miles E of Ramachandrapur. The sea seldom breaks over this danger.

The Nagavali River, which enters the sea about 14 miles ENE of Ramachandrapur, is shallow and available only to light-draft craft. A beacon stands on the E side of the entrance of the river.

**Kalingapatam** (18°20'N., 84°09'E.) lies close S of the mouth of the Vamsadhara River and about 1.5 miles NNW of Sandy Point. There are no berthing facilities. All cargo is transported by lighters from the anchorage in the roadstead. The town no longer has any importance as a trading center.

Kalingapatam has been reported to be a good radar target up to 27 miles.

The land in the vicinity of the port is low and flat but the locality may be identified by Sahliundam, an isolated ridge 125m high, which has its summit near its W end about 5.5 miles W of the town. This bare prominent wedge-shaped ridge has two white temples and a tree on its E slope.

Storm and weather signals are displayed in the town.

**6.30 Satara Reef** (18°20'N., 84°09'E.), which extends about 0.8 mile NE from Sandy Point, has general depths of 9.1m and a least depth of 6.4m at its outer end. The reef is steep-to on its N and E sides.

Considerably less depths than charted have been reported to exist in the roadstead.

An obstruction, with a least depth of 7.3m, was reported to lie about 1.5 miles NNE of Sandy Point.

Anchorage can be taken during the Northeast Monsoon, in a depth of about 9.1m, with the port flagstaff bearing about 284°, distant 0.8 mile. The coast between Kalingapatam and Pundi, about 26 miles NE, continues sandy and is backed by numerous isolated hills.

A tall black and white banded beacon lies on the beach at Bavanapadu Village, about 19 miles NE of Kalingapatam.

A rounded rocky point lies about 7.5 miles NE of Bavanapadu Village, and the entrance of Bendi Creek lies about 1 mile farther N. Pundi Village lies 0.8 mile above the entrance of the creek. A white obelisk and a flagstaff lie in the village. The village is not visible from the offing.

Bendi Hills, a flat range 175m high, lies about 3 miles NW of Pundi. Khirsinga Hill, small, red, and 51m high, lies on the coast about 1.5 miles NNE of the obelisk at Pundi.

Anchorage can be taken off Pundi, in depths of 12.8 to 14.6m, about 0.8 mile offshore, with the white obelisk bearing about 281°.

**Rati Beacon** (18°47'N., 84°32'E.), a 4.3m high obelisk, stands on a double-peaked hill, about 8 miles NE of Pundi and 0.8 mile inland. This hill lies at the end of a small range of about the same height which slopes down to the coast. This range is prominent when viewed from the NE or SW, and at a distance of 4 to 5 miles has the appearance of a headland. The steep Mahendragiri Range, about 15 miles NNW of Rati Beacon, rises to an elevation of 1,524m.

A rocky patch, with a depth of 11.9m, lies about 2.8 miles E of Rati Beacon.

**6.31 Baruva** (18°52'N., 84°35'E.), a small town of little importance to shipping, lies on the N bank of a river, about 6.3 miles NE of Rati Beacon. The customhouse and a few huts are the only objects in the town which can be seen from the offing. A group of trees SW of the customhouse is conspicuous.

Two beacons, about 64m apart, lie about 0.2 mile NE of the lighted beacon E of the town. The N beacon is black and white banded and the S beacon is white.

Anchorage can be taken, in a depth of 8.2m, sand and mud, with the lighted beacon bearing between 304° and 315°.

The coast between Baruva and Gopalpur, about 29 miles NE, is sandy and backed inland by ranges of hills. In the vicinity of Kaviti, about 10 miles NE of Baruva, the land rises gradually to an elevation of about 91m. The higher ranges inland are frequently obscured and are of little use to the mariner.

A masonry beacon lies on a large sandbank near the coast, about 9.8 miles NE of Baruva Lighted Beacon.

**Kaviti Beacon** (19°02'N., 84°42'E.), reported to be partially obscured by trees, lies on a plateau at an elevation of 85m, 2.5 miles NW of the masonry beacon.

Ichapur, a prominent sharp hill, rises about 4.5 miles N of Kaviti Beacon and is 156m high. Dandrasa, a 206m high hill, lies 5.5 miles NE of Ichapur. When viewed from the E, this hill appears round-topped, but when viewed from the S it appears as a long summit with two peaks. The W peak is slightly higher. Raegara, a conspicuous range with four peaks, lies 8 miles NW of Dandrasa.

**Investigator Rock** (18°58'N., 84°42'E.), with a least depth of 2.3m, lies about 8.5 miles NE of Baruva Lighted Beacon. The water over the rock is not discolored and it is not marked by breakers.

**6.32 Sonnapuram** (19°07'N., 84°47'E.), a small port on the N bank of the Bahuda River, lies about 17 miles NE of Baruva Lighted Beacon. A white obelisk and a white column, each about 15m high, lie on an islet in the entrance of the river. A customhouse, with a black flagstaff, stands on the beach at Sonnapuram.

**Gopalpur** (19°15'N., 84°55'E.), fronted by an open, exposed roadstead, lies about 11 miles NE of Sonnapuram. The town is no longer a port of call for ocean shipping.

Winds constantly blow along the coast near Gopalpur in March and April; the Southwest Monsoon usually breaks about in the middle of June. Farther N the winds are only occasional.

The currents usually set with the prevailing wind. About the middle of January, the NE current begins and by the middle of

February it sets steadily ENE with velocities of 0.5 knot close offshore, and increasing to 1.5 knots about 12 miles offshore. At the latter distance it sets NE.

The NE current continues to run until July and then sets SW, gradually strengthening to a rate of 2 knots and more.

Anchorage can be taken, in a depth of 13.7m, sand and mud, with Gopalpur Light Tower, white round masonry with red bands, bearing 299°, distance about 0.6 mile. Anchorage can also be taken, in a depth of 13.7m, about 0.3 mile SW of the above position.

During the windy months, April to July, it is recommended that anchorage be taken, in a depth of 16.5m, with ample chain veered. Two hard patches, one 0.8 mile SSE and the other 0.7 mile E of Gopalpur Light, should be avoided when anchoring.

The coast between Gopalpur and Ganjam, about 12 miles NE, is marked by several isolated conspicuous hills which are visible over the coastal sandhills. Manusurukota, a rocky hill 54m high, rises about 2.3 miles N of Gopalpur. Landabaums, the easternmost of two hills, is 198m high and lies about 8 miles N of Gopalpur. This hill appears as a conical sugarloaf shape from all directions.

### Ganjam to Balisahi Point

**6.33** The coast between Ganjam and Balisahi Point, about 147 miles NE, is regular and intersected by numerous rivers. False Bay, a small, exposed indentation, lies between False Point and Shortt Island to the NE. The Dhamra River discharges N of this bay, to the W of Shortt Island, and to the S of Balisahi Point.

Chilka Lake, a large, shallow body of water, lies close to the coast between Ganjam and Puri, about 50 miles to the ENE.

With the exception of the high mountain ranges which rise N of Ganjam in the interior, this section of coast is generally low and sandy and marked in places by sandhills, scattered trees, and jungle growth. On a clear day, some of the mountain peaks inland are conspicuous and useful marks.

All of the known dangers which lie off this section of coast are mostly contained within the 18m curve which lies between 1.5 and 13.5 miles offshore. This curve lies at its greatest distance offshore in the vicinity of False Bay and to the E of Shortt Island.

Six detached 18.3m patches lie within 4.5 miles SE through 5.8 miles SSE of **Puri Light** (19°48'N., 85°50'E.).

**Central Sand** (19°58'N., 86°24'E.), a shoal with depths ranging from 0.4 to 9.1m, extends about 1.5 miles E through NE from **Devi Point** (19°59'N., 86°24'E.). A detached 5.5m patch lies about 1.5 miles S of the same point. Central Sand is reported to have extended about 1 mile farther SE. In fine weather, the sea does not always break over this shoal.

**Palmyras Shoals** (20°47'N., 87°12'E.), with depths of 2.3 to 10.1m, lie within a radius of 8 miles ENE through SE of the central part of Short Island.

**Caution.**—Care is necessary when approaching Palmyras Shoals from the E, because the depths decrease rapidly and soundings will give no warning of the proximity of these dangers.

Care is also necessary when navigating in the vicinity of False Point. The lighthouse is difficult to identify during a heat haze, because of its light-colored top and lack of background.

During January through March, fog may occasionally obscure the light or cause it to show a deep red color. Frequent soundings should be taken and depths should not be shoaled to less than 20.1m.

During the Northeast Monsoon or with NE winds, the current in the vicinity of False Point generally sets to the W.

Tidal currents in the vicinity of Palmyras Shoals set at a rate of 2 knots at springs. On the NE side of the shoals, the flood sets to the NW and the ebb to the SE. At the S end of these shoals the flood sets to the N and the ebb sets to the S.

From the end of June to the end of November, there is little or no flood or W current off False Point and Palmyras Shoals, except at spring tides; a strong outset is experienced from the rivers during freshets.

Off False Bay the flood sets to the NW to N and the ebb sets SW, each at a velocity of about 1 knot. The velocity is greatly influenced by the prevailing winds. The tidal current, together with the coastal current during the Southwest Monsoon, sometimes attains a velocity of 4 knots.

**6.34 Ganjam** (19°23'N., 85°04'E.) lies on the N bank of the Rushikulya River close W of its entrance, but very little of the town can be seen from seaward. A fort in ruins lies on rising ground on the S side of the town; N of the town the land is low.

The port of Ganjam is little used because of the heavy surf and shifting banks.

**Paluru Bluff** (19°26'N., 85°08'E.), 177m high, lies about 6 miles NE of Ganjam and is the bold NE termination of the high mountain ranges of the Ganjam District. Kujidheppo Peak, saddle-shaped and 340m high, rises about 6 miles N of Ganjam. Mount Chandikho rises to an elevation of 462m on the W shore of Chilka Lake. The summit, which lies about 16 miles N of Paluru Bluff, appears as a double-peak when viewed from the S, and lies out against the high ranges to the W.

A low beach of sandhills extends 32 miles NE from Paluru Bluff to Chilka Mouth, the entrance of Chilka Lake. There are few landmarks found along this part of the coast. Mita Kua Bungalow, a small white house on a sandhill close to the coast about 20 miles ENE of Paluru Bluff, is the most conspicuous. A beacon lies on the coast about 13 miles ENE of the above bluff. Sandari Beacon lies about 5 miles ENE of Mita Kua Bungalow. Babeswal Temple, painted black, lies about 2.3 miles NE of Sandari Beacon and is sometimes visible among the trees.

**Danai** (19°59'N., 85°20'E.), a conspicuous sharp peak, rises to an elevation of 577m about 22 miles NNW of Mita Kua Bungalow and is a useful mark on a clear day.

**Chilka Lake** (19°45'N., 85°23'E.), a large shallow expanse of water, is separated from the sea by a long, narrow sandy ridge. Only boats can be accommodated.

The coast between Chilka Mouth and Puri continues low and sandy. Harchandi Temple lies on a sandhill about 0.8 mile inland and about 4 miles NE of Chilka Mouth.

**Puri** (19°48'N., 85°50'E.) (World Port Index No. 49530), an open roadstead, lies on a low sandy ridge on the coast where large buildings stretch about 3 miles fronting the sea. Puri Light is shown from a white pedestal on the wall of a two story building.

Storm signals are displayed at the flagstaff which lies 0.2 mile SW of the light structure; the Brief System is used. Further information on these storm signals may be found in Pub. 160, Sailing Directions (Planning Guide) South Atlantic Ocean and Indian Ocean under "India—Signals."

Anchorage can be obtained off the town, in fine weather, in a depth of about 14m, good holding ground. The soundings of depths should be continuous while an approach is being made to the anchorage.

**6.35 Baleshwar Temple** (19°50'N., 85°56'E.), a small, black, pagoda-shaped building surrounded by trees, stands about 7 miles ENE of Puri Light. Only the upper part of the temple is visible from seaward.

The Kushbhadra River entrance, marked by a temple with two palms near it, discharges about 13.5 miles ENE of Puri Light. The river is shallow and of no importance to shipping.

A black pagoda in ruins lies in the village of Konarak, about 16 miles ENE of Puri Light and 2 miles inland. This pagoda is about 40m high and prominent. From the NE it resembles a black pyramid.

**Tundaha Obelisk** (19°54'N., 86°13'E.), 4.6m high, stands on a sandhill about 7 miles E of the above black pagoda.

The **Devi River** (19°59'N., 86°24'E.), one of the largest branches of the Mahanadi River, flows into the sea N of Devi Point. This point can best be identified by Balijori Obelisk, which lies about 2.5 miles NNE of the point. Nulyasai Village is also conspicuous to approaching vessels in the vicinity of Devi Point. The river is frequented only by native craft.

Central Sand, the shoal which extends from the river mouth, has been previously described in paragraph 6.33.

Vessels with local knowledge can anchor off the mouth of the river NE and E of Devi Point. With onshore winds, anchorage can be taken, in a depth of 14.6m, with Balijori Obelisk bearing 317°, distant 1.5 miles. Anchorage can also be taken about 1 mile S of the above position when the winds are W.

Small vessels, with local knowledge and a draft not exceeding 3m, can anchor inside the river mouth, in a depth of 5.5m, with Devi Point bearing 057°, distant 0.5 mile.

The coast between Devi Point and the entrance of the Jatadharmohan River, about 17 miles NE, consists of low sandy beach marked by small hillocks. Breakers are always visible across the shallow entrance of this river. The entrance of the shallow Patakund River lies about 6 miles ENE of the mouth of the Jatadharmohan River. A prominent building lies near the shore, about 2 miles SW of the entrance of the Patakund River. A conspicuous water tower lies about 1 mile NE of the same entrance.

## Paradip (20°16'N., 86°41'E.)

World Port Index No. 49535

**6.36** Paradip, a lagoon-type harbor used almost solely for the handling of iron ore, lies on the coast about 6.5 miles ENE of the entrance of the Jatadharmohan River.

**Port Authority of Paradip**

<http://www.paradiport.com>

**Depth—Limitations.**—Vessels with a draft of 13m can utilize this port, which offers problem free berthing year round.

There are ten berths available at the T-head pier. Berths No. 1 and 2 have an alongside depth of 11.5m and can accommodate a vessel up to 40,000 dwt with a length of 260m. Berths No. 3 and 4 have an alongside depth of 12.5m and can accommodate a vessels up to 60,000 dwt with a length of 230m. Berths No. 5 thru 7 have an alongside depth of 13m and can accommodate vessels up to 65,000 dwt with a length of 230m. Berths No. 8 and 9 are for fertilizer; each has an alongside depth of 13m and can accommodate vessels up to 65,000 dwt. Berth No. 10 is a multi-purpose berth with an alongside depth of 13m that can accommodate a vessel up to 65,000 dwt.

A berth for small vessels and lighters is located on the S end of the main wharf.

LASH operations are normally carried out between the mother ship at the anchorage and the lighter berths at the S end of the general cargo wharf.

**Aspect.**—Paradip Light is shown from a round concrete tower, 1.5 miles W of the entrance to the port. The entrance to the port is protected by a N and a S breakwater. A trestle pier projects from the S breakwater.

The channel leading into the inner harbor passes about midway between two breakwaters and then extends NW to the turning basin close SW of the T-head jetty on the E side of the harbor. The alignment of the main fairway is indicated by two pairs of lighted range beacons.

The port has a large turning basin 520m in diameter.

**Pilotage.**—Pilotage, which is compulsory, is only available from 0500 until 2100. Pilots board 2 miles SE of the harbor entrance.

The following information should be sent by radio when a vessel is within 40 to 60 miles to the port:

1. Name.
2. Port of departure.
3. Call sign.
4. Destination.
5. ETA.
6. GRT.
7. Length.
8. Breadth.
9. Draft.
10. Speed.
11. Number or cases of dangerous or contagious diseases.
12. Type and quantity of cargo.
13. Name of agent and requirements.

**Signals.**—Storm and weather signals are shown at Paradip; the General System is used. Further information on these storm signals may be found in Pub. 160, Sailing Directions (Planning Guide) South Atlantic Ocean and Indian Ocean under "India—Signals."

**Anchorage.**—A general anchorage area, with a radius of 0.5 mile, lies centered on a point about 3 miles SE of the harbor entrance. A tanker anchorage area, with a radius of 0.5 mile, lies centered on a point about 1.3 miles E of the center of the general anchorage area.

Anchoring is prohibited in a triangular-shaped area lying in the approach to Paradip NE of the designated anchorage areas. This area is bound by lines joining the following positions:

- a. 20°14.6'N, 86°42.8'E.

- b. 20°13.0'N, 86°45.8'E.

- c. 20°16.1'N, 86°46.2'E.

The low coast extends about 3 miles ENE and terminates at the Lion's Rump, on the S side of the entrance of the Mahanadi River. A conspicuous white house and a water tower stand about 0.5 mile SW of the Lion's Rump.

**6.37 False Point** (20°20'N., 86°44'E.), about 2.5 miles NNE of the Lion's Rump, lies between the two entrances of the Mahanadi River and has been reported to be a good radar target up to 17 miles. The lighthouse on the point is shown from a white, round, masonry tower with red bands; the lighthouse is difficult to see if there is a heat haze because it has a light-colored top and there is no background.

False Point has been reported to be a good radar target up to 17 miles.

A long tongue of land extends about 3.8 miles NE from False Point and almost meets and sometimes joins the S extremity of Nurrea Banga Nassi, a low grass-covered narrow island about 5.8 miles long. A large stone building, with a banyan tree close by, stands on the W side of the island.

A drying shifting sand spit extends N and W from the N end of Nurrea Banga Nassi.

The **Mahanadi River** (20°18'N., 86°44'E.), a shallow passage available only to boats with local knowledge, is entered through two entrances. One passes S and E of the land on which False Point lies; the other passes W and N of this land.

The city of Cuttack, 55 miles above the river mouth, is the headquarters of the Orissa District.

**False Point Anchorage** (20°28'N., 86°47'E.) lies in the bay W of the N part of Nurrea Banga Nassi.

The outer anchorage, about 1 mile N of the N extremity of Nurrea Banga Nassi, has a depth of about 7.9m. A depth of 10m exists about 1 mile farther NE. The holding ground is fairly good, but a heavy swell is experienced. Anchorage is not recommended.

Small vessels can anchor in a depression about 1.5 miles long which lies W of the N part of Nurrea Banga Nassi, but local knowledge is necessary. Anchorage within the bay is safe, but the depths are shallow because of silting.

**Caution.**—With strong S winds, the flood sets toward the coast in the vicinity of Satbaia Sandhill about 15 miles N of the N end of Nurrea Banga Nassi. Vessels approaching from the N must guard against this current.

With a strong flood it is advisable to approach the anchorage on a S course. Such a current is noticeable by the rapid drift of the vessels to the N. Stemming the current by turning the vessel to port, to the E or NE, from a S course is advisable before anchoring. Vessels attempting to turn to starboard, or to the SW and NW, have been swept rapidly to the W and have grounded on the shoals extending from **Temple Point** (20°25'N., 86°44'E.).

The currents within the bay, W of Nurrea Banga Nassi, set through the channels at an average velocity of 2 knots at springs. During freshets on the Kharnasi River and the Jambu River, the ebb sometimes attains a rate of 4 to 5 knots and sets around the N end of Nurrea Banga Nassi.

The tides at False Point are semidiurnal.

Vessels approaching from the S, and having made False Point Light, should not shoal to depths of less than 18.3m until

the light bears about 244°, distant 10 miles, and the large building on Nurrea Banga Nassi bears 100°. Course should then be altered to about 320° which will lead to the anchorage.

The Kharnasi River and the Jambu River, which flow into the W side of the bay W of Nurrea Banga Nassi, are shallow, subject to change, and available only to small vessels with local knowledge.

**False Bay** (20°31'N., 86°55'E.) lies between Nurrea Banga Nassi and Maipura Point, about 20 miles NE, at the entrance of the Maipura River. Depths in the bay decrease gradually toward the shore over a bottom of olive-green mud, in the S part, to a bottom of sand and mud, in the N part. The shore on the W of the bay consists of moderately-high sandhills.

**Caution.**— The Gahiramatha Marine Wildlife Sanctuary, best seen on the chart, lies roughly between the 10m and 20m contours in False Bay. Fishing, trawling, or any other activity harmful to marine life within this area is prohibited.

**6.38 Satbaia Sand Hill** (20°38'N., 86°56'E.), 18m high, with an isolated clump of trees at its NE end, lies 4.5 miles SW of Maipura Point. This hill is a good landmark.

Long Sand, an extensive drying shoal with the six small Wheeler Islands on its N part, extends about 2.5 miles N and NW from Maipura Point. The sea breaks heavily over this shoal.

The **Maipura River** (20°42'N., 87°00'E.), about 5 miles W of Maipura Point, is entered between this point and the SW extremity of Long Sand. Although the river is deep, numerous flats obstruct its entrance and it can only be entered by boats at half tide when the water is smooth.

Anchorage can be taken off Maipura Point, in depths of 11 to 12.8m, with the N end of the sand hills on Maipura Point bearing NW, distant 2.8 miles. Protection is provided from NW winds.

**Shortt Island** (20°47'N., 87°05'E.), 3m high, is the largest of four small islands which lie on a drying shoal about 3 miles N of Maipura Point. The configuration of the island is constantly changing due to the continuous action of the sea. A tower, 17.3m high, stands close off the E side of the island.

Palmyras Shoals, which lie off the seaward side of Shortt Island, have been previously described in paragraph 6.33.

Anchorage can be taken, in depths of 11 to 12.8m, about 4 miles NE of Shortt Island. During strong SW winds good anchorage can be taken, in a depth of 12.8m, with the middle of Shortt Island bearing 206°. Vessels intending to anchor should approach with the middle part of Shortt Island bearing 226°. At night, anchorage should be taken, in depths of 11 to 12.8m.

The **Dhamra River** (20°47'N., 86°58'E.), the most important of the navigable rivers of the Orissa District, forms the N outlet for the confluence of the Brahmani River, the Kharsua River, and the Baitarani River.

The town of Chandbali lies on the N bank of the Baitarani River, about 8 miles above the junction of the Baitarani River and the Dhamra River, and about 18 miles above the entrance of the latter river.

The area off the Dhamra River entrance embraces Shortt Island, Wheeler Island, Long Sand, Palmyras Shoals, and extensive drying sand and mud flats.

The river is entered about 6 miles W of Shortt Island, between Palmyras Point on the S side and an unnamed low muddy point about 1 mile NW.

The extensive drying mud and sand flats extend about 2.5 miles offshore between the entrances of the Maipura River and the Dhamra River.

Shallow flats extend up to 6 and 7 miles offshore between the entrance of the Dhamra River and Balisahi Point, about 4.3 miles to the N. Kanika Sand is the S extremity of these flats.

**6.39 Kanika Sand** (20°47'N., 87°00'E.), an extensive drying mud and sand flat, lies on the N side of the entrance channel about 0.8 to 5.5 miles W of Shortt Island. This flat has been reported extending to the SE.

The outer bar, which has a least depth of 1.5m, lies about 1.3 miles NNW of the middle of Shortt Island. The inner bar, S of Kanika Sand, has a least depth of 2.4m.

The outer bar maintains its position and depths, but the inner bar is subject to change.

Chandnipal Bar lies in the fairway N of Kalibhanja Dian, a long, narrow island which lies on the middle of the river close within the river. This bar had a least depth of 5.2m.

The several other bars which lie within the river were reported to have depths of 2.4 to 2.7m at certain stages of the tide.

In 1960, a vessel drawing up to 3.7m at HW and up to 1.5m at LW, could ascend the river to Chandbali.

The Matai Nadi joins the Dhamra River about 3.8 miles above the entrance of the latter river entrance. Vessels with a draft of 2.4m have been reported able to navigate the Matai Nadi at LW.

**Palmyras Point** (20°46'N., 86°59'E.), about 6 miles W of Shortt Island, is the N extremity of the low land which lies between the Maipura River and the Dhamra River. The point is difficult to distinguish because of the dense jungle growth which covers it. The low land on the N side of the Dhamra River presents a similar aspect as far N as Balisahi Point, about 4 miles distant.

Three beacons, each 24m high with a ball topmark, stand in the vicinity of the entrance of the Dhamra River. These aids are visible from seaward, but are not easy to identify outside the outer bar.

The entrance channel over the outer and inner bars is buoyed and the channels within the river are buoyed in places. These buoys are liable to be moved to conform to changes in the channels and are not to be relied upon.

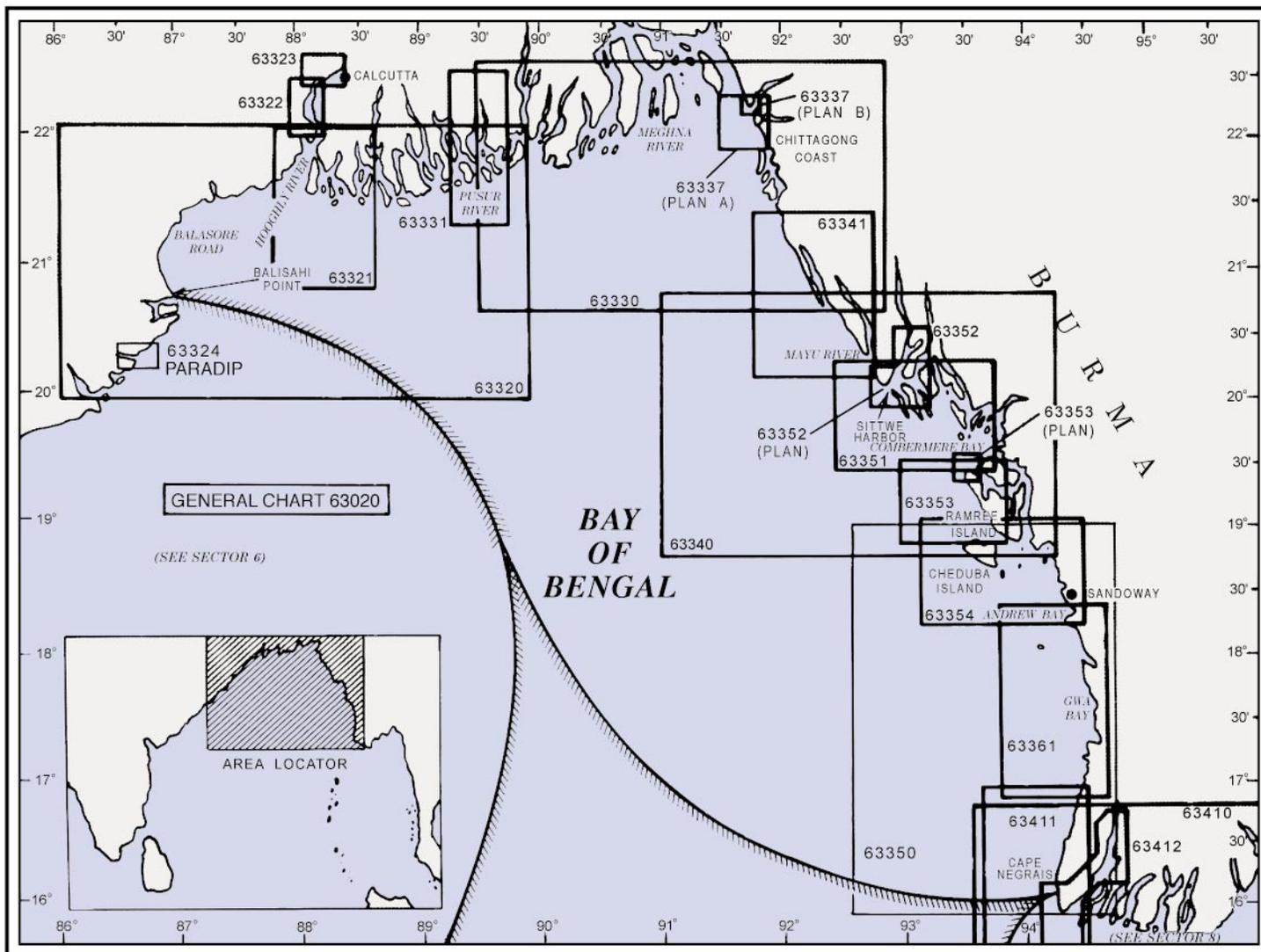
The buoyed entrance channel passes about 0.8 mile N of Shortt Island, and then leads between the shoals extending from it and Kanika Sand. It then leads W between Kanika Sand and the N edge of the flats which extend E from Palmyras Point. This latter stretch leads to the entrance of the Dhamra River and passes N of the island lying in the middle of the river close within the entrance.

Pilotage is not compulsory, but advisable for strangers.

The jetty at Chandbali provides berths for three small vessels with a maximum draft of 3.7m. Passengers and cargo are usually embarked and discharged alongside the jetty.

Weather signals are displayed at Chandbali; the Brief System is used. Further information on these storm signals may be found in Pub. 160, Sailing Directions (Planning Guide) South Atlantic Ocean and Indian Ocean under "India—Signals."

Vessels with local knowledge can anchor in mid-channel off the town of Chandbali, in depths of 8.2 to 12.2m.



Additional chart coverage may be found in NGA/DLIS Catalog of Maps, Charts, and Related Products (Unlimited Distribution).

**SECTOR 7 — CHART INFORMATION**

## SECTOR 7

### INDIA—EAST COAST—BALISAHİ POINT TO NEW MOORE ISLAND—BANGLADESH, AND BURMA—WEST COAST

**Plan.**—This sector describes the E coast of India E of Balisahi Point and then the coast of Bangladesh and the W coast of Burma. The descriptive sequence is from W to E and then S.

#### General Remarks

**7.1** The Hugli River, in the NW part of the Bay of Bengal, is the W branch of the Ganges and the means of access for ocean-going vessels calling at the port of Calcutta. Flowing through the Sundarbans, the Pussur River, another branch of the Ganges, is navigable by ocean-going vessels to the port of Chalna. Similar type vessels also ascend the Karnaphuli River to the port of Chittagong.

The Orissa Coast and the Sundarbans Coast are generally low, whereas the Chittagong Coast is marked by high mountain ranges.

Cape Negrais lies about 333 miles SSE of Elephant Point, with the intervening coast being irregular and broken in many places by the rivers which discharge into the sea on the E side of the Bay of Bengal. High hills and mountains back this section of coast at varying distances inland, and in most cases generally lie in a N-S direction parallel to the coast. Mayu and Arakan Yoma are the principal ranges. Many of the peaks of these ranges are useful marks to vessels navigating along this coast.

Ramree Island and Mun Aung Island, the two largest islands of many which lie off this coast, lie about midway between Elephant Point and Cape Negrais. Combermore Bay and Hunters Bay indent the shore N of the former island.

Akyab is the most important commercial port, although Kyaukpyu is of some importance.

**Winds—Weather.**—The weather and climate of the area described in this sector is primarily influenced and determined by the Northeast Monsoon and the Southwest Monsoon and the short transitional periods between them. The year is divided into four seasons referred to as the Northeast Monsoon (winter monsoon, cool or dry season), the spring transitional or hot season, the Southwest Monsoon (summer monsoon, wet or rainy season), and the autumn transitional season.

The Northeast Monsoon, December through March, is marked by good weather, with very little rainfall.

The hot season, April and May, is an interim period of weak and variable winds prior to the Southwest Monsoon. Increases in rainfall in April and May do not equal the amounts of rainfall during June through August; this results in greater heating of the air masses.

The Southwest Monsoon, June through September, is characterized by cloudiness, overcast skies, light rain almost daily, interspersed with rain squalls or thunderstorms accompanied by torrential downpours. Restricted visibility, high humidity, and general adverse weather conditions are associated with the Southwest Monsoon.

The autumn transitional season, a period of weak and variable winds with land and sea breezes prevailing, occurs in early October after the withdrawal of the Southwest Monsoon and before the cooler drier weather of the Northeast Monsoon is established in late November.

Tropical storms, with destructive winds, occasionally affect the coastal regions N of 15°00'N.

Tropical cyclones, which develop in the Bay of Bengal, occur most frequently during the transitional season. The Arakan Coast of Burma is more likely to be struck by a cyclone during the autumn transitional season than at any other time, but rarely is the Gulf of Martaban affected. During the hot season, some tropical cyclones cross the coast of the Gulf of Martaban.

**Tides—Currents.**—Surface currents across the head of the Bay of Bengal, as elsewhere in the bay, are developed and influenced by the effects of the monsoon winds.

At the Sandheads in August, a strong current sets to the W; in September, after the retreat of the Southwest Monsoon, the current setting to the W depends on the force and duration of the E winds. During October, the current sets W and SW.

Seaward of the Sundarbans Coast, there are strong rotary tidal currents. The flood current begins setting W at the end of the first quarter, its direction is WNW and at half flood about N. During the last quarter of the flood, the current sets ENE. At commencement the ebb current sets E, at half ebb it sets S, and during the last quarter of the ebb it sets WSW, thus making a complete rotation.

Tidal currents along the Chittagong Coast S of Elephant Point set parallel to the coast, with the flood current setting N and the ebb current setting S.

Tidal currents along the Arakan Coast set N on the flood and S on the ebb; they are greatly influenced by the immense volume of tidal backwater. Local in drafts of the current are strong during the flood and the outset is small during the ebb.

**Caution.**—Reefs, shoals, and sands extend seaward in a general S direction from the delta shore at the head of the Bay of Bengal. These dangers, with depths of 5.5m and less, lie within the 11m curve and in places extend up to almost 30 miles offshore.

Soundings provide a guide when approaching these shoals, but if in doubt as to the vessel's position, it is advisable not to shoal to depths of less than 36.6m until certain of the position.

Mariners should be aware of and have regard for the numerous dangers which lie offshore between Elephant Point and Cape Negrais.

#### India—Balisahi Point to the Sundarbans Coast, including the Hugli River to Calcutta

**7.2** **Balisahi Point** (20°51'N., 86°58'E.) is the extremity of the low land N of the entrance of the Dhamra River.

The coast between Balisahi Point and the entrance of the Hugli River, about 69 miles NE, is low, flat, and covered with scrub and mangroves along its S part. Southwest of Chandipur, the trees are higher than elsewhere. Northeast of Chandipur, the coast remains low and sandy, but the sandhills are more plentiful. There are no distinctive landmarks.

The Orissa Coast terminates at the entrance of the Hugli River.

**Winds—Weather.**—A general description of the winds and weather along the coast has been previously given in paragraph 7.1.

Baleshwar Road is in the track of cyclonic storms which pass through this area. Many disasters have been caused by these storms.

**Tides—Currents.**—At Balramgari, which is just within the **Burhabalang River Entrance** (21°29'N., 87°03'E.), springs rise 3.7m and neaps rise 2.4m.

The tidal currents in Baleshwar Road set NE during the flood and SW during the ebb. Both currents set at a rate of 2 knots at springs.

In the Burhabalang River, the ebb lasts 8 or 9 hours and sets at a rate of as high as 4 knots. The set of the flood averages only 0.5 knot.

**Depths—Limitations.**—Between Balisahi Point and the entrance of the Hugli River, the 18m curve lies about 9.5 miles E of Balisahi Point and extends NE to a position about 22 miles S of the entrance of the **Subarnarekha River** (21°34'N., 87°23'E.), and then extends ESE to a position about 40 miles S of the entrance of the Hugli River. With the exception of a detached 34.7m patch, which was reported to lie about 72 miles SE of Balisahi Point, there are known dangers seaward of the 18m curve. Those dangers which lie within the 5.5m curve adjacent to the coast are described under the principal description of the features which they front.

The coast between Balisahi Point and the entrance of the Burhabalang River is bordered by drying flats. The coast is low as far as the village of Bideipur, about 13 miles NNW of Balisahi Point. Between this village and Kalikoti, about 8 miles to the N, the flat coast is bordered by dense mangroves. At Nauri, about 11 miles NNE, the coast is marked by low sandhills and taller trees. These coastal features continue for an additional 10 miles NE to the village of Chandipur. A large double pagoda, about midway between Nauri and Chandipur and 2 miles inland, is visible among the trees on NW bearings.

A sand cliff, 16m high, lies in Chandipur. A black flagstaff lies near a large white bungalow, about 0.8 mile NE of Chandipur.

The entrance of the Burhabalang River lies 2.3 miles NE of Chandipur and is marked by low, barren, sandhills.

**Anchorage.—Baleshwar Road** (21°23'N., 87°07'E.), which lies off the entrance of the Burhabalang River, provides anchorage, in a depth of about 7.3m, sand and mud, good holding ground, with the flagstaff NE of Chandipur bearing 312°, distant 7 miles. This is the best anchorage for vessels with a draft of about 6.1m. Anchorage can also be taken closer inshore in lesser depths.

The anchorage can be approached with the highest part of Nilgiri Mountain (Dhobasila Pahar), about 16 miles W of the river entrance, bearing about 293°.

During stormy weather, anchorage can be taken off Kalikoti over a bottom of soft mud. The Burhabalang River is tidal for about 23 miles, but is navigable for only about 4 miles of this distance above the entrance. Native craft, with drafts up to 2.7m, can transit this part of the river.

**7.3 Baleshwar** (21°29'N., 86°57'E.) (World Port Index No. 49550) lies on the S bank of the Burhabalang River, about 16 miles above its mouth. This town was formerly a port of some importance, but in recent years there has been no sea-borne trade.

Cargo is transported by barges from the anchorage in Baleshwar Road.

The **Panchpara River** (21°31'N., 87°07'E.) discharges into the sea about 4.5 miles NE of the entrance of the Burhabalang River. The river is navigable only by small native craft capable of crossing the bar.

The coast between the entrance of the Panchpara River and the Subarnarekha River, about 13 miles ENE, is marked by several sandhills. Pippli Sand, which dries, lies about 2 miles S of the latter river entrance.

The **Subarnarekha River** (21°34'N., 87°23'E.) is reported to have moderate depths within its entrance and is navigable by native craft for about 16 miles of its distance. The former port of Subarnarekha lies at the mouth of the river, but is available only to fishing boats. A pagoda and a clump of trees lie near the mouth of the river on the W bank.

Anchorage can be taken off the mouth of the river, in depths of 8.2 to 9.1m, with the pagoda bearing 327°, distant 8 miles.

Digwash Mohan and Munder Mohan, both shallow streams, discharge about 13 and 17 miles ENE, respectively, of the mouth of the Subarnarekha River. The Pichaboni River discharges about 6 miles farther E.

The **Rasulpur River** (21°47'N., 87°54'E.), about 9.5 miles NE of the Pichaboni River, discharges on the W side of the Hugli River just within its entrance.

**Quoin Sandhill** (21°36'N., 87°28'E.) lies on the shore about 6.3 miles WSW of the entrance of Digwash Mohan, otherwise this stretch of coast is without any prominent features.

South of the mouth of Digwash Mohan, the 5m curve is tongue-shaped, with its outer edge about 10 miles offshore. Depths within this curve decrease to 4.6m. During bad weather, heavy breakers are raised over this shoal projection.

Jensen Sand, which dries 4.6m on its inner part and 4m on its outer part, extends about 8 miles SSW from the mouth of the Rasulpur River. Spense Sand, which dries from 0.3 to 2.4m in places, extends about 7 miles SSW from the S extremity of Jensen Sand. A shoal, with depths of 0.6 to 4.9m, extends about 19 miles S from Spense Sand and terminates in Western Sea Reef.

Buoy EB is moored 1 mile WSW of the outer end of Western Sea Reef.

## India—Approaches to the Entrance of the Hugli River

**7.4** Vessels entering the Hugli River approach Eastern Channel Light Vessel, equipped with racon and moored about 46.5 miles SSE of **Sagar Island Light** (21°39'N., 88°03'E.).

During the Southwest Monsoon, it is best to make the coast near **Pundi** (18°40'N., 84°27'E.) or between Pundi and **Ganjam** (19°23'N., 85°04'E.), where higher land backs the coast. When the weather is very hazy, the land is obscured until a very near approach is made. It is advisable to determine a vessels position before proceeding N of **Puri** (19°48'N., 85°50'E.).

Soundings provide a guide when approaching this coast; the 183m curve lies about 21 miles SE of Pundi, 23 miles SE of Ganjam, and 15 miles S of Puri. At night, vessels should make Kalingapatam Light, Gopalpur Light, or Puri Light. Depths of 36.6m lie about 4 miles off Kalingapatam, 3.5 miles off Ganjam, and 13 miles S of Puri; continuous soundings should be taken when approaching the coast.

At night or in bad weather, a vessel should proceed along the coast in depths of about 36.6m. During the day, in clear weather, the Jagannath Pagodas at Puri and the black pagoda at Konarak should be sighted when passing. When about 10 miles beyond the black pagoda at Konarak, course should be shaped for Eastern Channel Light Vessel. Care should be given to the soundings when passing False Point, as the depths decrease gradually toward the shoal ground around it. At night, vessels should keep in depths of not less than 26m or even 37m when the wind is SE.

In September, toward the end of the Southwest Monsoon, the current sets strongly to the SW, and if a vessel's position is fixed, landfall should not be made so far to the S.

During the Northeast Monsoon, if a vessel is on the E side of the Bay of Bengal, course should be shaped directly for Eastern Channel Light Vessel.

**Depths—Limitations.**—A bank, located in position 20°44'N, 87°35'E and extending off the coast between False Point and Palmyras Point, is an excellent guide when approaching the entrance of the Hugli River. The bottom, when in depths of 36.6 to 42.1m, consists of reddish-colored shell and sand and gravel; in deeper water to the E or seaward, the bottom consists of sand and mud with shining specks, or olive-colored mud with broken shells. The E edge of the ridge is rather steep, with depths seaward of it ranging from 51 to 55m.

The 35m curve follows the NE curve of the coast and lies about 24 miles E of False Point Light and 25 miles E of Palmyras Shoals.

**Pilotage.**—Pilotage is compulsory N of latitude 21°39'N for all vessels of 200 grt and over. Pilots are available 24 hours.

All vessels approaching Sandheads, in the vicinity of Eastern Channel Light Vessel, should contact the pilot vessel by calling Sandheads Pilot on VHF channel 12, 14, or 16 for instructions. Vessels should also contact the Vessel Traffic Management System (VTMS) Station by calling VTMS Control on VHF channel 16 or 68 for anchoring or pilot boarding instructions. Vessels requiring a pilot are advised not to proceed N of latitude 21°00'N without being advised by Sandheads Pilot or VTMS Control to do so.

Sandheads Pilots or VTMS Control may instruct vessels to proceed to anchor S of Talent Light Vessel (Intermediate Light Vessel) or between Talent Light Vessel (Intermediate Light Vessel) and Lower Gasper Light Vessel.

Vessels anchoring should state their time of anchoring (in local time) and position to Sandheads Pilot or VTMS Control

after anchoring and maintain a continuous listening watch on VHF channel 16.

For tankers and vessels greater than 160m long, pilots may board S of Upper Gasper Light Vessel, depending on the prevailing weather conditions.

The normal draft for vessels that can be taken upriver at springs, under normal conditions, is about 7.9 and 7.3m at neaps. Occasionally the maximum draft at neaps decreases to 5.2m. A forecast of monthly drafts is published by the port authorities; for deeper draft vessels or vessels of 7 knots and under, special arrangements must be made and the date selected by the port pilotage office.

In 1976, a barrage, 60 miles N of Calcutta, was in operation. This is expected to control the river flow so as to enable vessels of 8.5m draft to reach Calcutta throughout the year and to reduce the effect of tidal bores.

The pilot vessel is stationed between Gasper Channel and Sagar Island. In very strong winds and heavy seas, the pilot vessel cruises about 10 miles S of the light vessel..

The pilot vessel, when sending a pilot to board a vessel, will lie with the wind on its port side at all times throughout the year. When supplying a pilot, the pilot vessel will be underway during the Southwest Monsoon from March 15 to October 31 inclusive; it may be found at anchor during the Northeast Monsoon, either in the vicinity of the light vessel, or up to 10 miles N of the Eastern Channel Light Vessel. No vessel shall anchor within a radius of 2 miles from Eastern Channel Light Vessel.

Masters of vessels wishing to board a pilot are advised to approach the pilot vessel from astern of it, heading in the same direction, and about three ship's length distant. The pilot vessel will proceed ahead, dropping a pulling or motor boat, which should be picked up. The pilot vessel will always either turn around or move far enough ahead to allow the following vessel sufficient sea room to maneuver. Deep-draft vessels, approaching slowly during the Southwest Monsoon, should bear in mind that the pilot vessel is drifting to leeward and should approach slightly on its starboard quarter. A long boat rope and a pilot ladder fitted with man ropes should be ready on the starboard side.

During the Southwest Monsoon, from March 15 to October 31, the pilot vessel, when on station at the Sandheads will display, between sunset and sunrise, a flashing white light every 3 seconds. The light is displayed from the top of the superstructure, but is not easily made out because of its low power.

The pilot vessel displays the usual signals for a pilot vessel on station when underway and, in addition, a light at the foremast head, which is displayed in accordance with orders issued by the local port authorities. A stern light is also displayed. A red and white pilot flag is displayed by day. This flag is only displayed when a pilot is available on board.

Should the pilot vessel be at anchor, it will display the International Code of Signals signifying that it is at anchor. At night, it will display the lights for a pilot vessel at anchor, together with the anchor lights.

Should a vessel arrive at the Sandheads and not find a vessel displaying the above signals, it will signify that no pilots are available on the station. Instructions should then be requested by radio.

Vessels arriving at the Sandheads should have their clocks set to Bengal time, which is 5.5 hours fast of GMT; this time is kept by the pilot vessel and at Calcutta. Vessels should attempt to inform the pilot vessel by radio at least 24 hours in advance of their ETA at the pilot vessel, stating their grt, draft in fresh water, speed, length overall, whether any explosives are on board, number of passengers if any, and details about any livestock.

An ETA should be sent to the pilot vessel at the Sandheads immediately upon vessel's departure from a port less than 24 hours steaming distance away. Vessels wishing to make any sound signals should do so in accordance with the Regulations for Preventing Collisions at Sea.

To enable a vessel to reach Calcutta on one tide it is best to arrive at the Sandheads at the time of low water at Sagar Island. However, it is necessary to have daylight for the last 4 hours of the passage.

With a strong E wind, there is a strong set to the W. It is then especially important that masters be guided by the advice given by the pilot vessel.

Signals from the pilot vessel to prepare for bad weather should not be ignored.

The tidal current should be studied; with the first of the flood setting to the W, a vessel should lie E, and with the first of the ebb setting E, lie W and N.

Lloyd's agents at Calcutta have facilities for delivering communications to vessels at the Sandheads.

When within the Hugli River, vessels embarking a pilot hoist a black ball at the masthead, lowering it to half-staff when at low speed.

**Anchorage.**—If for any reason it should become necessary to anchor when approaching the pilot vessel, a vessel should do so S of a line bearing 270° from **Matia Station Buoy** (20°59'N., 88°38'E.), in a depth of not less than 27.4m, mud, and not too close to the pilot vessel.

When anchoring, vessels should stem the tide before letting go an anchor, because the current sets strongly at the Sandheads.

### India—The Hugli River Entrance (21°39'N., 88°01'E.)

**7.5** Eastern Channel Light Vessel, which is frequently moved, marks the entrance of Eastern Channel, the main fairway leading to the Hugli River. Eastern Channel is available for use both by day and night and leads into Gaspar Channel, which in turn leads into Sagar Roads

Caution is necessary, as several dangerous wrecks, best seen on chart, have been reported in the immediate vicinity of Eastern Channel Light Vessel.

Western Channel leads into Beaumont's Gut and then into Sagar Roads. Western Channel Station Buoy, conical, black and white stripes, with black framework topmark, is moored 19 miles S of the S end of Eastern Sea Reef.

**Sagar Roads** (21°39'N., 88°01'E.), the navigable entrance at the mouth of the Hugli River, lies about 2 miles W of the SW extremity of Sagar Island.

The navigable entrance channel leading to Sagar Roads is subject to change in position and direction to accompany the change in depths, which occur from time to time. Local knowledge and assistance is essential to safe navigation.

**Winds—Weather.**—The wind and weather prevalent at the Sandheads is given in the accompanying table.

**Tides—Currents.**—Seaward of the Sundarbans, there are strong rotatory currents. During the rising tide, the tidal current commences by setting W and gradually turns through N to NE. During the falling tide, it commences by setting E and gradually turns through S to SW.

At the Sandheads there is a strong W current in August; during September, after the cessation of the Southwest Monsoon, the W current depends on the force and duration of the E winds; in October, there is a W and SW current. During cyclonic weather a strong W set of 2 knots is experienced.

Tides at the Sandheads and in Sagar Roads are semidiurnal. Sagar Tidal Semaphore, displaying day and night signals, lies about 0.5 mile SSW of Sagar Island Light. Dublat Mark lies on Sidney Point, the SE extremity of Sagar Island.

The Sandheads—Winds and Weather

Months	Wind	Force	Weather	Remarks
September, after break up of the Southwest Monsoon	East	Light and variable	Showers of rain	West current depending on force and duration of E winds; weather generally clear
October	East and calms	Variable	Stormy, sultry at times	West and SW current; generally a gale or cyclonic storm
November, December, January	North in morning and evening	Fresh in morning and evening, calm midday.	Fine weather with cool mornings and evenings	Cessation of the strong tides of the Hugli River; fogs in January in morning
February	Variable, S at night; NW sometimes	Light	Warm toward end of month	Thick fogs in morning; floods strong in the Hugli River toward end of month
March, April, May	Variable, until end of March; W and SW in April and May	Light at first, sometimes strong at end.	Northwesters, with rain, thunder, and lightning, frequent; hazy	Flood tide occasionally accompanied by bore; sometimes a gale or cyclonic storm in April or May

The Sandheads—Winds and Weather				
Months	Wind	Force	Weather	Remarks
June	Southwest	Strong at first	Northwesters decreasing in force; heavy thunderstorms	In June, the “chota bursat” or small rain, generally lasts two weeks
July	Southwest and W	Strong; gales frequent	Squally heavy rains	Freshets in the river, much swell in Eastern Channel
August	Southwest and W; W during day, hauling to S toward evening	Lighter	Squally, heavy rains; generally clear	Strong W current at the Sandheads

In Eastern Channel, the tidal currents set as follows during the flood, when not influenced by the wind:

1. First quarter—bearing 306°.
2. Second quarter—bearing 340°.
3. Third quarter—bearing 025°.
4. Fourth quarter—bearing 070°.

During the ebb the current sets, as follows:

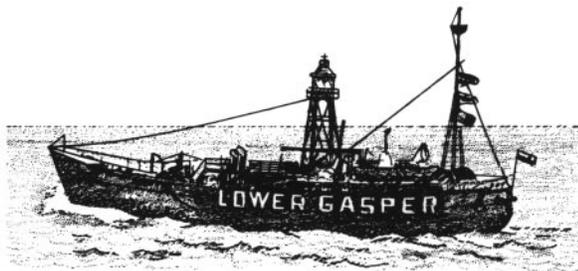
1. First quarter—bearing 126°.
2. Second quarter—bearing 160°.
3. Third quarter—bearing 194°.
4. Fourth quarter—bearing 070°.

The maximum velocities range from 2 to 3 knots at springs, and 1 to 1.5 knots during neaps between the bearings of 340° and 160°.

**Depths—Limitations.—Eastern Sea Reef** (21°14'N., 88°03'E.), with depths of 0.6 to 4.9m, has its S extremity about 29 miles S of Sagar Island Light. This reef extends S from Lower Long Sand, a drying shoal with its N end about 4.5 miles SSW of Sagar Island Light. A shoal, with depths of 0.6 to 4.9m, extends about 26 miles SSE from **New Island** (21°33'N., 88°11'E.). During the Southwest Monsoon, the sea breaks heavily over the S end of this shoal.

Middle Ground, with depths of 1.2 to 5.5m, lies between Western Sea Reef and Eastern Sea Reef. Depths over this shoal range from a drying patch on its N end to a depth of 5.2m over its S end. This shoal breaks heavily during the Southwest Monsoon. **Lower Gasper Light Vessel** (21°24'N., 88°10'E.) has a red hull with one mast surmounted by a topmark.

A similar breaking shoal, with depths of 0.6 to 5.5m, lies between Eastern Sea Reef and the previously-described shoal which extends SSE from New Island.



Lower Gasper Light Vessel

Eastern Channel, with Gaspar Channel, its N extension, lies between Eastern Sea Reef and the shoal to the E which extends about 26 miles SSE from New Island. Sagar Roads is entered N of this latter channel. Both Gaspar Channel and Sagar Roads are marked by lighted buoys. A number of dangerous wrecks, marked by buoys, are encountered at the junction of the two fairways.

Western Channel lies between Western Sea Reef and Eastern Sea Reef, and leads into Beaumont's Gut, which leads into Sagar Roads.

**Upper Long Sand** (21°34'N., 87°57'E.), a drying bank about 5 miles long, lies with its upper end about 5.3 miles SW of Sagar Island Light. A narrow shoal, with depths of 1.8 to 4.6m, extends 10.5 miles S from Upper Long Sand and then curves NE to join the upper part of Eastern Sea Reef.

Mizen Sand, a small drying bank, lies about 2.3 miles N of Upper Long Sand; Tigris Sand lies about 1 mile farther N. Lighted Buoy LWA is moored close off the NE end of Mizen Sand. Lighted Buoy AD is moored close off the E side of Tigris Sand, 2 miles NNW of Lighted Buoy LWA.

**Auckland Bar** (21°45'N., 87°59'E.), with depths over 4.6m, is marked by Lighted Buoy AS, 0.5 mile NE of Tigris Sand. A passage from Auckland Bar to Haldia Port is made through Jellingham Channel, marked by lighted buoys.

In 1986, it was reported that sand banks and islands SW of **Aguimari Char** (22°00'N., 88°08'E.) were to have been washed away to form a crossing to run from Jellingham Channel to Rangafala Channel, lying E of Aguimari Char. This connecting channel will allow an alternate route to Kulpi Roads and Calcutta, a detour from Haldia Channel. In 1988, Rangafala Channel was marked by lighted buoys. In 1989, it was reported that vessels make passage through Rangafala Crossing SSW of Aguimari into Rangafala Channel.

**Middleton Bar** (21°36'N., 88°03'E.), which dries 1.2m near its S end, lies centered about 3.3 miles S of Sagar Island Light, on the W side of Gaspar Channel. North of Middleton Bar a narrow shoal, with depths of less than 3m, extends about 4 miles N to join the drying coastal flat about 2 miles N of Sagar Island Light. A drying bank lies on this shoal about 1.5 miles WSW of the same lighthouse.

**Aspect.—Sagar Island** (21°44'N., 88°07'E.) lies on the E side of the Hugli River entrance and is flanked on its E side by the Baratala River, and on its W side by Bedford Channel. The main fairway leading into the Hugli River passes close off the

SW extremity of this island. Although well-populated and heavily cultivated, the island has few distinguishing features.

**Regulations.**—The master of an inbound vessel should report the health condition of the vessel to the pilot when the pilot boards at the Sandheads and act in accordance with the pilot's instructions.

A vessel arriving at the Sandheads from an infected port, or having plague on board, or a vessel on board which one or more cases of plague have developed within 12 days of the date of arrival, shall hoist and keep flying a yellow flag, and the signal indicating the port departed. Permission to haul them down must be obtained in writing from the health officer.

During this period, no communication shall be held with the shore, or with any other boat or vessel, with the exception of the pilot boat.

In the case of a vessel with sickness on board, which the pilot has reason to believe is plague, the pilot shall notify the health officer from Sagar and shall not proceed beyond Diamond Harbor without permission of the health officer. If the pilot has no reason to believe that there is anyone suffering from plague on board, the pilot shall bring the vessel up the river to Garden Reach and anchor it off Matia Bruz until visited by the health officer.

Vessels with cases of smallpox, cholera, measles, or other epidemic diseases common in India, or of diphtheria or scarlatina on board, or those on which two or more deaths from suspicious causes have occurred during the voyage, must report the facts to the pilot immediately after boarding the vessel; the pilot will give instructions as to the signals to be hoisted.

A vessel that has called at any yellow fever infected port within 1 month of arrival in Calcutta, even though it may have entered another Indian port during that period, will not be granted free pratique. Health officials will board such a vessel at its berth.

Radio pratique may be obtained prior to arrival at Calcutta in accordance with local instructions.

The quarantine station is situated at Diamond Harbor.

**Signals.**—Storm signals are displayed at Sagar Island Light; the Extended System is used. Further information on these storm signals may be found in Pub. 160, Sailing Directions (Planning Guide) South Atlantic Ocean and Indian Ocean under "India—Signals."

**Anchorage.**—Sagar Roads provides anchorage, in 9.1 to 14.6m, in ordinary weather. During heavy gales, a considerable swell rolls into the roads.

**Caution.**—A dangerous wreck, with a least depth of 1.5m, lies in Bedford Channel about 0.6 mile off the W coast of Sagar Island, about 3.5 miles SW of the N extremity of the island.

The coastal features on the W side of the mouth of the Hugli River to the **Rasulpur River** (21°47'N., 87°54'E.) have been previously described.

## India—The Hugli River to Calcutta, including Haldia and Diamond Harbor

**7.6** Navigation on the Hugli River is reported to be difficult. The 39 mile stretch from Hugli Point (22°13'N., 88°04'E.) to Calcutta is the most treacherous. In 1984, it was reported that the channel buoys were not well maintained, many were

either unlit or missing. It was reported (1976) that night navigation above Hugli Point was prohibited.

The navigable channel in the river is subject to annual variations; these are caused by the scour of the freshets and the flood current, as the season is wet or dry, respectively. The channel through the estuary is subject to such changes as occur in all wide, sandy, tidal estuaries.

Vessels take advantage of the rise in tide and cross the shallowest bars at HW; this results in bunching of vessels. A vessel inbound can generally go up the river with the tide without any stops, but sometimes it might take about 24 hours with an anchorage stop along the way. An outbound vessel cannot cover the total distance of the river during the same high tide; the transit down the river is made in stages. According to the speed and type of vessel, sailing down the river takes about 36 to 48 hours, with stops at Ulubaria (abreast of Achipur Point), Diamond Harbor or Kulpi Roads, and Sagar Roads Anchorage.

Sharp bends in the river upstream of Diamond Harbor limit the length of a vessel to 189m at Buj-Buj and 172m at Calcutta.

During times of predicted tidal bores, the overall length of vessels will be regulated by the harbor master.

The navigable channels of the Hugli River, leading to Calcutta N of the parallel of latitude 21°01'N, are under the jurisdiction of the Port Commissioners of Calcutta.

Vessels proceeding against the current should slow down or stop if it appears that other vessels will be met with at difficult parts of the river, or on bars where the deep-water channels are narrow. The usual rule of the road is adhered to in the river and estuary. A prolonged blast of the whistle, quickly followed by three short blasts, is an optional signal that the vessel making the signal is obliged to stop and cannot get out of the way.

**Winds—Weather.**—The wind and weather conditions usually encountered in the upper reaches of the Bay of Bengal and the approaches to the Hugli River have been previously described in paragraph 7.1. Storm and weather signals, in accordance with the Indian General System, are displayed at the following points when the weather in the Bay of Bengal is disturbed:

1. Diamond Harbor, near the telegraph office.
2. Budge, near the telegraph office.
3. Kidderpore Docks, from the clock tower near the entrance.
4. From the flagstaff on the Port Commissioner's Office in Calcutta.

Further information on these storm signals may be found in Pub. 160, Sailing Directions (Planning Guide) South Atlantic Ocean and Indian Ocean under "India—Signals."

The following signals and instructions from the General System have been approved by the Deputy Conservator of the Port of Calcutta for the security of shipping and are described in greater detail so as to have local significance.

1. **Danger Signal V**—Indicates that a storm of slight or moderate severity will probably cross the coast to the E of Sagar Island and W of Chittagong. Vessels may proceed to sea if the height of the barometer, state of the sea, and weather are such as to lead masters and pilots to infer that there is no danger. The wind at the mouth of the Hugli will probably haul from NE through N to NW or W.
2. **Danger Signal VI**—Indicates that a storm of slight or moderate severity will probably cross the coast to the W of

Sagar Island and N of False Point. The wind at the mouth of the Hugli will probably veer from NE through E to SE or S. As these E winds will raise a heavy swell and produce a strong W set in the channel at the Sandheads, it is advisable that none but fast steamers in light trim should put to sea, and those only if the weather appearances and state of the sea are not too unfavorable.

3. **Danger Signal VII**—Indicates the approach toward Sagar Roads of a storm of slight or moderate intensity. It is advisable that no vessels, except fast vessels in light trim, should put to sea until the wind direction and force, the state of weather and sea, and the rise of the barometer indicate that the storm has either broken up or passed inland. It should be remembered that cyclonic storms of small extent in the Bay of Bengal sometimes blow with hurricane force, and raises a high sea near their centers.

4. **Great Danger Signal VIII**—Indicates that a storm of great intensity will cross the coast to the E of Sagar Island and W of Chittagong. It is advisable that sailing vessels, with or without steam, and deep-draft or slow vessels should not proceed to sea. The wind at the mouth of the Hugli will probably haul from the NE through N to NW or W.

5. **Great Danger Signal IX**—Indicates that a storm of great intensity will cross the coast to the W of Sagar Island and N of False Point. Vessels should not go to sea; masters and pilots of outbound vessels should be guided by the appearance of the weather and height of the barometer in deciding whether it is advisable to proceed below Diamond Harbor or Mud Point. The wind at the mouth of the Hugli River will probably veer from NE through E to SE or S.

6. **Great Danger Signal X**—Indicates the approach of a storm of great intensity toward the mouth of the Hugli River and Calcutta. Vessels should not go to sea from Sagar Island, or proceed down the river from Diamond Harbor; all vessels should be properly secured.

The masters of vessels in the port should take the special precautions for safety laid down in the port rules.

A cyclonic storm of severe intensity is frequently accompanied by a storm wave, which is not often the case with a small cyclonic storm. The height and destructive effect of a storm depend almost as much on the state and character of the tide when the cyclonic center reaches the coast, as upon the depression at the center, or the intensity and extent of the storm.

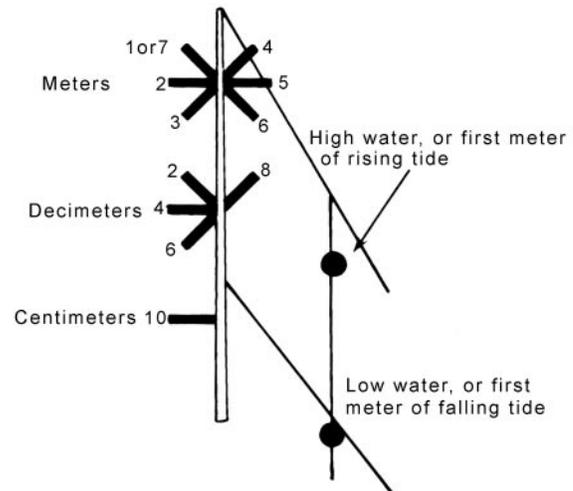
**Tides—Currents.**—Tides in the Hugli River are semi-diurnal.

Tidal semaphores have been established at the following places to indicate the rise of the tide in the Hugli River:

1. About 0.5 mile SSW of Sagar Island Light.
2. At Gangra, on the W bank about 7.5 miles NW of the N point of Sagar Island.
3. At Balari, on the W bank about 12 miles NE of the tidal semaphore at Gangra.
4. On Hugli Point, about 12 miles upriver from the semaphore at Balari.
5. At Moyapur, about 17 miles downriver from Kidderpore Docks.
6. At Akra, about 6.5 miles downriver from Kidderpore Docks.

7. At Rajabagan, about 3 miles downriver from Kidderpore Docks.

The semaphores have three arms, the upper arm indicates meters, the middle arm decimeters, and the lower arm centimeters, as depicted in the diagram below.



**Hugli River Tidal Semaphore Signals**

At the moment of HW, a ball is hoisted to its upper position; as the tide begins to fall, the ball is lowered to the lower position until the tide has fallen by 1m, when the ball is hauled down. At LW, the ball is hoisted to the lower position; as the tide begins to rise, the ball is hoisted to the upper until the tide has risen by 1m, when the ball is hauled down.

Night semaphores are situated at Sagar, Gangra, Balari, Hugli Point, and Moyapur.

Each semaphore can display two flashing lights, an upper light showing a 2-second flash every 8 seconds and a lower light showing one flash every second.

The rise of the tide is indicated, as follows:

Signal	Tidal Rise
Upper light green	1.0m and 4.0m
Both lights green	1.2m and 4.2m
Green over red	1.4m and 4.4m
Green over white	1.6m and 4.6m
Lower light green	1.8m and 4.8m
Upper light red	2.0m and 5.0m
Red over green	2.2m and 5.2m
Both lights red	2.4m and 5.4m
Red over white	2.6m and 5.6m
Lower light red	2.8m and 5.8m
Upper light white	3.0m and 6.0m
White over green	3.2m and 6.2m
White over red	3.4m and 6.4m

Signal	Tidal Rise
Both lights white	3.6m and 6.6m

One fixed red light is displayed if the semaphore is not working.

The strength of the tidal current varies in different parts of the Hugli River at different times of the year; its velocity is least during the Northeast Monsoon from November to February, when it is 3 to 3.5 knots at springs and 1.5 to 2 knots at neaps.

During the latter part of the dry season, the Southwest Monsoon blowing in the direction of the flood current increases its velocity so that it flows up the river at 4 to 6 knots during spring tides.

The descent of the freshets, from July to October, causes the ebb current to predominate and it reaches a maximum velocity of 7 knots during spring tides; at this time the flood current is imperceptible, except in the estuary.

There are three distinct periods in the year, lasting approximately 4 months each. During the cold season, the flood current has a slight preponderance over that of the ebb, because of its shorter period of flow. The flood current, during the second half of the dry season, is made considerably stronger than the ebb by the Southwest Monsoon. During the rainy season, the flood current is over-powered by the descent of freshets and the ebb current predominates accordingly.

The great body of the tidal current flows in the direction of the channels at velocities of 2 to 3 knots at springs and 1 knot to 1.5 knots at neaps.

At LW during spring tides, the flow of the flood current is checked by the shallow and restricted bed of the river and by the seaward flow of water from the upper reaches. These conditions can lead to the creation of a tidal bore.

Bores in the Hugli River occur only with a greater than average spring tide, and usually when the seaward flow is augmented by freshets.

There is a considerable diurnal inequality in the tides of the Hugli River, the higher HW of spring tides occurring at night between October and March, and during the day between May and September. A bore is more likely to occur preceding the higher HW than preceding the lower HW. There is a seasonal variation in the probability of the occurrence of a bore. Extreme tidal bores are most prevalent in March and September and reach heights of 2.4 to 6.1m.

During the Northeast Monsoon, from November to February, freshets do not occur and for this reason, bores are a rarity. When they do occur during this particular season, it is likely to be at night. They are dangerous because they are unexpected. It is advisable to anticipate their occurrence during this season whenever greater than average spring tides are predicted.

With the Southwest Monsoon, the occurrence of freshets during greater than average spring tides will always cause bores, those preceding the daylight HW being higher than those at night.

The first appearance of the bore is on **Diamond Sand** (22°10'N., 88°10'E.), on the W side of the river abreast Diamond Harbor, where the ascending wave runs on as a breaking roller. It is not of much consequence until it enters the contracted reaches above Hugli Point, when, besides swamping

boats, it affects vessels at anchor by causing them to run upstream, especially if there is a strong S breeze. The bore reaches a maximum at Chinsura, about 26 miles above Kidderpore Docks, and disappears about 14 miles farther up the river above Naya Serai.

Vessels at moorings surge and roll during the passage of the bore as there is a sudden lift of 1.2 to 1.8m; when bores are expected, springs must be put on the flood moorings close down to the buoys to relieve the jerk on the cable and bits. Vessels at anchor have been known to break their anchor chains during extreme tidal bores.

**Depths—Limitations.**—Bars, bends, and bores, known as the three Bs, constitute the main dangers to shipping in the Hugli River. Numerous bars, with continuous fluctuating depths over them, encumber the winding channel of the river.

The river is high from June to October and during this period, vessels drawing up to 8.5m can reach Calcutta at HWS. Vessels drawing up to 7.9m can reach the port at HWN. From October to June, the river is low and the maximum permissible draft is 7.3m. Maximum drafts may vary from year to year according to the season, but vessels drawing up to 8.8m have ascended the river to Calcutta; special arrangements have to be made and the date selected by the Port Pilotage Office.

Vessels proceeding to Calcutta should arrive at the pilot station with drafts as close to an even keel as possible.

In some parts of the river, the changes in depths and the directions of the channels are very rapid and no attempt will be made to describe them or the navigational aids which mark them.

Although the charts may currently be correct, they can not be relied on to give an accurate presentation of the depths and dangers which may be encountered because of these rapid changes.

**Signals.**—Signal stations are situated near the lighthouse on Sagar Island, on the E bank at Diamond Harbor, and at Hugli Point, about 6 miles above Diamond Harbor. Diamond Harbor Signal Station is connected by telegraph, and the other stations are connected by telephone with Calcutta.

## Haldia (22°01'N., 88°05'E.)

World Port Index No. 49555

**7.7** Haldia, a subsidiary port and anchorage, lies on the W bank of the Hugli River about 56 miles downriver from Calcutta. An important secondary port; the oil port serves an oil refinery at Barauni, 280 miles NW by pipeline.

Extensive works are in progress to dredge and deepen the approaches, channels, and berthing areas. The results of dredging in shipping lanes are constantly reviewed to affirm permissible drafts. Drafts are issued as the draft of the day and forecasted 6 weeks in advance.

Haldia Terminal Oil Jetty No. 1 and Haldia Terminal Oil Jetty No. 2 are situated 2.3 and 2 miles ENE of **Haldia Point** (22°01'N., 88°04'E.). Berth No. 1 has a berthing face of 91.5m and can accommodate tankers up to 90,000 dwt, with a maximum length of 238m. Berth No. 2 can accommodate tankers up to 150,000 dwt. Haldia Oil Jetty No. 3 can accommodate vessels up to 150,000 dwt. Currents may exceed 5 knots.

It has been reported (1996) that shoaling has begun to limit the size of vessels able to use Berth No. 1.

The Haldia dock system is approached through a lock entrance at Haldia Point, with a least depth of 8.5m. Vessels up to 230m in length can utilize this entrance, which leads to a large turning basin and an enclosed dock extending about 900m NNE. There is a depth of at least 8.5m throughout the turning basin and dock system.

The E side, from S to N, provides ore, coal, and phosphate berths, with modern cargo handling equipment. A 235m finger pier projects S from the N head of the dock. This berth, which can accommodate vessels on either side, is utilized for the discharge of salt, sulfur, and fertilizer.

At the N end of the W side of the dock is a general cargo berth, with two container berths S of it.

LASH vessels are at present (1978) worked at the anchorage 0.3 mile S of the oil jetty.

Anchorage can be taken in mid-channel, in a depth of 11m, abreast of the port area over a bottom of medium to hard mud and sand, good holding ground.

A vessel has anchored, in a depth of 12.8m, mud, with the anchorage lights in range 244° and Bagnapara Mark bearing 350° on the ebb and 339° on the flood. A good anchor watch is required because of the strong currents.

Two mooring buoys are available; vessels are required to secure to these buoys with unshackled anchor chains. Mooring takes place under the direction of the pilot and an experienced mooring crew is provided.

The maximum rate of the current in the river is about 5 knots, both on the flood and the ebb.

The pilot and the customs officer remain on board during the vessels stay at Haldia and accommodations must be furnished.

## Diamond Harbor Anchorage

**7.8 Diamond Harbor Anchorage** (22°1'N., 88°11'E.) lies on the E bank of the Hugli River about 38 miles above Sagar Roads, and provides anchorage for large vessels, in depths of 11 to 23.8m. Because of the strong river current, at least five shots of chain must be used and a good anchor watch maintained. Mooring buoys are available for vessels requiring them.

Explosives destined for Calcutta are usually unloaded into special barges at this anchorage.

A signal and telegraph station and a customhouse are situated in the town.

An examination anchorage area is enclosed by a line joining the following positions:

- 22°11'30"N., 88°11'00"E.
- 22°11'30"N., 88°08'30"E.
- 22°11'00"N., 88°08'30"E.
- 22°11'00"N., 88°11'00"E.

## Calcutta (Kolkatta) (22°33'N., 88°19'E.)

World Port Index No. 49560

**7.9** The port of Calcutta extends from Budge Budge, about 21 miles above Hugli Point, to Konnagar, about 21 miles farther upriver, the limits being marked by boundary pillars.

The port is about 83 miles above the entrance of the Hugli River, and about 128 miles from Eastern Channel Light Vessel, near The Sandheads.

The Howrah Bridge, about 15 miles above the downriver boundary of the port, crosses the river above Howrah Railway Terminus and is a steel cantilever structure, with tower on either side of the river which rises to a height of 91m. Several ferries ply across the river. The bridge marks the upper limit of navigation for ocean-going vessels.

Modern well-equipped berthing facilities are provided for all classes of vessels alongside and at the mooring buoys in the river.

Calcutta, the second largest commercial port in India, is also the site of the largest city.

### Port Authority of Calcutta

<http://www.portofcalcutta.com>

**Tides—Currents.**—Tides in the Hugli River at Calcutta are semidiurnal.

When regular, the flood runs 5 hours and the ebb runs 7 hours. During the Northeast Monsoon, the velocity of the current is 3 to 3.5 knots at springs and 1.5 to 2 knots at neaps. Between March and July, the velocity of the flood is increased and reaches a maximum velocity of 4 to 7 knots at springs. During the freshets, July to October, the flood is weak and of short duration and at neaps may be nearly imperceptible; the ebb during freshets has a maximum velocity of 7 knots at springs. Anchors are then quickly buried by the silt, so that sometimes it is necessary to slip the cable and leave the anchor to be picked up by the Port Commissioners. The tidal currents set fair up and down Calcutta Reach.

**Depths—Limitations.**—Mooring berths in the river have sufficient depths to accommodate any vessel that can enter the river. Depths at the moorings range from 5.5 to 15.2m, but vary according to their location in the river.

Kidderpore Docks comprise No. 1 Dock, No. 2 Docks, and a turning basin. The lock entrance from the river is 176.8m long and 24.4m wide. Vessels up to a maximum length of 157m and a beam of 21.3m can enter Kidderpore Docks. No. 1 Dock has 11 berths; No. 2 Dock has eight berths for general cargo and six coal berths. A depth of 9.1m exists alongside the berths in both docks.

Nataji Subhas Docks (King George Dock) lock entrance is 213.4m long and 27.4m wide. Vessels up to 172m may enter the dock. Seven berths, with a depth of 10m alongside, are available for ocean-going vessels. The other berthing facilities within the dock are for the sole use of lighters. In 1985, there were two container berths and cranes in Nataji Subhas Docks.

Garden Reach Jetties consist of five jetties for ocean-going vessels. Vessels, with lengths from 137 to 172m can be accommodated alongside.

Vessels berthed at Garden Reach Jetties are limited to a draft of 5.5m during bore periods.

Calcutta Jetties, which lie below Howrah Bridge, consist of nine jetties, but only five are available to ocean-going vessels.

The petroleum facilities at Buj-Buj (Budge Budge) consist of eight pontoon jetties. Vessels, with a maximum draft of 9.1m, can be accommodated alongside these berths.

Vessels mooring in the river are required to moor head stern, with two lower and stern cables shackled to the permanent moorings which are laid parallel with the banks.

**Regulations.**—Port Regulations are supplied to vessels on arrival by the harbor master.

Rules regulating the handling of explosives are issued by the port authorities. Masters of vessels with explosives on board are required to give an advance notice of arrival of 72 hours.

## India—The Sundarbans to the Chittagong Coast

**7.10** The Sundarbans, broken by many outlets of the Ganges, extends E from the entrance of the Hugli River for about 165 miles to the entrance of the Tetulia River, the W mouth of the Meghna River.

The Sundarbans, an extensive, heavily-wooded swampy area in the S part of the Ganges Delta, is intersected by many creeks and rivers. The more important rivers are the Matla River, the Raimangal River, the Malancha River, the Pussu Riverr, the Haringhata River, and the Rabnabad River. An intricate series of branches connect these rivers whose courses are continually shifting their positions. Boats can be piloted through the Calcutta Canals towards Kulna, about 65 miles to the E. Kulna is the most important center situated in the Sundarbans. The Meghna River, the E branch of the Ganges, discharges the main volume of the Ganges waters.

**Depths—Limitations.—Swatch of No Ground** (21°05'N., 89°17'E.) is a remarkable tongue-shaped depression lying S of the entrance of the Pussur River. The NE side of the depression is centered in about position 21°24'N, 89°36'E. Depths around the peri-meter of this depression decrease rapidly from 36.6m to over 183m within a distance of 1 to 2 miles along the N and NW sides, and to much greater depths in its central and S parts.

Swatch of No Ground ranges in width from 6 to 12 miles within the 183m curve and is about 50 miles long.

The 11m curve, like the 18 and 35m curves to the S, extends in a general E and W direction from a position about 25 miles S of the entrance of the Matla River to a position about 60 miles S of the mouth of the Hatia River. The 11m curve lies nearest to the coast about 11 miles S of the entrance of the Pusur River.

Those depths and dangers which lie within the 11m curve are described together with the principal description of the coastal features which they front.

East of Sagar Island is a series of low alluvial jungle-covered islands intersected by numerous creeks and rivers.

**Saptamukhi Sand** (21°20'N., 88°27'E.) and **Bulcherry Sand**, both with depths of 5.5m and less, extend about 28 and 20 miles S, respectively, from the shore. Reliable information about this part of the coast is scanty and the chart should be

used with great caution. Changes on the SW part of the Sundarbans have been particularly rapid in recent years.

**Lacams Channel** (21°13'N., 88°24'E.), which lies close W of Saptamukhi Sand leads N into the Baratala River on the E side of Sagar Island. Saptamukhi Channel, which lies close E of Saptamukhi Sand and is the common entrance of the Jamira River on the E and the Saptamukhi River on the W. Ocean-going vessels cannot use the channels.

A dangerous wreck is situated in the outer approach to Lacam's Channel about 18 miles E of Eastern Channel Light.

**Signals.**—Special storm signals, used on the rivers of the Sundarbans, are displayed at Namkhana, Barisal, Goalunda, Noakhali, Narayanganj, Chandpar, Mongla, and at some river police stations in Bengal, Assam, and Bangladesh; for further information, see the accompanying table.

## India—The Matla River

**7.11** The **Matla River** (21°37'N., 88°41'E.), about 34 miles E of Sagar Island Light, lies with its mouth between Dalhousie Island and Bulcherry Island. The river is entered through Eastern Channel and Western Channel, which are divided by a partly drying shoal known as Raimatla Sand (West Spit), about 10 miles S of Dalhousie Island. Shoals at the entrance are subject to change and, since pilotage is not available, caution is necessary in navigating these two channels and the Matla River.

Eastern Channel has least charted depths of 7.9 to 12.8m; Western Channel has least charted depths of 6.1 to 11m. Western Channel is preferred to Eastern Channel, but navigation is dangerous because the depths in the approach to the SW side of Dalhousie Island are fairly regular and the lead gives no warning of the proximity of the steep-to bordering sands. This condition also exists within the river.

**Tides—Currents.**—The tidal currents below Dalhousie Sand appear to rotate; the flood current sets WNW at its commencement and works through N around ENE. The ebb current sets ESE through S to WSW. Velocities of the flood and ebb currents are 2 to 3 knots at springs and 1 to 1.5 knots at neaps.

In the channel, the flood current runs toward the E shore until abreast of Dalhousie River at the N end of Dalhousie Island, then it crosses S of Grappler Sand and runs toward Peel Point, forming eddies. It then runs N for about 8 miles to **Roger Point** (21°55'N., 88°40'E.) where it bifurcates, the greater portion going up Bidra River and the balance running around Roger Point into Katalli Bight, leaving slack water in the vicinity of Bidra River Point. The velocity of the flood current varies in different parts of the river, but 5 knots is the maximum velocity recorded.

Special Storm Signals—Rivers of the Sundarbans

Signal	Day	Night	Meaning
Cautionary Signal I	Black diamond	White light over red light	Squally weather threatens your area
Warning Signal II	Black ball	Red light	A storm may affect you shortly
Danger Signal III	Cone, point up	Two red lights displayed vertically	A storm will soon strike you

Special Storm Signals—Rivers of the Sundarbans			
Signal	Day	Night	Meaning
Great Danger Signal IV	Cylinder, displayed vertically	Three red lights displayed vertically	A violent storm will soon strike you

The ebb current sets fairly down the river; off Roger Point it forms numerous eddies. At the last of the ebb, the current sets from abreast the N end of Dalhousie Island across the river toward Halliday Island. The maximum recorded velocity of the ebb current is 2.5 knots.

**Aspect.**—Clumps of trees lie on Dalhousie Point on the W side of the island of the same name. This point and Halliday Island to the NW, may be seen from a distance of 10 miles when the height of eye is about 7.3m. When close-to Dalhousie Point, conspicuous when the sun is shining, appears as a high, white sandy beach.

Below Kattali, which lies 12 miles N of the N end of Dalhousie Island, the land is so low that at HWS the water runs some distance inland. From the sea to Eedoo Reach, about 23 miles above Kattali, the land is covered by dense jungle. Between this reach and Port Canning, about 8 miles distant, the banks are marked by villages.

**7.12 Port Canning** (22°19'N., 88°39'E.), about 60 miles above the entrance of the Matla River, is connected with Calcutta by railroad.

Anchorage can be taken off the port, in depths of 7.3 to 14.6m, but local knowledge is essential.

The coast between the Matla River and the Pusur River, about 50 miles to the E, is marked by the entrances of the Bangaduni River, the Gosaba River, the Raimaugal River, and the Malancha River. All of these rivers are fronted by shoals which extend from 3 to 17 miles offshore.

**Dalhousie Sand** (21°24'N., 88°51'E.) extends about 17 miles SSE from Dalhousie Point.

**Bhangaduni Island** (21°33'N., 88°52'E.), which lies between the mouths of the Bhangaduni River and the Gosaba River, is fronted by Bhangaduni Sand, which extends about 17 miles SE from it. Both of these rivers have shallow entrances and are of no commercial value. The Raimangal River and the Malancha River farther to the E are both shallow.

The Haribhanga River opens 12 miles ENE of the Gosaba River; the Raimangal River is about about 4 miles E; both enter the sea through a common estuary which extends miles S. It has a least depth of 6.4m in its approach, but local knowledge is essential for entering.

**New Moore Island** (South Talpatty Island) (Purbasha Island) (21°37'N., 89°09'E.) is located on the W side of the main entrance channel to the Haribhanga River; the boundary between India and Bangladesh lies in the vicinity.

### Bangladesh—The Pusur River to Khulna, including the Mongla Anchorage

**7.13 The Pusur River** (21°46'N., 89°30'E.) is entered between Jefford Point and West Point, about 8 miles to the W. Zulfiqar Channel extends N from the bar which lies between these two points and joins the deep channel leading through the

estuary to Akram Point about 15 miles to the N. This point lies at the junction of the Sipsah River and the Pusur River. Boar Point lies on the E side of Zulfiqar Channel about 5 miles N of Jefford Point. Hiran Point lies on the W side of the channel about 6.5 miles NE of West Point.

The Pusur River, between Akram Point and the anchorage off Mongla, is fairly broad and navigable 24 hours.

Vessels with a speed of less than 8.5 knots shall not be permitted to transit the river during springs. Under special circumstances, provided permission is granted, a tug will have to be hired from the port to assist a vessel within the port limits. Requests for a tug must be made at least 24 hours in advance. For reasons of safety, Mongla Anchorage is normally departed only on the flood. Deep-draft vessels depart on the first of the flood.

This coast must be approached with caution at all times and soundings taken continuously. Swatch of No Ground is a good aid for vessels coming from the W. The change in the water from blue or blue-green to a yellow color normally indicates the approach to shallow water. During the ebb at springs, yellow water is found as far seaward as Swatch of No Ground.

In 1985, lesser than charted depth was reported 17.5 miles SSW of Jefford Point.

A dangerous wreck lies about 18 miles SSW of Jefford Point, marked on its SW side by a lighted buoy.

**Winds—Weather.**—Haze generally prevails in the approaches to the low coast, except at the change of the seasons. Fog, off the coast and in the river, occasionally occurs during the change of seasons, but it usually lifts during the forenoon. In general, thick weather can be expected during the Southwest Monsoon from May to September.

At the anchorage off Mongla, vessels are required to have steam ready for meeting any emergency during northwester, March through May, and during the Southwest Monsoon. Northwester are usually directional as their name implies; they are storms accompanied by heavy rain and high winds, with velocities up to 30 to 40 knots. Northwester give about 2 or 3 hours notice, and vessels are usually advised in the day's weather forecast.

**Tides—Currents.**—Tides in the Pusur River are semi-diurnal. High water over the bar occurs about 1 hour before predicted HW for the river entrance.

Tide gauges lie on the river banks at Hiran Point, abreast Sundar Kota, about 9 miles above Akram Point, about 5 miles below Mongla, and about 1.5 miles below Chalna Bazar.

Tidal heights vary with the season, being lower in February and March and higher in July through November.

At **Mongla Fairway Lighted Buoy** (21°27'N., 89°34'E.), 17.5 miles S of Jefford Point, the ebb sets about SSE and the flood sets NNW. The velocity of the current is about 2 knots at springs during the Northeast Monsoon. At the time of the Southwest Monsoon, the ebb is stronger and the flood is weaker.

In Zulfiqar Channel, the ebb flows at a velocity of about 3 knots at springs. The currents turn about 1 hour after high and low water in the entrance of the Pusur River. Extensive rips and eddies mark the edges of Sarwar Sand and Dubla Shoal.

At the anchorage off Mongla the ebb has a velocity of about 4 knots at springs. The currents turn about 4.5 hours after HW and LW in the entrance.

A report states the currents turn in Zulfiqar Channel about 2 hours and at the anchorage off Mongla about 3 hours, respectively, after HW and LW in the entrance. The velocity of the ebb was reported to be 6 knots at springs at the anchorage off Mongla.

**Depths—Limitations.**—A bar, about 5 miles wide with a least depth of 5.5m, lies in the approach to the Pusur River between 5 and 10 miles S of the entrance. Lighted Buoy B1 to Lighted Buoy B10 mark both sides of the channel across the bar. A dangerous wreck, marked by a buoy moored close S, lies on the E side close S of the channel entrance.

Following pilot instructions, vessels drawing up to 7m may cross the bar in all seasons. During Southwest Monsoon, 7.8m draft may be permitted. The maximum permissible fresh water draft for Chalna Port is published each day in advance by the Chalna Port Authorities. Draft permitting, the bar can be crossed anytime both by day and night.

When crossing the bar during the Southwest Monsoon, vessels should have not less than 1.2m of water under the keel and not exceed a speed of 12 knots. During the Northeast Monsoon, a minimum clearance of 1m under the keel is considered a safe margin for crossing the bar.

The best time to cross the bar inbound is about 1 hour before HW in the entrance. Outbound vessels should cross the bar during the last 45 minutes of the flood. During the first stage of the ebb, the river level drops very rapidly.

The depths over the crossings inside the river range from 5.8 to 7m. Vessels with a fresh water draft of 7.3m and vessels with drafts of 7.5 to 7.6m can enter the river during spring tides in September through December, and proceed as far as the anchorage off Mongla, about 48 miles above Jefford Point. Vessels with a maximum draft of 4.9m can proceed to Khulna, about 25 miles above Mongla Anchorage.

A dangerous wreck with exposed masts lies about 11 miles SSW from Jefford Point; close W of Buoy B5. Another dangerous wreck lies approximately 6 miles NW of Fairway Buoy.

Numerous fishing boats and nets have been reported in the vicinity of the river entrance.

**Sarwah Sand** (21°42'N., 89°28'E.), awash at HW, lies on the W side of Zulfiqar Channel with its N edge 4.5 miles S of Hiran Point. An unnamed sand, which dries in patches, lies about midway between Sarwah Sand and Hiran Point.

**Dubla Shoal** (21°46'N., 89°31'E.), with depths of less than 1.8m and patches which dry up to 0.9m, lies on the E side of the channel between Jefford and Boar Points.

**Pavanga Shoal** (21°51'N., 89°30'E.), with depths of less than 5.5m and a central drying area, lies on the W side of the main fairway with its S end about 1.5 miles SW of Boar Point. The S end of this shoal has been reported extending to the S. Less water has been reported in the channel W of the N part of Pavanga Shoal.

**Aspect.**—The terrain in the vicinity of the river is low and has no distinctive landmarks which can be seen from the

offing. Land is not normally sighted until the outer bar is crossed. **Jefford Point Light** (21°44'N., 89°32'E.) is shown from a gray, metal framed tower. Reports indicate that the entrance is a poor radar target.

The radiobeacon antenna, about 1.5 miles NNW of Hiran Point is reported to be a good landmark when approaching the entrance. Some white houses stand near this radiobeacon.

Hiran Point Light is shown from a grey, metal framed tower.

The entrance of the river, between the approach to the bar and the central part of Zulfiqar Channel, is normally buoyed and marked in places by light floats. Lighted Buoy Z2, Lighted Buoy Z3, and Lighted Buoy Z4 mark the fairway through Zulfiqar Channel. After the annual winter survey of the bar, the floating aids are moved to conform with the changes in the channel; replacement of aids is not always made.

During severe weather, the buoys are liable to be blown off station; their charted positions cannot always be relied on.

A lighted fairway buoy, equipped with a radar reflector, is moored about 20 miles SSW of Jefford Point. Within the river above the bar, the main fairway, as far N as Chalna Bazar, is well-marked by navigational aids. Some of these are equipped with radar reflectors.

**Anchorage.**—During the Northeast Monsoon, anchorage can be taken outside the bar, in depths of 7.3 to 9.1m, good holding ground, about 14.5 miles S of Jefford Point. Deeper water exists about 0.8 mile N of this position.

Unsheltered anchorage, with good holding ground, can be taken, in a depth of 8.2m, about 1.5 miles NE of Sarwar Sand Lighted Beacon.

A vessel should not anchor N of 21°47'N to avoid Pavanga Shoal.

**Pilotage.**—Pilotage is compulsory for vessels of 200 grt and over. Pilots board and depart vessels off the Fairway Light Float in good weather, or off Hiran Point in unfavorable weather. In adverse weather, if boarding is impossible off Hiran Point, the pilot vessel will lead inbound vessels up to Akram Point, where pilots will board in sheltered water. Pilot vessels are subject to be withdrawn without prior notice.

Vessels requiring a pilot should give 24 hours notice to the Mongla Port Authorities at Khulna and the pilot stations by radio stating their ETA at the Fairway Light Float, fresh water draft, speed available, vessel length, gross registered tonnage, flag of vessel, local agents, and quantity of fresh water required. On approaching the river, the vessel will receive instructions from the pilot station regarding the course to be followed and the depth of water on the bar. Vessels can cross the bar in daylight only, and should anchor 2 miles SE of Hiran Point and S of Lighted Buoy Z3 to await the pilot. The pilot vessel is radio equipped.

Vessels drawing over 5.2m draft are usually piloted over the outer bar on a flood, in which case the pilot vessel may rendezvous around 7 miles N of Fairway Buoy.

**Regulations.**—The Port Director at Khulna is to be notified 24 hours in advance of vessel's arrival as to the state of health on board and vessel's last port of call. Radio pratique may be granted. A report states that health officials board vessels about 7 miles below Mongla Anchorage (Chalna Anchorage). The port health officer is stationed at Khulna.

**Caution.**—In 1976, strict security measures were in force in the port area. A ban on bathing and swimming in the anchorage was strictly enforced.

Mongla Port Rules are used primarily by the pilots and port service organizations.

If repairs are to be made to a vessel at the anchorage and the work requires the immobilization of the vessel, permission should be obtained from the port authorities.

In 1994, many buoys in Zulfiqar Channel were reported missing or unlit. The 5m curve of Pavanga Shoal was reported to be extending S to Buoy B18; a shoal patch, with a least depth of 5.3m, was reported between Buoy B18 and Buoy B15.

**7.14 Mongla Anchorage** (Chalna Bazar) (22°28'N., 89°35'E.) (World Port Index No. 49580), the lighterage port for Chalna, consists of a river anchorage in the Pusur River, about 66 miles above Fairway Light Float and 9 miles downstream from Mongla Bazar. Vessels up to 6.9m draft may use the anchorage, and of slightly greater draft in the flood season. A wharf, 920m long and 61.3m wide, close N of Mongla Nala, has been completed. In 1981, alongside depths to 7.9m was being dredged along the wharf.

The anchorage area stretches along the river for about 3 miles and has depths which range from 6.4 to 13.7m. Several swing moorings are available. One of the vessel's chains is made fast to a buoy with the assistance of a mooring tug. Vessels can also anchor in midstream at nine additional anchorage berths. The holding ground is good. All cargo is discharged into lighters and transferred to Mongla.

To prevent dragging anchors when a strong ebb is running, especially during the Southwest Monsoon spring tides, it is advisable not to moor more than two large or four average-size lighters alongside a vessel.

Hazardous cargo can be discharged about 5 to 6 miles below the anchorage.

Tugs are available for handling the lighters.

Storm signals are displayed for the Bay of Bengal from the signal tower on the E side of the river at Mongla.

Old Chalna Anchorage, about 9 miles above Mongla Anchorage, extends about 1 mile below Mongla Bazar and has a least depth of 3.8m. In 1974, the maximum draft allowed at Mongla was 7.3m. This site was found to be unsuitable because moored vessels were frequently set adrift by the strong freshets and eddies. Ocean-going vessels no longer use this anchorage.

Five new berths, with a total length of 920m and an alongside dredged depth reported (1997) to be 6.1m, stand on the E bank of the Pusur River, about 2 miles N of the anchorage off Mongla.

**Directions.**—From a position close E of Fairway Lighted Buoy, steer N for about 3 miles to the buoyed channel entrance. This buoyed channel should be followed, according to radioed instructions, to the anchorage area about 1.3 miles SE Hiran Point Light.

No vessel should attempt to cross the outer bar without a pilot on board. If the pilot is unable to board at the fairway buoy, the vessel should wait until detailed instructions are received by radio. At this time navigational aids, depths, and pilotage information should be verified. Mongla pilots empha-

size that all instructions received over VHF are repeated by the Master to ensure understanding.

When entering or leaving, Dubia Shoal Lighted Buoy should be passed to the W and the lighted buoys off Sarwar Sand and Pavanga Shoal should be passed to the E.

Vessels are required to display their call sign by International Code Signal Flags when entering port and while at the anchorage off Hiran Point awaiting a pilot.

**7.15 The Haringhata River** (21°50'N., 89°57'E.), one of the principal outlets of the Ganges, is entered through an estuary about 7 miles wide at the entrance. Tiger Point lies on the W side of the entrance, about 17.5 miles NE of Pusur Point.

The river is navigable by ocean vessels as far inland as Morreigani, about 37 miles from the entrance, and throughout its entire course by the largest native boats. Navigation of this river is said to be easier than that of any other river at the head of the Bay of Bengal, as the river is free from tidal bores and mid-channel dangers.

The river should not be entered without local knowledge or a pilot aboard.

Tidal currents within the river are reported to exceed a velocity of 4 knots at springs.

**Caution.**—A bar, with a LW depth of about 4.6m, fronts the mouth of the Haringhata.

**7.16 Argo Flat** (21°44'N., 89°57'E.), an extensive area of shoal ground with depths of less than 5.5m, lies between Pusur Point and Landfall Point, about 30 miles ENE. The flat extends up to 19 miles offshore and dries in patches up to 8 miles S of Tiger Point. Heavy breakers have been observed over these patches.

Morrelgani, a local rice exporting center, lies on the river bank about 37 miles above the entrance. Local river steamers frequent the port.

Good holding ground and shelter is provided at the anchorage in the river abreast of the town.

**Rabnabad Channel Entrance** (21°50'N., 90°16'E.) lies about 8 miles ENE of Landfall Point. The narrow channel within the entrance has a least charted depth of 4.3m in its N part, which lies between the westernmost Rabnabad Island and the mainland to the W. Above this island, the channel connects with the Ganges River through the Kaja River and the Tetulia River. Little is known of these latter two rivers.

An area between the S point of the E Rabnabad Island and a position about 18 miles to the E, has not been surveyed. A similar unsurveyed area lies N of a line extending about 50 miles ENE from the S point of the E Rabnabad Island to a position about 6 miles E of the SE point of **South Hatia Island** (22°15'N., 91°05'E.).

**Meghna Flats** (21°30'N., 90°24'E.), an area of shoal ground with depths of 5.5m and less, lie between the entrance of the Haringhata River and the entrance of the Shahbazpur River, about 60 miles to the NE. These flats and shoals extend up to 45 miles S of the mouths of the Meghna River.

**D'Apres Shoal** (22°00'N., 91°09'E.), a drying sand bank with a 2.4m depth, lies on the E side of the entrance of the Shahbazpur River, about 14 miles S of the SE point of South Hatia Island.

**7.17 Sandwip Island** (22°28'N., 91°29'E.), the furthest E, is one of the largest of the numerous islands which lie between the entrances of the Meghna River.

Several shoal spurs, with depths of 5.5m and less, extend up to 22 miles S from South Hatia Island and extend irregularly NE to a position about 15 miles S of Sandwip Island. In 1979, less water than charted was reported 35 miles S of South Hatia Island. Two detached shoals, with depths of 2.4 and 5.5m, lie in the entrance of the narrow channel on the W side of Sandwip Island, about 6.5 and 7.5 miles S of the SW point of that island.

**Tides—Currents.**—The velocity of the tidal current in the vicinity of D'Apres Shoal is about 4 knots.

During the first 30 minutes of the flood, there is always a swell in depths of 9.1m and less.

About 40 miles SW of D'Apres Shoal the tidal current continues to run N and NE for 1 hour after HW and SSW and SW for 1.5 hours after LW. During spring tides the tidal currents set N and S and at neaps they gradually turn in a clockwise direction. Tidal currents setting more to the W than the E are experienced during good weather. The estimated velocity of the ebb current at springs is from 4 to 6 knots and at neaps about 2.5 knots.

**Depths—Limitations.**—The Meghna River discharges the main volume of the waters of the Ganges River and the Brahmaputra River through its four principal mouths (the Tetulia River, the Shahbazpur River, the Hatia River, and Sandwip Channel). The Brahmaputra River joins the Ganges River at Goalunda; the combined waters enter the Meghna River at Chandpur. In 1979, the banks S of the entrances to these two rivers were extending S and less water was reported.

The Hatia River, the only navigable passage of the Meghna River, passes between Sandwip Island on the E and the Hatia Islands group to the W. Sandwip Channel, between Sandwip Island and the mainland coast to the E, is closed by sandbanks N of the N end of Sandwip Island.

Vessels, with a draft of 3m, can proceed upriver as far as Narayanganj.

In 1964, Hatia Channel, the navigable entrance of the Meghna River, had its entrance about 9 miles SE of the S extremity of Sandwip Island. The buoyed channel leading from the entrance extends NW and W to a position midway between South Hatia Island and North Hatia Island.

Depths in Hatia Channel and over the adjoining shoals are subject to rapid changes, and the buoys may be moved to conform to these changes. Extreme caution is advised.

Directions cannot be given because of the rapid changes in the depths and no one without local knowledge or a pilot aboard should attempt to enter. Pilots are available at Chittagong.

**Anchorage.**—Anchorage can be taken off the W side of Sandwip Island, abreast of the village of Sandwip or in Sandwip Channel E of that island. A shallow flat extends about 6 miles S of the island. Authority Lighted Buoy is moored about 9.5 miles SE of Sandwip and 2.5 miles SSW of a dangerous wreck. The lighted buoys marking the S approaches to Hatia Channel are moved as the channel changes.

**Caution.**—Sandwip and the Hatia Islands are particularly subject to flooding by storm waves.

A stranded wreck lies approximately 7 miles off the mainland coast at the S end of Sandwip Channel.

A dangerous wreck, marked by a lighted buoy, is situated 10 miles SE of the S end of Sandwip Island.

It has been reported that the Meghna River can be dangerous for navigation between February and November. A tidal bore affects the lower parts of the river, especially around the equinoxes. Shifting banks and snags also present a hazard. Vessels should always use local knowledge.

**Chandpur** (23°09'N., 90°33'E.), a small river port frequented by local steamers, lies at the junction of the Meghna River and Chandpur Khal. The port has little commercial value.

**Narayanganj** (23°37'N., 90°32'E.), a small river port and transshipment point, lies about 8 miles SE of Dacca on the left bank of the Lakhya River near its junction with the Meghna River. Local steamers frequent the port.

## Bangladesh—The Chittagong Coast to Elephant Point

**7.18** The coast of the Chittagong District extends S from the Feni River for about 150 miles to the Naf River, the boundary between Bangladesh and Burma, which lies about 5 miles NE of St. Martins Island. The Feni River empties into Sandwip Channel about 8 miles N of the N extremity of Sandwip Island. Between the entrance of the Karnaphuli River and Cox's Bazar, the coast is broken by Kutubdia Island and Maiskhal Island. South of Cox's Bazar to Elephant Point, low hills rise close inland and cliffs mark the coastline. Chains of mountain ranges rise parallel with the Chittagong Coast at varying distances inland.

**Winds—Weather.**—During the Northeast Monsoon, from October to March, small fog banks or thick mists occur on the Chittagong Coast on an average of 2.5 days a month. These weather conditions cause the lights in some instances to assume a deep red color and in other instances to completely obscure them.

**Tides—Currents.**—The tidal currents in this part of the Bay of Bengal set N and S with the trend of the coast; the velocity at spring tides ranges from 4 to 6 knots. In hazy weather, vessels have been swept past the entrance of the Karnaphuli River by the flood or N current and set upon the sands S and SW of Sandwip Island, without sighting Kutubdia Island Light by night or the land by day.

**Depths—Limitations.**—Off the Chittagong coast the depths decrease gradually from the 36.6m curve, about 22 miles W of **Elephant Point** (21°11'N., 92°03'E.), to the 11m curve about 15 miles SSW of the entrance of the Karnaphuli River. With but few exceptions, all of the known dangers which lie off this section of coast are contained within the 11m curve.

**7.19 Dolphin Shoal** (21°51'N., 91°46'E.), with a least depth of 6.4m, lies between 3.3 and 5 miles WSW of **Kutubdia Light** (21°52'N., 91°51'E.). A shoal, with a least depth of 8.2m, lies about 7 miles WSW of the lighthouse.

**North Patches** (21°43'N., 91°44'E.), a group of hard, sand shoals with depths of 4.1 to 5.5m, extend about 8 miles S from a position about 7.5 miles SW of Kutubdia Light. Less water than charted may exist over these shoals.

A narrow shoal bank, about 4.5 miles long with a least depth of 9.4m, lies centered about 23.8 miles SSW of Kutubdia Light.

**South Patches** (21°26'N., 91°40'E.), a narrow shoal bank with a least depth of 9.1m, lies centered about 28 miles SSW of Kutubdia Light.

**Reju Shoal** (21°17'N., 91°59'E.), small in extent with a least depth of 4.9m, lies about 7 miles NNW of Elephant Point.

In 1977, the shoal was reported to be 0.5 mile NW of its charted position.

A detached 14.6m patch lies about 25.8 miles NW, and a similar detached patch lies 27.5 miles WNW of Elephant Point.

**Kohinur Shoal** (21°07'N., 91°38'E.), with a least depth of 21.9m, was reported to exist about 23.5 miles W of Elephant Point.

**Caution.**—The greatest care is necessary in making the entrance of the Karnaphuli River. Whatever the state of the weather or the time of the year, but especially during the Southwest Monsoon from April to September, mariners should exercise extreme caution, being cognizant of the depths and dangers.

Even with favorable weather and when a vessel's position is known, strict attention to the depth as well as to the course and distance made good over the ground is necessary.

If the position is doubtful and there is a strong flood or N current, it is well to anchor to avoid being set on the shoals lying off Sandwip Island and the entrance of the Meghna River. These shoals may lie farther S than indicated on the chart.

When approaching from the SW and uncertain of a vessel's position, a landfall can be made in the vicinity of the conspicuous white cliffs about 4 miles SSE of Cox's Bazar.

Vessels should pass outside of South Patches, North Patches, and Dolphin Shoal. Soundings should be taken frequently and allowances made for tidal currents.

**Sitakund Mountain** (22°38'N., 91°41'E.) rises to an elevation of 352m, about 20 miles NNW of Chittagong. A ridge of hills extends SSE from this mountain and roughly parallels the coast for about 18 miles. Nagarkha, 88m high, lies about 17 miles SSE of Sitakund Mountain. Fakir Hill, 73m high, lies about 1 mile farther S at the S end of the ridge close N of Chittagong. A black pillar, 6.1m high, lies atop this hill.

From a position along the coast E of the N part of Sandwip Island, a white sandy beach borders the shore for about 27 miles SSE to the mouth of the Karnaphuli River.

## Bangladesh—Approach to the Karnaphuli River

**7.20** The entrance of the Karnaphuli River lies between **Patenga Point** (22°13'N., 91°48'E.) and Normans Point, about 2 miles SSE.

**Tides—Currents.**—About 0.5 mile W of the outer bar at the entrance of the Karnaphuli River, the flood current sets NNW and the ebb current sets SSE. The tidal current turns about 1.5 hours after HW and LW near Juldia, and 1.3 hours after HW and LW at Chittagong. The ebb current is very strong during the rainy season from April to September. Under ordinary conditions, the velocity of the tidal current is about 2 knots at neaps and 3 to 4 knots at springs.

The mean range of the tide at Chittagong is 2.9m; the spring range is 3.6m.

**Depths—Limitations.**—On the W side of the approach to the entrance of the Karnaphuli River from the SSW, depths of less than 9.1m lie SE of Meghna Flats and S of Sandwip Island.

Dangers on the E side of the approach consists of South Patches, North Patches, Dolphin Shoal, and the 8.2m shoal, all of which have been previously described in paragraph 7.19.

In 1984, the stranded wreck of a coastal sailing vessel, with masts visible, was reported to be lying 5 miles offshore, 7.5 miles SSW of Patenga Point.

**Aspect.—Patenga Point** (22°13'N., 91°48'E.), on the N side of the entrance of the Karnaphuli River, is low, flat, and marked by a few trees. A drying sandy mud flat extends about 0.5 mile SW from the point. Lights in line, bearing 037°, lie approximately 0.5 mile NE of Patenga Point, but are reportedly difficult to distinguish. A dangerous wreck lies close NW of the leading line 2.5 miles SW of Patenga Point.

**Normans Point** (22°12'N., 91°49'E.), a low extremity of the coast, lies on the S side of the entrance of the Karnaphuli. Extensive mud flats lie between this point and the entrance of the river. The outer part of these flats dries. Middle Island lies in the center of these flats, about 0.8 mile NNE of Normans Point. The greater part of the island is awash at HWS, during the Southwest Monsoon.

Normans Point Light shows from a red and white framework tower, 1.3 miles S of Normans Point; a racon is located at the light. A disused light lies 0.2 mile WSW of the light.

Four Tree Hill, 38m high and topped by trees, lies 2.5 miles ENE of Normans Point. From a distance, the hill appears to form the S end of a tableland of which Juldia Hill, about 1.5 miles NNW of Four Tree Hill, is a part. A flagstaff and some radio towers lie on Juldia Hill.

**Coombs Pillar** (22°15'N., 91°51'E.), a white mark 9.1m high, stands on the highest part of the ridge, about 0.8 mile N of Juldia Hill.

A conspicuous flare stands 2.3 miles N of Patenga Point.

**Pilotage.**—Pilotage is compulsory for all merchant vessels. The river entrance is constantly changing and no vessel should attempt to enter without a pilot on board. The following information should be sent to Chittagong 72 hours and confirmed 24 hours in advance of arrival:

1. Vessel's ETA at Kutubdia and Chittagong outer anchorage.
2. Date and hour of departure last port of call.
3. Nature and quantity of cargo to be discharged.
4. Maximum fresh water draft on arrival. The arrival draft should be forwarded in writing if it is expected to be within 0.2m of the maximum permissible draft.

The pilot launch is stationed off Juldia and is equipped with radar and VHF radiotelephone.

Vessels should arrive at the pilot station at least 3 hours before the daylight HW. Priority vessels should arrive at least 6 hours prior to daylight HW.

Vessels with a speed of under 7 knots will not normally be handled during spring tides.

Vessels are usually boarded about 1 mile SW of the outer bar lighted buoy. The harbormaster boards in the river, about 0.5 mile below the SW extremity of the railway jetties and take vessels to their assigned berth.

Pilots are available only from sunrise to sunset.

**Signals.**—A signal station lies on Juldia Hill and is equipped with radiotelephones and facilities for signaling by the International Code of Signals, on a 24-hour basis.

Storm signals are displayed on Juldia Hill and at Normans Point; the Indian General System is used. Further information on these storm signals may be found in Pub. 160, Sailing Directions (Planning Guide) South Atlantic Ocean and Indian Ocean under “India—Signals.”

Weather signals will be displayed from the Port Commissioner’s Office for inland vessels and small craft.

All vessels entering or leaving port should display their signal letters.

**Anchorage.**—Three anchorage areas, lettered A through C, lie off the entrance of the Karnaphuli River. Anchorage A and Anchorage C have least charted depths of 9.7m. Anchorage B has a least depth of 8.2m. Anchorage A is for vessels with a draft of over 9.1m. Anchorage B is for vessels entering within 24 hours. Anchorage C is for lightering and other vessels not scheduled to enter for 24 hours. The limits of these three areas, together with the prohibited anchorage area, can best be seen on the chart. An obstruction lies on the NW limit of Anchorage C.

North of a bearing of 055° on Patenga Lighted Beacon, the holding ground is soft mud and vessels are liable to drag. The mud is firmer farther S of this bearing, but attention should be given to the strong ebb which is experienced here especially during the Southwest Monsoon. A vessel using this anchorage should note the way it swings at the change of the tide, because it is liable to swing in one direction only. Vessels anchor should be sighted at regular intervals to avoid fouling.

A vessel reported anchoring in a depth of 10.5m with Normans Point Light bearing 109°, distant 2 miles, good holding ground. During a stay of 11 days at this anchorage, the maximum current experienced was 5 knots.

During spring tides, a vessel reported good holding ground with Patenga Lighted Beacon bearing 070° and Normans Point Light bearing 120°.

An abandoned submarine pipeline extends 1.5 miles WSW from a position about 2.5 miles NW of Patenga Point. Anchoring is prohibited in this vicinity.

A dangerous wreck lies 5.5 miles NW of Patenga Point; a lighted buoy is moored 0.5 mile NE of this wreck. Two more dangerous wrecks lie at approximately 4 miles NW of Patenga Point.

**Caution.**—Small fishing craft without lights, and fish nets marked by small black and white stakes, were reported to be a hazard to vessels approaching the river entrance.

The channels and depths in the Karnaphuli River and its approaches are subject to frequent change. Aids to navigation are adjusted accordingly. Consult the harbor master at Chittagong for the latest information.

It has been reported (2002) that several uncharted wrecks lie in Anchorage A, Anchorage B, and Anchorage C. In addition, it has been reported (2002) that two vessels with drafts of 10.5m have grounded while in Anchorage A. Mariners are advised to contact local port authorities for current information on depths and wrecks prior to arrival.

## Chittagong (22°19'N., 91°49'E.)

World Port Index No. 49590

**7.21** Chittagong, one of the leading ports in Bangladesh, lies on the W bank of the Karnaphuli River, about 10 miles above its entrance. Ample, modern berthing facilities are provided for all classes of vessels capable of crossing the river bars.

Chittagong is a first port of entry.

**Winds—Weather.**—Chittagong is in the track of cyclones and as a result, the port has been damaged on numerous occasions.

A hot sultry day followed by still air conditions in the evening usually results in thunderstorms. The peculiarity of these storms is that they approach from the N and W in the form of a line squall accompanied by intense lightning, thunder, rain and/or cyclonic rotation winds which may reach a velocity of upwards of 50 knots. When signs of such a storm exist, masters must exercise great caution. Vessels at fixed moorings and pontoon jetties must exercise extreme caution when a storm is blowing.

In general, rainfall is heavy during the Southwest Monsoon; dense fogs occasionally occur. Early morning fogs, clearing by mid-morning, also occur from December through February and sometimes in March. The fine weather period is from the middle of October to March.

**Tides—Currents.**—The tidal currents set across the outer part of the bar with the flood setting NNW and the ebb to the SSE.

During the Southwest Monsoon season, in the months of June to September and sometimes in October, strong freshets are experienced at which time there may be no flood current for several days. During freshets the velocity of the current increases to 6 to 8 knots. Notices regarding them are circulated well in advance by the local port authorities.

During the Southwest Monsoon, the spring range of the tide is about 6.1m; the neap range is about 2.7m. During the winter the spring range is 2.7 to 4m and the neap range is 1.5 to 2.4m.

Tide gauges, marked in 3-inch divisions, lie on the sides of the river at various locations to assist in determining the level of the tides.

Tidal signals are displayed from a tidal semaphore station on Juldia Hill. The signals indicate, by day, the height of water above tidal datum. The diagram (See Tidal Semaphore Signals for Calcutta in paragraph 7.6) shows the position of the semaphore arms and their meanings, as viewed from a vessel approaching from seaward.

A black ball is displayed on top of the semaphore at HW, and dropped when the tide has fallen 3 inches below HW level.

Vessels approaching the outer bar, in order to be certain the rise of tide as indicated by the semaphore, will not display a black ball at the foremast head.

Tidal lights for night pilotage are displayed from two framework masts, each 49m high. Three lights, vertically displayed, 5.5m apart and displayed from each mast, indicate the rise of

the tide in feet and inches. These lights are visible both from the jetties and outside the outer bar.

**Port Authority of Chittagong**

<http://www.cpabd.com>

**Depths—Limitations.**—Outer Bar lies at the seaward end of the entrance range and has a least depth of about 4.6m. The least charted depths over the Inner Bar and Gupta Crossing are 5.5 and 4.9m, respectively. Depths over the bars and in the river are subject to constant change.

The maximum safe fresh water drafts in the Karnaphuli River may range from 5.5 to 8.5m, depending on the time of the year and local conditions. In general, the greatest depths are available in the summer and the least in the winter.

A monthly forecast of drafts is published by the port authorities. Daily maximum anticipated safe drafts in the Karnafulli River for the months can alter with prevailing winds and unusual siltation. Local authorities should be consulted to affirm maximum permissible draft for the day, generally referred to as fresh water draft.

Ship movements generally commence about 4 to 5 hours before the day's HW. Outbound ships of light draft sail on the first daylight flood; ships with the maximum draft for a particular day sail about 2 hours before daylight HW.

Vessels entering or leaving port must have full steam on main engine and deck, and both anchors with full lengths of chain must be available for use at all times.

A confused and dangerous sea breaks on the outer bar during strong SW winds.

To determine the draft for entering or leaving port, the depth of 3.6m over the inner bar is added to the height of water in the tide tables, allowing for an error of 30.5 to 35.6cm, depending on the phase of the moon and season.

A deep-draft vessel, intending to discharge cargo, may gain a 7.6 to 15.2cm draft advantage by entering close to time of HW and berth, whenever practicable, on the ebb current.

A 1965 report states the water salinity at the outer anchorages changes from almost salt water to practically fresh water, depending on the tide. This causes corresponding differences in vessels' drafts and is important in that maximum drafts are based on fresh water. Pilots check drafts of deeply-loaded vessels. It was further reported that due to siltation, the channel for crossing the bar is a sharp zigzag and the usual extra draft allowances, such as 3 inches for vessels of less than 152.4m in length and a speed of over 14 knots, are not granted.

The alignment of the fairways, with the best water over the bars and within the river, are denoted by lighted range beacons.

The lighted beacons, indicating the fairway in the entrance and over the outer bar, are in line bearing 037°04'.

Lighted and unlighted buoys mark the channel limits and some of the sunken wrecks in the river. The range beacons and buoys are moved as necessary to conform to depth changes in the channel.

The port has 17 jetties, including two pontoon jetties. Vessels having a length of 167 to 186m, with the day's permissible draft, but not exceeding 8.5m, berth at Jetty No. 1 to Jetty No. 13. Vessels having a length of 164m, with a maximum draft of 8.5m, are berthed at Jetty No. 14 and Jetty No. 15. Vessels up

to 164m in length, drawing the day's permissible draft, are berthed at Jetty No. 16 and Jetty No. 17.

There are nine river mooring berths, of which two have pontoons for supporting pipelines. The largest berths can accommodate vessels of up to 186m in length.

Jamuna Oil Jetty is situated 0.5 mile upriver of Gupta Khal No. 9. The draft limits at the jetty vary seasonally with tide from 7.9 to 9.4m.

Two container berths, with a draft of 10m alongside, are situated on the W bank of the river, 1.5 miles above Jamuna Oil Jetty.

An offshore oil terminal is situated about 4.8 miles NW of Normans Point. The deepest draft that can be accommodated is 10.4m. A special pilot is required to place the tanker alongside the terminal buoy.

Two ocean-going tugs and a sufficient number of barges are available for handling cargo at the anchorages off the river entrance.

Explosives are handled at the outer anchorage. Safety explosives can be handled alongside the jetties.

A vessel entering on the flood normally turns off the assigned berth using the starboard anchor; after turning, the anchor is weighed and the vessel proceeds to either a berth or mooring buoy using the port anchor.

**Aspect.**—The entrance of the river lies between a training wall on the W side, which retains a sand and mud flat extending about 0.5 mile SW from Patenga Point, and a stone apron on the side which is the SW extension of Juldia Training Wall. Mud flats and Middle Island lie SE of the stone apron and Juldia Training Wall. The stone apron and training walls at the entrance of the river have been reported to be submerged at HW.

The outer bar fronts the entrance of the river about 1.5 miles SW of Patenga Lighted Beacon. The inner bar lies about 2.5 miles within the entrance and W of Juldia Hill. Gupta Bar is about 5 miles above the river's entrance.

About 1 mile NNW of Normans Point, the E bank of the river curves NE for a distance of 2.5 miles to a position NW of Juldia Hill. Large mud flats lie along this part of the bank and embankments have been constructed to prevent inundation. Several small villages are situated on this section of the bank. About 2.3 miles farther N, the E bank becomes low and swampy and is cultivated.

Mud islands (chars), the largest of which are Gupta Island and Lukia Island, are part of this bank and low-lying land to the E. Back Channel Khal and a passage for boats at half tide separate Gupta Island and Lukia Island, respectively, from the mainland to the E.

The W bank of the Karnaphuli trends NE from Patenga Point for about 3 miles to **Gupta Point** (22°17'N., 91°50'E.). Active Spit, the greater part of which is enclosed by a training wall, lies between the W bank and the training wall, E through S of Gupta Point. Numerous creeks (khals) intersect the W bank of the river for a distance of about 4 miles between Gupta Point and the jetties at Chittagong.

Two high tension power line pylons, 105m high with obstruction lights, lie one on each side of the Karnaphuli River, 2 miles SW of Sadarghat. The overhead clearance under the power line is 52m.

In 1981, a quay, 342m long, and a dry dock to accommodate 16,500 dwt vessels, were near completion on the W bank, 1.8

miles WNW of Gupta Point. In 1984, construction was started on two multi-purpose jetties to provide 450m of additional wharfage, with a depth of 10m alongside.

**Pilotage.**—Pilotage is compulsory and available during day-light hours only. Contact the pilots on VHF channel 16 or 12. Vessels should arrive at the Pilot Boarding Ground, 1 mile SW of Outer Bar Lighted Buoy, at least 3 hours before high water.

**Regulations.**—Vessels are advised to report any incidents of piracy and armed robbery to the Port Radio Control on VHF channel 12.

**Anchorage.**—Vessels can anchor temporarily in certain reaches of the river on their way to or from Chittagong. However, there is only swinging room at or near HW, and then only with the assistance of the engines. Vessels cannot remain at anchor at low water.

There are three main anchorage areas outside the harbor. Anchorage A is for vessels over 9m draft. Anchorage B is used by vessels entering port within 24 hours. Anchorage C is for vessels lightering and vessels not scheduled to enter port within 24 hours.

Vessels with plague or other infectious diseases on board must anchor off Coombs Pillar until inspected by the Health Officer.

**Caution.**—Piracy remains a concern at Chittagong. The port was reported to have the second highest number of piracy incidents in 2001. Armed attacks from small boats can occur in Chittagong Anchorage or in the harbor. In addition, vessels have reported a high incidence of theft of zinc anodes from vessel hulls and rudders. Mariners are advised to keep a sharp lookout.

**Sangu Gas Platform** (22°01'N., 91°31'E.) is lighted and is situated about 23 miles SW of Chittagong. A dangerous gas well head is situated about 2.5 miles NW of the platform.

A high pressure gas line extends from the platform to the shore about 2 miles N of Chittagong, as best seen on the chart.



Sangu Gas Platform

## Bangladesh—Normans Point to Elephant Point

**7.22** The Chittagong Coast from the entrance of the Karnaphuli River extends about 66 miles S and SSE to Elephant Point. A group of deltaic islands, separated by shallow channels, lie about midway between the river and the point.

Between Normans Point and the N point of the Sangu River, about 5.5 miles SSE, the low coast is wooded and marked in places by small sand hills.

The N entrance point of the river is marked by low sand hills and a clump of trees. The river is entered about 3 miles S of this point, but is available only to large native boats.

South of the mouth of the Sangu River the coast is low, wooded, and marked by low sand hills. About 7 miles S of the Sangu River, the coast recedes at Cuckold Point. A drying mudflat extends up to 2 miles offshore along this section of coast.

Cuckold Point has been reported to be a good radar target up to 24 miles.

**Kutubdia Island** (21°51'N., 91°52'E.), which lies with its N end about 1 mile SW of Cuckold Point, is low, flat, covered with trees, and is about 12 miles long. The island is visible for about 8 miles.

Kutubdia Island has been reported to be a good radar target up to 16 miles.

Kutubdia Island Light has been reported to have a radiobeacon and a racon.

**Anchorage.**—Anchorage can be taken, in a depth of 12.8m, with Kutubdia Island Light bearing 068°, distant 1 mile. The anchorage is fairly well protected, but the currents are strong. Approach to this anchorage should be made from N of Dolphin Shoal.

A channel, about 30 miles long in a N-S direction, lies between Kutubdia Island, Maiskhal Island, and Sonadia Island on the E and Dolphin Shoal, North Patches, and South Patches on the W. Depths in the channel range from 10 to 31.1m. Tidal currents set through this channel at a high velocity and it should not be attempted without local knowledge.

**Maiskhal Island** (21°37'N., 91°56'E.) lies SE of Kutubdia Island, Matarbari Island lies in between them.

**7.23 Kutubdia Channel** (21°44'N., 91°52'E.), a narrow passage with depths of 4.3 to 11m, lies between Kutubdia Island and the mainland. Channel depths are subject to rapid changes and cannot be relied on.

Maiskhal Island is marked by a range of hills about 91.4m high near its central part. Garamchari Hill is not distinctive as the range is of uniform height. Low hills lie along most of the E side of the island, whereas, the other sides are low. Maiskhal Bluff, 61m high and conspicuous, lies near the SE extremity of the island. A marshy flat extends up to 3 miles offshore S of the Matarbari Channel entrance.

**Sonadia Island** (21°29'N., 91°53'E.), about 2 miles SSW of Maiskhal Island, is marked by low white sand hills. A flat, which dries in places, extends about 3 miles from the island. With a flood current the sea breaks heavily over this flat.

**Lattadia Island** (21°35'N., 91°51'E.), which dries 1.5m, lies about in the middle of the marshy flat which fronts the W side of Maiskhal Island.

**Maiskhal Channel** (21°30'N., 91°59'E.), which lies between the E side of Maiskhal Island and the mainland, is narrow with rapidly changing depths. This channel should not be attempted.

**Rupadia Sands** (21°27'N., 91°57'E.), bare in places with shallow depths elsewhere, extend up to 2.3 miles S of the SE end of Sonadia Island. These sands lie on the W side of the entrance of Maiskhal Channel.

**7.24 Cox's Bazar** (21°27'N., 91°58'E.), which consists of a small town and export center, lies about 4 miles S of the SE extremity of Maiskhal Island. The town lies on a low range of sand hills on the mainland and on the SW bank of the Baghkali River. This river discharges into Maiskhal Channel about 1.5 miles N of the town. Cox's Bluff, about 0.5 mile S of the town, rises steeply to an elevation of 48m. Twin casuarina trees, both conspicuous, lie almost 0.5 mile NE of Cox's Bluff. Cox's Bazar Light is shown from a gray, metal framework tower on a white concrete building on Cox's Bluff; the light structure is topped by a conspicuous orange dome, and is fitted with a radiobeacon and racon.

A spit, which dries in patches, extends about 2.8 miles W and 3.5 miles WNW from Cox's Bluff. The sea breaks heavily over this spit, especially during the flood tide.

The principal channel leading into Maiskhal Channel lies between the spits extending from Cox's Bluff and S from Sonadia Island over a shifting bar about 3 miles W of Cox's Bluff. In 1960, there was a least depth of 2.1m in this channel.

Another channel crosses the spit extending S from Sonadia Island, but the depths are shallow.

There are usually heavy rollers off the entrances of both channels and the bars break occasionally. Depths in these channels are subject to rapid changes.

A shoal, composed of sand and mud with depths of less than 1.8m and which dries in places, lies on the NW side of the fairway of Maiskhal Channel about 0.5 mile S of **Hamidardia Island** (21°30'N., 91°57'E.).

The Baghkali River, which enters Maiskhal Channel about 1.5 miles S of the E end of Hamidardia Island, is narrow and shallow and dries in places.

Deep-draft vessels can anchor S of the entrance of the main channel, in a depth of 9.1m, sand and mud, with Cox's Bluff bearing 055°, distant 3 miles.

Light-draft vessels can anchor, in a depth of about 5.5m, sand and mud, with Cox's Bluff bearing 043°, distant about 2.3 miles.

Vessels capable of crossing the bar can anchor off the mouth of the Baghkali River in Maiskhal Channel, in depths of 9.1 to 18.3m, mud.

Reliable pilots are not available and the bar and channel should be examined and buoyed before entering, because they are subject to change during the monsoon. The best time to enter is at about half flood when the breakers will mark the edges of the shoals.

The coast between Cox's Bazar and Elephant Point, about 15.5 miles SSE of Cox's Bluff, is backed by low hills.

Red cliffs, about 61m high, line the coast from 3.5 to 6.5 miles SSE of Cox's Bluff. South Cliff, the S cliff, is 82m high. From offshore these cliffs appear white when the sun is shining on them, and on a clear day they may be visible up to 20 miles.

These cliffs are a good landmark for vessels approaching Chittagong from the S.

Waila Taung (Sugarloaf Hill) rises to a height of 413m about 11 miles ENE of Elephant Point.

## Burma—Elephant Point to Thames Point

**7.25** Cape Negrais lies about 333 miles SSE of Elephant Point. The intervening coast is irregular and broken by the many rivers which discharge their waters into the E side of the Bay of Bengal. Hills and mountain ranges back the coast at varying distances inland, generally lying parallel to the coast in a N-S direction. Mayu and Arakan Yoma are the principal mountain ranges. Ramree Island and Mun Aung Island, the largest islands along this section of coast, lie about midway between Elephant Point and Cape Negrais. Combermere Bay and Hunters Bay indent the coast N of Ramree Island. Akyab is the most important port, although Kyaukpyu is of some importance.

**Winds—Weather.**—The weather and climate of Burma is primarily influenced and determined by the Northeast Monsoon and the Southwest Monsoon and the short transitional periods between them. The year is divided into four seasons, referred to as the Northeast Monsoon (winter monsoon, cool or dry season), the spring transitional or hot season, the Southwest Monsoon (summer monsoon, wet or rainy season), and the autumn transitional season.

The Northeast Monsoon, December through March, is marked by fine weather with very little rainfall.

The hot season, April and May, is an interim period of weak and variable winds prior to the Southwest Monsoon. Increases in rainfall in April and May do not equal the amounts of rainfall during June through August; this results in greater heating of the air masses.

The Southwest Monsoon, June through September, is characterized by cloudiness, overcast skies, light rain almost daily, interspersed with rain squalls or thunderstorms accompanied by torrential downpours. Restricted visibility, high humidity, and general adverse weather conditions are associated with the Southwest Monsoon.

The autumn transitional season, a period of weak and variable winds with land and sea breezes prevailing, occurs in early October after the withdrawal of the Southwest Monsoon and before the cooler, drier weather of the Northeast Monsoon is established in late November.

Tropical storms with destructive winds occasionally affect the coastal regions N of 15°00'N.

Tropical cyclones, which develop in the Bay of Bengal, occur most frequently during the transitional season. The Arakan Coast of Burma is more likely to be struck by a cyclone during the autumn transitional season than at any other time, but rarely is the Gulf of Martaban affected. During the hot season some tropical cyclones cross the coast of the Gulf of Martaban.

**Tides—Currents.**—The monsoon winds affect and influence the surface currents. To a great extent the currents are variable and at the height of each monsoon, currents may sometimes be met setting in the opposite to the monsoon current, or in general in any direction. The currents are still more variable during the transition periods of the monsoons. The

Northeast Monsoon tends to produce a seasonal current setting to the W; the Southwest Monsoon a similar current setting to the E in the open waters of the Bay of Bengal.

Tidal currents along the Chittagong Coast S of Elephant Point set parallel with the coast, with the flood setting N and the ebb setting S.

Tidal currents along the Arakan Coast set N on the flood and S on the ebb; they are greatly influenced by the immense volume of tidal backwater. Local in drafts of the current are strong during the flood and the outset is small during the ebb.

**Depths—Limitations.**—The 35m curve is not defined off the coast between Elephant Point and a position about 18 miles WSW of the entrance of the Mayu River. From the above position, the 35m curve extends SE to a position about 18 miles WSW of Thames Point on the W side of Ramree Island. The 35m curve lies within 10 miles of the W side of the NW extremity of Ramree Island and about 16 miles WSW of the entrance of the Kaladan River.

The 18m curve lies about 7 miles W of Elephant Point and 3 miles W of the W side of Ramree Island. Southwest of the entrance of the Kaladan River, the 18m curve is defined in an irregular pattern lying between 15 and 7 miles off the entrance. Southeast of the entrance of the Kaladan River, the 18m curve lies near the shore in the proximity of the W side of Myengun Kyun (West Boronga Island) and Boronga Point, the island's S extremity.

Between Boronga Point and Ramree Island, depths within the outer 36.6m curve W of Combermere Bay and in the approach to Kyaukpyu Harbor are irregular.

Numerous islands, reefs, rocks, and shoals lie seaward of the coast up to 16 miles offshore between Elephant Point and Thames Point.

Shore dangers which lie within the 9.1 and 11m curves are described under the principal description of that section of coast which they front.

Mud volcanoes occasionally rise from the sea off the coast between the entrance of the Kaladan River and Mun Aung Island. Many of these exist only temporarily and disappear, leaving a shoal. Mariners should keep a constant and careful lookout, as it is not possible to keep their existence charted.

**7.26 The St. Martins Islands** (20°37'N., 92°20'E.), a group of one island and two islets, lie between 5.5 and 9 miles SSW of Shahpuri Point, the N entrance point of the Naf River. North Tall Trees, a group of casuarinas, lie at the N end of the large island and a similar clump of trees lie near the S end. Sunken dangers extend up to 1 mile offshore along the W side of the island. Depths between the St. Martins Islands and the mainland are less than 9.1m. St. Martins Island Light is shown from a gray metal framework tower on a white concrete building near the N end of the island. Red and white daymarks are fixed to the top of the light structure which is also fitted with a racon.

**Anchorage.**—Sheltered anchorage can be taken about 0.5 mile E of the N end of the large island, in a depth of 7.3m, good holding ground. In the approach to the anchorage, the best water lies E and S of the St. Martins Islands.

**7.27 St. Martins Reef** (20°37'N., 92°13'E.), a 4 mile long ridge of sunken rocks, lies about 10 miles WSW of Shahpuri

Point. A rock, awash, lies on the S part of the reef. Depths elsewhere on the reef range from 0.9 to 10.5m. The sea breaks over the reef in heavy weather or with a S swell.

**North Delay Shoal** (20°30'N., 92°15'E.), a small patch of hard ground with a least depth of 6.9m, lies about 6.5 miles SW of the S extremity of the St. Martins Islands.

**South Delay Shoal** (20°28'N., 92°15'E.), with a least depth of 9.7m, lies about 2 miles S of North Delay Shoal. This shoal should not be crossed because lesser depths may exist.

**Sitaparokia Patches** (20°32'N., 92°26'E.), a group of shoal patches with depths of 2.7 to 9.1m, lies centered about 5.3 miles SE of the southernmost St. Martins Islands.

**Asirgarh Shoal** (20°28'N., 92°28'E.), small and rocky with a depth of less than 1.8m, lies about 6.5 miles SW of **Sitaparokia** (20°33'N., 92°32'E.) which is on the mainland. During heavy weather and at LW, the sea breaks over this shoal. A detached 9.8m patch lies about 1.5 miles WNW of Asirgarh Shoal.

**Oyster Island** (20°12'N., 92°32'E.), low, sandy, and almost devoid of vegetation, lies about 12.5 miles WSW of Foul Point. This island lies on the E side of a rocky ledge from which foul ground extends about 1.5 miles NNW and 3.5 miles SE.

A flagstaff, Mayu Light, some buildings, and low trees lie on the NE side of the island. A stranded wreck lies in shoal water about 2 miles SSE of Oyster Island. A dangerous wreck lies about 6 miles NNE of Mayu Light.

**Taylor Shoal** (20°15'N., 92°25'E.), with a least depth of 7.8m, lies about 8 miles WNW of Oyster Island. Vessels should avoid this shoal because lesser depths than charted may exist.

**Oyster Reef** (20°05'N., 92°39'E.), about 1.8 miles in extent, lies centered about 9 miles SE of Oyster Island. The least charted depth is 1.8m, but lesser depths have been reported to exist. A heavy sea breaks over this reef during bad weather or when a swell sets in.

The red can buoy moored about 1.8 miles S of Oyster Reef is withdrawn from May 1 to November 1.

**7.28 Heckford Patch** (19°57'N., 92°44'E.), with a least depth of 9.7m, lies about 18.5 miles SE of Oyster Island. Vessels should not attempt to cross this danger. **Prain Daung** (20°01'N., 92°57'E.), bearing 080°, leads N of, and bearing 060°, S of Heckford Patch.

A patch of discolored water was reported to exist about 8 miles SW of **Boronga Point** (19°49'N., 93°02'E.). A depth of 16.5m, whose existence is doubtful, was reported to exist about 13.5 miles SW of the same point.

Shoal water and breakers have been reported in an area 8 to 9 miles S of Boronga Point. A mud volcano was reported to have existed in this area.

**The Terribles** (19°24'N., 93°17'E.), three groups of rocks, lie on the S side of the W approach to Kyaukpyu Harbor, between 8 miles WNW and 10.5 miles WSW of **Saddle Island** (19°26'N., 93°27'E.).

**North Terrible** (19°27'N., 93°16'E.), 3.7m high, is the N rock of the group. Drying rocks lie within 1.8 miles N and a rock, awash, lies about 0.5 mile S of it.

Middle Terrible, 4.3m high, lies about 1.3 miles SW of North Terrible. Isolated drying rocks lie 1.5 miles WNW and 1 mile SSW of Middle Terrible.

**South Terrible** (19°23'N., 93°16'E.), almost 3 miles SSW of Middle Terrible, consists of several low rocks, the highest being 3.7m.

South Rock, which dries 1.8m, lies about 1.5 miles S of South Terrible. The sea breaks between South Rock and South Terrible.

Volcanic disturbances have been reported to have occurred about 3.3 miles NNW of North Terrible. Less water than charted may exist in this area.

A shoal, with a depth of 7.8m, lies about 4.5 miles SW of North Terrible. This shoal, which is the remains of a mud volcano, was marked by discolored water and should be avoided.

**7.29 Irrawaddy Rock** (19°25'N., 93°23'E.), which dries 0.6m, lies about midway between Middle Terrible and Saddle Island. Depths within a 0.5 mile radius of this rock are less than 11m. The rock is hard to make out with a smooth sea. A breaking shoal lies about 0.3 mile ENE of Irrawaddy Rock. A mud volcano was observed about 3.8 miles S of Irrawaddy Rock.

Research Rock, a sunken reef with depths of 1.8 to 8.2m, lies about 3 miles SSW of **West Point** (19°22'N., 93°28'E.) on the NW extremity of Ramree Island.

**Elephant Point** (21°11'N., 92°03'E.), about 9.5 miles S of South Cliff, is backed by Elephant Point summit, a conspicuous 124m high hill, visible on a clear day for about 20 miles. Stranded wrecks lie 13 miles WNW and 9 miles SW of the point.

Elephant Point has been reported to be a good radar target up to 35 miles.

The coast between Elephant Point and the entrance of the Naf River, about 33 miles SSE, is formed by the W side of the Naf Peninsula. The peninsula terminates to the S in Shahpuri Island, which is low, flat, and covered with jungle growth. Shahpuri Point, the S extremity of the island, is the NW entrance point of the Naf River.

**Taungnyo Hill** (21°04'N., 92°12'E.), 267m high and the highest peak on the Naf Peninsula, lies about 11 miles SE of Elephant Point. A conspicuous peak, 253m high, lies about 9 miles farther SSE.

East of the Naf Peninsula the Mayu Range rises to heights of 332 to 670m. Wetkyein Tauno, 460m high, rises at the N end of the Mayu Range, about 19 miles E of Elephant Point.

**7.30 Shahpuri Flat** (20°43'N., 92°18'E.), composed of mud and sand with depths of 5.5m and less, extends S from the shore about 9 miles NNW of Shahpuri Point to a position about 5 miles SW of the point. A heavy breaking sea usually exists over this flat in depths of 3.7m and less.

The **Naf River** (20°43'N., 92°22'E.) is entered between Shahpuri Point and Cypress Point, about 1.5 miles to the SE. The entrance can be identified by the high trees which lie in the vicinity of the entrance points.

The tidal currents set across the approach to the bar, with the flood setting to the N and the ebb to the S, at velocities of 0.8 to 1 knot at spring tides. The tidal currents run mainly fair in Patricks Gut. In the Naf River, the tidal current runs full at velocities up to 4 knots. There is little or no river current.

**Cypress Sands** (20°40'N., 92°18'E.) consist of a number of shallow ridges, some of which dry, which lie on the flat ex-

tending about 4 miles SW from Cypress Point. Depths are less than 3.7m. Their location is marked by breakers.

The bar which obstructs the river entrance lies between Shahpuri Flat and Cypress Sands.

In 1960, the least charted depth over the Shahpuri Flat part of the bar N and NW of Cypress Sands was about 3.2m. The least depth in Patricks Gut and in the deepest channel between the ridges of Cypress Sands was about 2.4m at MLWS

In 1960, charted depths of 5.5 to 14.6m existed up to 12 miles above the entrance of the Naf River. In 1966, it was reported that considerable shoaling had taken place within the river.

Two buoyed channels lead across the bar to the river entrance. The SE channel leads in a N direction through Patricks Gut and then through Cypress Sands. The NW channel leads in an E direction and lies N of the St. Martins Islands and Cypress Sands.

Anchorage can be taken, in a depth of 8.2m, off Maungdaw, about 7 miles above the entrance of the Naf River.

Vessels should approach the entrance of the SE channel (Patricks Gut) by passing S and E of the St. Martins Islands. Patricks Gut, close S of Cypress Sands, is sheltered from the swell and passage should be possible during the Southwest Monsoon. The approach to the entrance of the NW channel should be made from the NW, passing N of St. Martins Reef and the St. Martins Islands. A mid-channel course should be steered in the river.

Local knowledge or the services of a pilot is essential to enter the river.

Between Cypress Point and Foul Point, about 34 miles SE, the numerous sharp peaks of the Mayu Range back this section of coast from 1 to 6 miles inland. Fakirmura Hill, 133m high and conspicuous, lies at the SE end of this range about 3 miles NW of Foul Point.

**7.31 Mount Todd** (20°23'N., 92°42'E.), 338m high, lies about 4.3 miles NNW of Fakirmura Hill, and when seen from the W appears flat-topped and slightly higher than the peaks on either side. When viewed from the S, it appears as a conspicuous sharp peak.

Agandu Hill, 192m high with a pagoda on its summit, lies 7 miles ENE of Fakirmura Hill. Pimple Hill, 107m high, lies about 1.5 miles SE of Agandu Hill.

Bengara Hill, 414m high, rises about 19 miles NE of Fakirmura Hill. This conspicuous hill, when open S of the latter hill, is easily identified.

**Sitaparokia** (20°33'N., 92°32'E.), a small conical hill 65m high, with the ruins of a temple on its summit, lies on a point 13 miles SE of Cypress Point. A conspicuous rock, 36.6m high and shaped like a chair, lies about 183m offshore 0.5 mile NW of Sitaparokia. A rock, with a least depth of 3m, lies about 1.8 miles offshore and almost 2 miles S of Sitaparokia.

A flat, with depths of less than 5.5m, extends from a position close offshore, about 8 miles NW of Foul Point, to a position about 7.5 miles SSW of the point where it terminates in North Spit.

The **Mayu River** (20°13'N., 92°45'E.) is entered between Foul Point and Mayu Point, about 3.5 miles SSE. The river has been surveyed for a distance of about 13 miles above Foul Point and flows almost due S. A long narrow shoal, with depths

of less than 1.8m and which dries in places, divides the river into two channels. This shoal extends from 1.5 miles NNE to almost 9 miles N of Foul Point. Kazidiya Kyun, an island covered by mangroves, lies at the N end of the shoal with a drying spit extending almost 3 miles S from it. About 4 miles N of Mayu Point, the Kywede River, flowing from the E, joins the Mayu River within its entrance.

The tidal currents at the bar have a velocity of about 2.5 knots at springs and 1.5 knots at neaps. The flood sets NNE and the ebb in the opposite direction.

The tidal currents within the river attain a velocity of 3.5 knots at springs.

The bar obstructing the river entrance has a least depth of 5.8m and lies between North Spit and South Spit, about 4.5 miles SW of Mayu Point.

Dangers on the NW side of the entrance include North Spit, Martini Sands, and Burne Rocks. Between Foul Point and Burne Rocks, about 1.5 miles to the S, there are numerous patches and rocks which dry from 0.6 to 2.4m.

**7.32 Burne Rocks** (20°15'N., 92°45'E.), one of which is above-water, with the rest drying in places. Two small islets lie between these rocks and Foul Point.

**Martini Sands** (20°13'N., 92°44'E.), which extend about 3 miles S and SSW from Burne Rocks, are subject to constant change and are marked by breakers.

On the SE side of the entrance, a flat with depths of 5.5m and less, extends about 4 miles SW from Mayu Point. Mayu Spit lies on the inner part of this flat; South Spit lies on its outer edge.

Depths inside the bar increase from 5.8m to over 9.1m and increase to depths of 16.5 to 20.1m W of Mayu Point.

The E channel within the river E of Kazidiya Kyun and the shoal extending S from that island had a least depth of 5.5m in past years. The channel W of the island and the shoal had a least depth of 5.8m.

The E channel is obstructed by fishing stakes, but it is easier to navigate. The entrance of the W channel is narrower and dangerous.

Depths of 9.1 to 12.8m lie in the fairway of the Kywede River up to 4 miles above its entrance.

It has been reported that considerable shoaling has taken place in the E channel within the Mayu River NE of Foul Point and at the junction of that river and the Kywede River.

Good anchorage can be taken, in depths of 11 to 18.3m, in the fairway E of Burne Rocks. Anchorage can also be taken in the channel which lies between Foul Point and the shoal about 1.3 miles to the E.

Anchorage can also be taken in the Mayu River abreast of the town of Rathedaung, about 12 miles N of Foul Point or in a position about 2.3 miles S of the town.

A distant bluff, in line bearing 001° with a wooden pagoda atop an 82m elevation, leads across the bar between North Spit and South Spit. The pagoda, which is difficult to make out, lies almost 0.8 mile E of Fakirmura Hill. When Bengara Peak is in line bearing 032° with Pimple Hill, this course should be steered until Mayu Point bears 158°. Course should then be altered to the N so as to pass about 0.8 mile E of Burne Rocks.

**Fakir Point** (20°07'N., 92°54'E.) lies on the NW side of the entrance of the Kaladan River, about 10 miles SE of Mayu Point.

The entrance of the Kaladan River lies between Fakir Point and Savage Island, about 1.5 miles to the S.

**Sittwe Harbor** (20°08'N., 92°54'E.) lies just within the entrance N of Fakir Point.

The harbor area has been reported to be a good radar target up to 17 miles.

Vessels are prohibited from entering Sittwe Harbor between sunset and sunrise.

### **Sittwe Harbor (Akyab Harbor) (20°08'N., 92°54'E.)**

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**7.33** Sittwe Harbor, the chief port and administrative center of the Arakan Division of Burma, lies on the W bank of the Kaladan River, close N of Fakir Point and is the oldest rice exporting center in the country.

Vessels anchor to work cargo from barges or berth at the main wharf abreast of the city.

Sittwe Harbor is a first port of entry.

**Winds—Weather.**—The Southwest Monsoon begins early in May and lasts until the end of October, during which period the rainfall is so heavy as to almost inundate the country. The rivers become swollen at this time. Vessels do not normally load in Sittwe during this period.

The Northeast Monsoon, from November to April, is very dry. During the winter months, thick fog may be expected with the flood tide.

**Tides—Currents.**—Tides in the entrance of the Kaladan River and at Sittwe are semidiurnal. The tide rises and falls quickly with slack water lasting about 1 hour during springs and from 2 to 3 hours during neaps.

During the rainy season, the mean level of the Kaladan River rises about 0.6m.

The tidal currents are regular and rapid at springs; overfalls form on the ebb running between Fakir Reef and Passage Rock. The velocity at springs on the outer bar is from 0.8 to 2 knots, but between Fakir Point and Passage Rock the velocity is 3 to 4 knots, and during the Southwest Monsoon as much as 7 knots. During neaps, the tidal currents are very weak.

The tidal currents set directly across Fakir Reef, and a vessel leaving an inner anchorage when the ebb current is running will be set towards the reef after passing Fakir Point.

Vessels entering the harbor during the flood current, when in the vicinity of White Rocks, require careful navigation as the current sets directly towards the rocks. When leaving the harbor on the ebb current, vessels should keep as close to White Rocks as practicable to prevent being set on Horseshoe Shoal.

**Depths—Limitations.**—The outer bar lies between the W coast of Myengun Kyun, located SE of Fakir Point, and the tongue-shaped spur of Horseshoe Shoal, which lies about 4 miles S of Fakir Point. In 1984, the least depth over the bar was 6.4m; with. During the Southwest Monsoon, vessels crossing the outer bar should have 0.9 to 1.2m of water under their keels because of heavy swells.

The inner bar lies within the entrance of the Kaladan River, between the mainland N of Fakir Point and the SW end of Flat Island Spit. In 1976, the bar had a least depth of 4.9m. Silting is a problem because of inadequate dredging facilities.

North of the Main Wharf, which lies in the inner harbor about 1.8 miles N of Fakir Point, channel depths range from 6.1 to 9.1m.

Main Wharf, about 1.5 miles N of Fakir Point, consists of a T-head pier with a berthing length of 98.8m across the outer face. The main wharf can accommodate vessels up to 99m in length and up to 4.9m draft at the T-head pier.

Supplemental berthing facilities consist of the Naval Pier at Fakir Point; Stone Pier, about 0.3 mile S of Main Wharf; and the oil pier, about 1.5 miles N of Main Wharf.

A tanker berth, 152.4m long, lies about 1 mile S of Main Wharf. A pipeline extends to the shore from this berth.

Five vessels moored to their own two anchors can be loaded simultaneously to drafts of 6.4m in the inner harbor.

Vessels moved from the inner harbor to the outer harbor can be loaded to a draft of 7.9m.

**Horseshoe Shoal** (20°05'N., 92°51'E.), a large body of shoal water with depths of 5.5m and less, extends about 5 miles SE from Fakir Point and then about 3.8 miles E, as a narrow tail about 1 mile wide. During the Southwest Monsoon, the sea breaks heavily over the outer part of this shoal.

Passage Rock, Savage Island, Peaked Rocks, and White Rocks lie on the E side of the fairway between 1.5m and 2.5 miles S of Fakir Point. Passage Rock, 4.3m high and the outermost danger, is bordered by deep water on all except its E side. A disused lighthouse lies on the NW point of Savage Island.

**Fakir Reef** (20°06'N., 92°54'E.), topped by drying rocks, extends almost 0.5 mile SSE from Fakir Point.

**Saunders Shoal** (20°07'N., 92°56'E.), a detached 5.5m patch, lies in the fairway about 2 miles ENE of Fakir Point.

**Flat Island** (20°11'N., 92°58'E.), low and brush covered, lies in the middle of the river about 5.3 miles NE of Fakir Point. Paw Kyun, a similarly-covered island, lies close N of Flat Island.

**Flat Island Spit** (20°10'N., 92°57'E.), an extensive mud shoal which dries in places, extends about 4.3 miles SW from the S side of Flat Island. The inner bar leading into Sittwe Inner Harbor lies between the SW end of this spit and the shoal bank extending E from the mainland.

**Aspect.**—**Fakir Point** (20°07'N., 92°54'E.), the NW entrance point of the Kaladan River, is low and marked by two conspicuous radio masts, a lookout tower, and a lighthouse. The disused lighthouse on Savage Island, on the E side of the fairway, is a useful landmark. A depth of 5.5m lies 0.8 mile SSE of Fakir Point.

**Myengun Kyun** (20°00'N., 92°58'E.), a high densely-wooded island about 17 miles long, lies S of the entrance of the Kaladan River about 2 miles SE of Fakir Point. Prain Daung, a high tableland located about 4 miles SSE of the N end of the island, rises to a height of 293m. This tableland is conspicuous from seaward, except when viewed from the SSE, where it is obscured by a high mountain. The latter appears as a sharp peak when viewed from the S, but as a saw-toothed ridge when viewed from the W. It has no conspicuous summit. Two prom-

inent hummocks, 106 and 137m high, lie near the N end of the island.

South Hummock, a conspicuous 73m high hill, lies near the S end of Myengun Kyun. This hill is a good landmark when viewed from the W.

A conspicuous white pagoda stands on a low hill about 1.5 miles N of Boronga Point, the S extremity of the island. Pagoda Summit, 225m high, backs this low hill and the white pagoda.

**Pilotage.**—Pilotage is compulsory for all vessels.

Licensed Burmese pilots are stationed at Fakir Point where the lookout tower is situated. Pilots board from a white launch, displaying the usual signals, about 4 miles S of Savage Island.

Port authorities must be notified 48 hours prior to a vessel's ETA.

In the event no pilots are available, a vessel should anchor about 3.5 miles SSW of Hodge Point until one can be obtained.

**Regulations.**—As silting may have occurred, it is advisable to obtain information prior to anchoring.

**Signals.**—Storm and weather signals are displayed at Sittwe; the Indian Extended System is used. Further information on these storm signals may be found in Pub. 160, Sailing Directions (Planning Guide) South Atlantic Ocean and Indian Ocean under "India—Signals."

**Anchorage.**—Temporary anchorage can be taken outside the outer bar, in depths of 12.8 to 14.6m, between 3.8 and 4 miles S of Savage Island. During the Southwest Monsoon, this anchorage may not be practicable.

When necessary, vessels can anchor in the outer harbor outside of the inner bar. Good anchorage berths lie N of Saunders Shoal Buoy, in depths of 6.7 to 9.4m. The ebb tide, which runs at a considerable rate in this vicinity, may cause vessels to drag their anchors. It is recommended that eight shots of chain be veered when anchoring anywhere within Fakir Point.

Cargo vessels usually anchor close offshore, in the inner harbor W of Flat Island Spit between the Main Wharf and Charugyea Chaung. Vessels drawing less than 5.5m can anchor abreast of the hospital, about 0.3 mile S of the Main Wharf.

Anchorage is prohibited in the area lying between the tanker berth and the shore.

**Directions.**—Deep-draft vessels approaching from the W during the Southwest Monsoon should steer 091° for Prain Daung on Myengun Kyun, which leads between Oyster Reef and Heckford Patch to the entrance range over the outer bar.

The beacon on White Rocks, in line bearing 350° with Savage Island Light, leads over the outer bar. A course of 330° should be steered from a position about 1.3 miles S of the beacon on White Rocks, which leads about 0.5 mile W of this beacon and about 0.3 mile W of Peaked Rocks. When W of Savage Island, course should be altered to pass 0.3 mile NW of Passage Rock and then a course of about 060° will pass about 0.3 mile SE of the buoy moored off Fakir Reef, which leads to a position with Fakir Point Light bearing 315°, distant 1 mile. Course should then be altered to the N between Fakir Point and Saunders Shoal, and thence to the inner bar or to the anchorage in outer harbor.

The strong S and W set of the ebb tidal current must be allowed for; vessels should be well kept up after passing the buoy off Fakir Reef and before turning toward the inner bar or the anchorage.

**7.34 Boronga Point** (19°49'N., 93°02'E.), the S extremity of Myengun Kyun, has a narrow ledge of rocks extending about 1 mile S from it. Some of these rocks dry.

The broken and irregular coasts between Boronga Point and Ramree Island, about 35 miles SE, is deeply indented by Hunters Bay and Combermere Bay.

**Peinnechaung Kyun** (19°57'N., 93°05'E.), a high and thickly-wooded island, lies 1 to 6 miles E of Myengun Kyun and roughly parallel to it.

**Research Strait** (19°58'N., 93°02'E.), which lies between Myengun Kyun and Peinnechaung Kyun, provides sheltered passage to small craft with local knowledge, especially during the Southwest Monsoon. The S end of the strait is deep, but shoals rapidly toward the N end. A shoal, with a least depth of 6.1m caused by a mud volcano, lies in the S part of the strait about 2.3 miles ENE of Boronga Point.

A chain of small islands, rocks, and foul ground extends about 7 miles SSE from the S End of Peinnechaung Kyun. Painaisa Island, 58m high, and Conspicuous Rock, 9.1m high, are easily distinguished. Bingham Rock, which dries, lies at the S end of the chain.

Painaisa Island has been reported to be a good radar target up to 14 miles.

Ingrinchaing Kyun, inconspicuous from seaward, lies about 3.5 miles E of and parallel to Peinnechaung Kyun. Linlok Kyun, a small island 80m high, lies close SE of the S end of Ingrinchaing Kyun. A chain of above and below-water obstructions extend about 4 miles SE from Linlok Kyun.

**Hunters Bay** (19°55'N., 93°19'E.), entered between Linlok Kyun and Kyunthaya about 9 miles SE, is shallow over most of its area and has no commercial value to ocean shipping.

**Kyunthaya** (19°43'N., 93°27'E.), bold and high, rises to an elevation of 262m at its NW end, the most conspicuous part of the island.

**7.35 Retkamauk Taung** (19°48'N., 93°28'E.), a conspicuous peak 480m high, lies about 4.5 miles NE of the NW end of Kyunthaya. In clear weather, this peak is sometimes visible for 45 miles when viewed from the S.

**Combermere Bay** (19°37'N., 93°29'E.) is entered between Kyunthaya and the N point of Nakhaungbauk Kyun, about 6.5 miles to the S. Nasapo Kyun, 111m high and conspicuous, lies about 2.3 miles SE of Kyunthaya. This wedge-shaped island makes a good landmark. Naungdaw Kyun, 1 mile E of Nasapo Kyun, attains an elevation of 256m in the conspicuous cone-shaped summit of Seppings Peak. The peak slopes gradually on its SE side.

**Black Rocks** (19°38'N., 93°29'E.), which dry 2.4m, lie in the entrance of Combermere Bay about 2.8 miles SSW of the SE extremity of Kyunthaya.

Many islands, islets, and shoals lie within the entrance of Combermere Bay. Only native craft attempt to enter it as a rule, because of these dangers and intricate channels.

Temporary open anchorage can be taken, in depths of 12.8 to 16.5m, mud with good holding ground, off the entrance of Combermere Bay.

A shoal, with depths of 9.1 to 11m, lies between 5 and 8 miles NW of Nakhaungbauk Kyun.

**7.36 Kyaukpyu Harbor** (19°27'N., 93°34'E.) is situated between Tankharo Island, on the S side of Combermere Bay, and the N side of the NW end of Ramree Island. The harbor provides sheltered anchorage. The town of Kyaukpyu lies on the N shore of Ramree Island. Fletcher Hayes Strait leads E from the harbor, E of Ramree Island, and then SE to Ramree Harbor, about 32 miles distant. Only boats use this passage.

The tides in Kyaukpyu Harbor are semidiurnal.

The velocity of the tidal current ranges from 1 to 3 knots. Seaward of Saddle Island, the flood sets N and the ebb sets S, frequently with considerable velocity. At neaps, the currents are very weak. Between the islands, the currents follow the directions of the channels.

**Tankharo Island** (19°30'N., 93°32'E.), long, narrow, and thickly wooded, lies about 1.5 miles SE of Nakhaungbauk Kyun and separates Combermere Bay from Kyaukpyu Harbor. Wood Harbor, a small inlet, lies close N of the NW end of Tankharo Island.

An extensive shoal area, with depths of 11m and less, extends about 2.5 to 4.3 miles W from the N half of the Island.

**Kyaukpandu** (19°29'N., 93°30'E.) lies about 2.3 miles SSW of the NW extremity of Tankharo Island and is 25m high. The rock, conical-shaped and topped by two sharp points close together, occasionally has its seaward side white washed which makes an excellent mark. The S and W sides of the rock are steep-to.

**North Shoal** (19°28'N., 93°30'E.), a small rocky patch, part of which dries, lies about 1.5 miles SSE of Kyaukpandu.

**Giles Bank** (19°28'N., 93°27'E.), small in extent with a least depth of 6.7m, lies about 2.8 miles WSW of Kyaukpandu and is the outermost danger on the N side of the entrance of Kyaukpandu Harbor.

Sinbaikchaing and Ledaung Kyun, two small islands, lie close W of the N half of Tankharo Island. The N island is low, whereas the S island is high. A small pagoda stands at the NW end of a ridge of hills on the N island.

Squadron Rocks, low and covered with scrub growth, lie close off the SW end of Sinbaikchaing.

**Laws Island** (19°26'N., 93°37'E.), 158m high and covered with foliage, lies in the E part of Kyaukpyu Harbor, about 0.8 mile SE of the S extremity of Tankharo Island. A shoal spit extends about 1 mile W from the NW side of Laws Island.

**7.37 Saddle Island** (19°25'N., 93°27'E.), located on the S side of the entrance of Kyaukpyu Harbor, rises to two rounded summits near its N end. This island lies about in the middle of a narrow area of shoal ground about 2.8 miles long and 0.7 mile wide. A group of drying rocks lie on a shoal about 1.5 miles S of the S end of Saddle Island. Bowman Passage lies between this latter group of rocks and the foul ground extending S from Saddle Island. A detached 5.5m patch lies about in the middle of the passage, 1.3 miles S of the S end of Saddle Island.

**Dacey Shoal** (19°27'N., 93°27'E.), over which the sea breaks heavily, lies at the N end of the foul ground extending N from Saddle Island.

Dickenson Channel, with depths of 14.6 to 20.1m, lies between Irrawaddy Rock and the foul ground which extends W from Saddle Island.

**Helen Passage** (19°24'N., 93°27'E.), the channel between Saddle Island and Ramree Island, is unsafe because of the numerous reefs and rocky patches which foul it. A close approach to Saddle Island should not be made from any direction.

Cap Islet, 45m high and conspicuous, lies about 1.5 miles SE of the S end of Saddle Island. Knot Islet, about 1 mile NNE of Cap Islet, is low with some scrub growth. Both islets lie on an area of foul ground which extends about 1 mile WNW and 1.8 miles NW from **Adams Point** (19°24'N., 93°29'E.) on Ramree Island.

Adams Point, the NW extremity of Ramree Island, is low and backed by a ridge of hills. Mount Peter, 101m high, lies about 0.5 mile E of Adams Point.

The coast between Adams Point and Georgina Point, about 3 miles NE, and then to Dalhousie Point 2 miles farther E, is bordered by several beaches and rocky points.

The NW end of Ladies Ridge, about 0.8 mile long, lies with its N edge about 0.5 mile S of Georgina Point. Conspicuous from the W are some trees lying at an elevation of 66m, near the NW end of the ridge.

**Bombay Shoal** (19°26'N., 93°31'E.), a rocky foul area with a least depth of 2.7m, lies at the outer edge of an area of foul ground extending from the coast almost 0.8 mile NNW of Georgina Point. A detached 4.9m patch lies about 1 mile W and a similar patch lies about 0.8 mile E of Bombay Shoal.

**7.38 Reliance Shoal** (19°27'N., 93°32'E.), a detached patch with a least depth of 3m, lies about 1.3 miles NE of Georgina Point.

Dalhousie Point, low and sandy, is well-marked by high trees. The ruins of a fort and a large clump of coconut trees lie on the point. A small shoal, with a least depth of 4.9m, lies about 0.5 mile SE of the point.

The N part of Ramree Island, which forms the S side of Kyaukpyu Harbor, is thickly wooded. A sandy beach, with a foreshore of mud which dries up to 0.3 mile offshore, lies on the S side of the harbor between Dalhousie Point and the entrance of Ngalapwe Chaung, about 0.8 miles SE.

Soundings in Ngalapwe Chaung differ from charted depths. In 1964, there was a least depth of 4.8m in the channel leading to the piers within the creek. The least depth was found on the alignment of the entrance range across the bar at the mouth of the creek.

Anchorage can be taken SE of Dalhousie Point, in depths of 16.5 to 18.3m, mud, with the pier bearing between 271° and 288°, 0.5 mile distant. Care should be taken to avoid the shoal and the wreck SE of Dalhousie Point. Strong eddies occur at springs.

Vessels approaching from the W or NW should enter Kyaukpyu Harbor by steering 091° for Kyaukpandu and remain on that course until North Terrible bears more than 212°. When North Terrible bears more than 212°, or when the N extremity of Saddle Island bears 119°, course should be altered to 099° to enter the harbor, steering for Laws Island Light and passing S of Giles Bank and North Shoal and N of Dicey Shoal and Reliance Shoal. Having passed Reliance Shoal, course may be shaped for the anchorage SE of Dalhousie Point.

Vessels approaching from the S may pass E of the Terribles. The approach should be made with the summit of **Nasapo**

**Kyun** (19°39'N., 93°33'E.) in line bearing 029° with the N point of Nakhaungbau Kyun. When South Terrible bears 316°, course should be altered to 001° to pass about 2 miles W of Irrawaddy Rock. When the summit of Nasapo Kyun bears 040°, and is well open NW of Nakhaungbau Kyun, it should be steered for on a course of 040° until Paungnetkyi Light bears 099°. The directions previously given should then be followed for entering the harbor.

**7.39 Kyaukpyu** (19°25'N., 93°33'E.) (World Port Index No. 49630), a small town and trading center, lies near the shore about 0.8 mile SE of Dalhousie Point.

An iron pier, about 0.2 mile SSE of Dalhousie Point, has a depth of 3.7m alongside. A submarine pipeline has been laid between a tanker berth and the shore, about 0.8 mile ESE of this pier.

An all-weather jetty, with a 73.2m long pontoon head, safe for coastal vessels to berth alongside at any time, lies on the W bank of the Ngalapwe Chaung, about 1.5 miles above its entrance. A depth of 5.5m exists alongside the pontoon. A T-head wooden pier, in poor condition, is also situated in the creek.

**Ramree Island** (19°07'N., 93°47'E.) is about 43 miles long in a NW and SE direction and about 20 miles wide across its center, the widest part of the island.

**West Point** (19°22'N., 93°28'E.), the W extremity of Ramree Island, is located about 2 miles SSW of Adams Point.

The coast between West Point and Thames Point, about 15 miles SSE, has a rocky appearance and rises steeply to a range of high hills. Outer Peak, North Paps, and Tree Summit are the most prominent summits of this range. All of these summits are easily identified when not obscured by the coastal range.

All of the dangers along this section of coast are contained within the 9.1m curve, which nowhere lies more than 1 mile offshore. Research Rock, about 2.8 miles SSW of West Point, has been previously described in paragraph 7.29.

## Burma—Thames Point to Cape Negrais

**7.40 Thames Point** (19°09'N., 93°36'E.), a low-lying projection marked by some tall trees, is located on the W coast of Ramree Island, about 12 miles NNW of the entrance of Mun Aung Strait.

The coast S of Ramree Island to Cape Negrais is rocky, irregular, and indented by numerous small bays, none of which provide good shelter during the Southwest Monsoon.

From Andrew Bay to the S, the coastal land is hilly, mountainous, and marked by high peaks which are visible from seaward and serve as useful landmarks. The Arakan Yoma Range rises from the mountainous country along the W edge of Burma. South of Taungnela, the range is lower and terminates in the vicinity of Cape Negrais.

Ramree Harbor, the Saudoway River, and Andrew Bay are of some commercial importance.

**Depths—Limitations.**—Numerous small islands, rocks, and shoals lie inside the 183m curve SE of Mun Aung Island to a position about 20 miles W of Bluff Cape.

Between Gwa Bay and Cape Negrais, numerous dangers also lie off the coast within the 35m curve. St. John's Rocks and the Northwest Group of the Calventuras Islands lie outside the 35m curve.

Depths within the 18 and 35m curves along the coast between Ramree Island and Cape Negrais are irregular for the most part.

**7.41 Nantha Kyun** (18°04'N., 94°05'E.), an active mud volcanic island 168m high, lies about 20 miles WNW of Bluff Cape. The island is thickly wooded, but has a bare scar extending from the crater to the water on its W side.

Good anchorage can be taken, in depths of 14.6 to 18.3m, sand and mud, about 1 mile N of the island. The dangers lying E of Nantha Kyun can be avoided by passing within 3 miles E of the island.

**Brougham Shoal** (18°09'N., 94°07'E.), rocky and dangerous, with a least depth of 1.8m, lies about 4.5 miles NNE of Nantha Kyun. The sea usually breaks over this danger. Detached shoal patches, with depths of 11 to 16.5m, lie up to 2 miles NE of the shoal.

**Carpenter Shoals** (18°15'N., 94°02'E.) consist of two separate shoal areas, one with a least depth of 4.9m and the other with a least depth of 6.7m. The shallowest patch lies about 10 miles NNW of Nantha Kyun; the deepest patch lies about 3 miles WNW of the shallowest patch. Numerous coral heads and shoal patches, with depths of 12.8 to 18.3m, lie within a radius of 6.5 miles of the E patch.

**New Shoal** (18°05'N., 94°15'E.), a small rocky patch with a depth of 5.5m, lies about 8.8 miles ENE of Nantha Kyun.

**Satellite Ledge** (18°07'N., 94°18'E.), a coral shoal with a depth of 25.6m, lies about 12.5 miles ENE of Nantha Kyun.

**Vestal Shoal** (18°03'N., 94°13'E.), a small coral patch with a least depth of 1.5m, lies about 6.5 miles ESE of Nantha Kyun. Robinson Shoal, about 1.8 miles E of Vestal Shoal, has a least depth of 1.2m coral. Breakers usually mark both shoals.

**Investigator Ledge** (18°01'N., 94°09'E.), a coral patch with a least depth of 21.9m, lies about 3.5 miles SE of Nantha Kyun.

William Shoal, a rocky patch with a least depth of 4.6m, lies about 13 miles ESE of Nantha Kyun. A narrow shoal bank extends about 5 miles WNW from William Shoal and has depths of less than 36.6m.

**7.42 Thyne Bank** (17°46'N., 94°19'E.), with a least depth of 27.4m, lies about 9.5 miles WNW of **Abhay Island** (17°45'N., 94°29'E.). White Bank, with a least depth of 21.9m, lies about 5.3 miles WSW of the same island. Both banks are of coral formation.

**St. John's Rocks** (17°28'N., 94°20'E.), a group of four rocks, lie about 20 miles SSW of Abhay Island. The largest rock is 12.2m high and resembles a church when viewed from the N.

The **Calventuras Islands** (16°54'N., 94°16'E.) comprise the Northwest Group, located about 10 miles W of **Broken Point** (16°55'N., 94°23'E.) and the Southeast Group. North Island and South Island lie 7 miles WSW and 8 miles SW, respectively, of Broken Point.

The highest island of the Northwest Group is 38m high. In the Southeast Group, North Island is 39m high and South Island is 24m high. Their well-wooded summits form good landmarks.

Navigable channels lie between the Northwest Group and the Southeast Group, and between the latter group and the mainland. The channel between North Island and South Island should not be attempted. A rock, which dries 2.1m, obstructs

the channel midway between the islands and two large rocks lie close N of South Island.

**Juanita Shoals** (16°00'N., 93°40'E.), a coral bank with a least depth of 29.3m, lies about 30 miles W of Cape Negrais.

The coastal tides between Thames Point and Cape Negrais are semidiurnal.

Tidal currents along the SW side of Mun Aung Island follow the general trend of the coast. Between the SE end of Mun Aung Island and Ye Kyun there is a considerable indraft. During the Northeast Monsoon, the current may set to the S.

The currents in the vicinity of the shoals, lying W of the coast between Andrew Bay and Bluff Cape, are influenced and affected by the monsoons and the tides, both in velocity and direction. The current sets strongly across these shoals.

The current between Gwa Bay and Cape Negrais sets with the direction of the coast, N or S according to the prevailing monsoon, and barely exceeds a velocity of 1 knot.

**Rocky Point** (19°00'N., 93°41'E.), a low, rocky, reef-fringed projection marked by a white pole beacon, lies on the SE side of Ramree Island, about 10 miles SSE of Thames Point. All of the known dangers along this section of coast lie within 1.5 miles of the shore.

## Burma—Mun Aung Strait

**7.43 Mun Aung Strait** (Cheduba) (18°58'N., 93°38'E.) lies between Ramree Island and Mun Aung Island and is entered between Rocky Point and Searle Point, the N extremity of Mun Aung Island. The strait is about 4.5 miles wide, but the navigable channel is much less because of the fringing dangers along the sides. A least charted depth of 6.4m exists along the recommended track leading through the strait.

**Beacon Island** (18°56'N., 93°27'E.) lies near the outer end of an extensive area of foul ground which extends about 10.5 miles W from Searle Point. This stony 9.1m high island is marked by a white stone beacon on its highest part.

Mud volcanoes frequently raise islets and shoals in the vicinity of Mun Aung Strait. These islets may disappear suddenly, leaving dangerous shoals.

Several volcanic shoals and islets were reported to lie between 4.8 and 8 miles NNW of Beacon Island. The dangers break heavily during the Southwest Monsoon.

Anchorage can be taken, in depths of 9.1 to 11m, good holding ground, about 1.8 miles NE of Beacon Island, with the lighthouse bearing about 215°, or in a depth of 11m with the lighthouse bearing 242°, distant 4.8 miles. Small vessels can anchor, in a depth of 6.4m, mud and sand, about 1.5 miles NNE of Searle Point.

**7.44 Northeast side of Mun Aung Strait.—Zikha Taung** (18°56'N., 93°51'E.), the highest peak on Ramree Island, rises to a height of 305m about 10 miles ESE of Rocky Point. Dark Hill, 79m high and wooded, lies near the shore about 2.8 miles E of Rocky Point. Helmy Hummock, a small wooded hill about 2.8 mile SSE of Dark Hill, shows up well from the NW. A 123m high dome-shaped hill lies near the coast, about 4 miles NW of the S end of Ramree Island, and is a useful mark for vessels entering the strait from the WNW.

Shoal water, with depths of 5.5m and less, fronts the S coast of Ramree Island at distances up to 1.3 miles between Rocky

Point and Button Island, about 9 miles ESE. Between this island and the S extremity of Ramree Island, about 8.5 miles farther ESE, similar depths extend up to 0.8 mile offshore.

Middle Ground, an extensive shoal area with depths of 4.3 to 5.5m, occupies about 0.7 mile of the channel to the E of the recommended track through the strait between Sandy Point and the S extremity of Ramree Island. Between Middle Ground and the coastal shoal to the W, the channel is about 1 mile wide and has a least depth of 6.4m. The channel between Middle Ground and the S coast of Ramree Island is about 0.3m mile wide with a least depth of 6.1m.

**7.45 Southwest side of Mun Aung Strait.**—The N coast of Mun Aung Island is generally low and fronted by foul ground; above-water rocks lie on parts of this foul ground.

A patch, with a depth of 5.5m, lies about 3 miles SSW of Rocky Point and is the furthest west of a line of shoals which extends about 5 miles ESE. The shallowest patch has a least depth of 2.4m. The recommended track passes N of these dangers.

A mud volcano shoal, with a least depth of 2.7m, lies about 1.8 miles NE of Sandy Point and close W of the recommended track. Great caution must be exercised when navigating in this vicinity.

The E coast of Mun Aung Island is low for about 8 miles and then becomes high as far S as the southernmost point of the island.

On Chaung enters the sea about 2 miles S of Sandy Point, and is marked by a white pagoda about 1 mile WNW of its entrance.

Mun Aung Village lies about 0.8 mile within the creek entrance.

The coastal bank, as defined by the 5.5m curve, extends from 1 to 6 miles offshore from the E side of Mun Aung Island. Taik Kyun, 78m high with an even-rounded summit, lies near the outer edge of this shoal, about 10 miles SSE of Sandy Point.

Ywathit Taung and Taungni Taung, both on Mun Aung Island, and the high hills on Ramree Island will be visible to vessels approaching Mun Aung Strait from the NW. Helby Hummock and Dark Hill are seen over the low ground of Rocky Point.

From a position about 5.5 miles W of Rocky Point with Zikha Taung bearing 102° and Ywathit Taung bearing 170°, vessels should steer 109° on the recommended track indicated on the chart and toward the dome-shaped hill on Ramree Island. When Dark Hill bears 338°, course should be altered to 158°. If Dark Hill is kept bearing not more than 338° astern, the mud volcano shoal NE of Sandy Point will be cleared to starboard. When 2 miles have been made on the 158° course, a bare, blunt, conical hill will appear open W of Dark Hill.

As the edge of the coastal bank E of Mun Aung Island is fairly steep-to in places, preference should be given to the E or Middle Ground side of the channel. When Taik Kyun bears 203°, Middle Ground will have been cleared. From abeam of Taik Kyun, the bare blunt conical hill and Dark Hill will be just visible over the horizon and will appear as a hill with twin summits.

**7.46 Mun Aung Island** (18°47'N., 93°38'E.), roughly triangular in shape, lies about 5.8 miles SW of the SW side of

Ramree Island. The island is well-wooded and marked by several high hills on its W and SW sides.

**Ywathit Taung** (18°48'N., 93°37'E.), about 7 miles S of Searle Point, is 172m high and conspicuous. Taungni Taung, 196m high, lies about 2 miles farther S and has two pagodas on its summit. Palengu Taung, 257m high, lies 7 miles SE of Taungni Taung on the S part of Mun Aung Island.

The N and E sides of the island have been previously described in paragraph 7.44. West Hill, 186m high and wooded, lies 7 miles SE of the NW point of the island.

The high SW coast of Mun Aung Island is bold and fronted by above and below-water rocks.

**Henry Rocks** (18°52'N., 93°27'E.), a group of above and below-water rocks, lie on a reef about 2.3 miles WSW of the NW point of Mun Aung Island. The highest rock rises to a height of 5.2m.

Oyster Rock, above-water, lies about 1.8 miles SE of Henry Rocks and has been reported to be a good radar target up to 22 miles.

A rock, awash at LW, lies about 1.3 miles offshore W of West Hill.

**Pyramid Bay** (18°41'N., 93°39'E.), located near the S end of Mun Aung Island, provides good anchorage to native craft during the Northeast Monsoon. A high pyramidal rock lies off the entrance of this bay.

A reef, marked by numerous above-water rocks, extends up to 2 miles S from the S end of Mun Aung Island.

## Burma—Islands and Approaches to Ramree Harbor

**7.47 Ye Kyun** (18°37'N., 93°47'E.), Taung Kyun and numerous rocks lie on the foul ground which extends about 8 miles SE from the S extremity of Mun Aung Island.

Ye Kyun lies near the edge of the foul ground about 3 miles S of Taik Kyun. Ye Kyun, reef-fringed, is generally low, but rises to an elevation of 32m in its central part. Several detached reefs lie between the two islands.

Taung Kyun, 4.9m high, lies about 0.8 mile S of Ye Kyun. South Rock, which dries 2.4m, lies near the outer edge of the foul ground, about 0.5 mile S of Taung Kyun.

There is no clear passage between Mun Aung Island and Ye Kyun. Taung Kyun should not be approached within a distance of 2 miles from any direction.

**Ramree Harbor** (19°01'N., 94°02'E.) lies between the SE side of Ramree Island and the mainland. Ramree Roads and the entrance of the harbor are approached from the NW through Mun Aung Strait and from the SW through Heywood Channel, Childers Channel, and the channel W of Nerbudda Shoal, all of which lie between numerous islands and dangers.

**West Shoal** (18°30'N., 93°50'E.), a group of sunken rocks, lies about 5 miles SSE of Taung Kyun. The rocks are sometimes visible at LW when the sea breaks over them. Taung Kyun, bearing more than 338°, leads W of this danger.

**Sail Rock** (18°33'N., 93°51'E.), 2.4m high and small in extent, lies almost 4.8 miles ESE of Taung Kyun. False Rock, 3m high, lies about 4.5 miles NNE of Sail Rock and is joined to it by a chain of sunken rocks and reefs.

**Heywood Channel** (18°34'N., 93°49'E.) lies between Sail Rock and False Rock, and the shoal ground extending E from Taung Kyun and Ye Kyun. In the narrowest part of this channel NW of False Rock, there is a least depth of 9.8m. Passage through this channel is not recommended.

**7.48 Unguan Island** (18°26'N., 93°55'E.), about 11 miles SE of Taung Kyun, is 40m high with a dense clump of trees on its summit. This island lies on the W side of an area of foul ground about 2 miles long and 1.3 miles wide. A detached 7.3m patch was reported to lie about 0.5 mile NW of Unguan Island.

**East Reef** (18°30'N., 93°56'E.), an area of foul ground which uncovers 1.2m, lies about 4 miles NNE of Unguan Island. Shoal depths of 9.1m and less extend about 0.8 mile NE from the reef.

**Cutters Patch** (18°28'N., 93°54'E.), a detached 4.6m patch, lies about 2 miles NNW of Unguan Island.

**Childers Channel** (18°30'N., 93°52'E.) lies between West Shoal, Sail Rock, and False Rock to the W and Unguan Island, Cutters Patch, and East Reef to the E. This channel, which has a least depth of 16.5m, is recommended when West Shoal is breaking.

**Nerbudda Shoal** (18°22'N., 93°59'E.), irregular in shape with depths of 1.2 to 18.3m, lies centered about 5.3 miles SE of Unguan Island. The channel between Unguan Island and Nerbudda Shoal is almost 3 miles wide at its narrowest part and has a least depth of 18.3m. This channel is frequently used because of the light on Unguan Island. A patch, with a depth of 1.2m which breaks, lies on the SW end of Nerbudda Shoal. This shoal is the remains of a volcanic eruption which occurred in 1908.

**Osprey Rocks** (18°40'N., 94°05'E.), 2.4m high, lie within the coastal bank about 5.5 miles SE of Magyi Kyun (18°44'N., 94°00'E.), an island on the E side of Ramree Roads.

Gungasager Rocks, 0.9m high, lie at the SW end of a narrow shoal about 4.8 miles SSE of Osprey Rocks. A detached area of foul ground, with depths of 6.7 to 7.9m, lies about 1.5 miles N of Gungasager Rocks.

**Pantaw Rocks** (18°40'N., 94°09'E.), a group of above and below-water dangers, lie about 4 miles ENE of Osprey Rocks. The N rock lies 0.6m high.

**7.49 Ramree Harbor** (19°00'N., 94°00'E.) comprises the estuary of the Kaleindaung River, which flows into the sea between the S extremity of Ramree Island and the mainland to the E.

A group of islands obstructs and divides the harbor entrance into two channels, the E and W entrances. The W or main entrance channel is known as The Gates. Ramree Roads lie about 5 miles SW of The Gates.

The tides in Ramree Harbor are semidiurnal.

In the harbor at springs, the flood sets N and the ebb sets S at a velocity of 3 knots. The tidal current sets through The Gates in the direction of the channel at velocities of 3 to 4 knots.

**Magyi Kyun** (18°44'N., 94°00'E.), the S island in the approach to Ramree Harbor, lies about 6.3 miles SSE of the S extremity of Ramree Island. This 80m high island is surrounded by foul ground. Nyaunghin Kyun, a small islet, lies about 0.5 mile SW of Magyi Kyun and marks the SW edge of the foul

ground surrounding the latter island. A small islet lies about in the middle of the foul ground which extends about 1.5 miles W from the W extremity of Magyi Kyun.

**Sagu Kyun** (18°48'N., 93°58'E.), 106m high near its SW side, is the largest island in the approach to Ramree Harbor and forms the S side of The Gates. Channel Clump, a lone conspicuous group of high trees, lies near the N coast of Sagu Kynun about 1.3 miles WSW of the N point of the island, and forms a useful landmark for The Gates from the SW. Big Rock, 18.3m high, lies on the foul ground close off the S side of Sagu Kyun.

Between the 10m curves in Ramree Roads SSW of The Gates, there is a least charted depth of 9.6m. Depths elsewhere in the approach channel range from 10.1 to 43.9m. Fishing stakes are usually found in the channel about 2 miles S of The Gates.

Channel depths within The Gates are for the most part deep, ranging from 9.6 to 65.9m. Harbor depths up to 10 miles within The Gates range from 10.1 to 20.1m.

Alligator Rocks, which dry, lie near the N shore of Sagu Kyun and are surrounded by deep water. A beacon lies on the shore reef extending about 1.3 miles NE from the NE extremity of Sagu Kyun.

The E entrance of Ramree Harbor lies between the E side of Sagu Kyun and the mainland, but is fouled by numerous reefs and shoals and is available only to fishing vessels and small craft with local knowledge.

**7.50 Dragon Shoal** (18°53'N., 93°59'E.), parts of which dry, is about 4.3 miles long and narrow and lies with its S end 1 mile NNE of the N extremity of Sagu Kyun. White Rock, 0.9m high and one of a group of above-water rocks on the shoal, lies about 1.3 miles S of the N end of Dragon Shoal.

Two white marks lie on the W shore of the harbor 1.3 and 3.8 miles NNE of the S extremity of Ramree Island. The fairway of the channel between Dragon Shoal and the shore bank to the W is about 0.8 mile wide with depths of 10.5 to 18.3m.

**Flat Reef** (18°55'N., 94°00'E.), which covers at HW, lies between the N end of Dragon Shoal and the shore bank to the W. The SE and NW sides of the reef are marked by beacons. The reef may be passed on either side, but the channel to the E is preferred.

**Low Islet** (18°58'N., 94°00'E.), marked by a beacon and steep-to on its E side, lies about 2.3 miles N of Flat Reef and about 0.5 mile SE of Kyangyaung Point, a high bluff.

A rocky patch, almost awash at low water springs, lies about 0.8 mile N of Low Islet. This patch lies about midway between Low Islet and a white mark on the W shore about 1.5 miles NNW of Low Islet.

**Oyster Rock** (19°00'N., 93°59'E.), which covers at HW and is marked by a beacon, lies 3 miles N of Low Islet.

Cutters Rock lies 1 mile N of Oyster Rock. For about 4 miles N of Cutters Rock to a position abeam of the entrance of the Ramree River, there are depths of 5.9 to 7.3m, but the channel is narrowed by mud banks.

**7.51 Middle Bank** (19°04'N., 93°59'E.) lies about 1 mile SW of an island located 3 miles E of the Ramree River entrance. This bank partly dries and has a group of rocks awash on its W side.

Nepal Rock, with a least depth of 2.7m, lies about C mile E of the Ramree River entrance. The rock is sometimes marked by a swirl.

Between Nepal Rock and the narrow entrance of the Mingaug Chaung, about 2 miles farther N, depths of 7.3 to 12.8m exist in the fairway.

Fishing stakes are placed at various places in the harbor and may constitute a hazard to navigation.

Excellent anchorage can be taken, in depths up to 18.3m, in all parts of Ramree Harbor, not obstructed by shoals or fishing stakes.

Anchorage can be taken, in a depth of 11m, between the W side of Dragon Shoal and the shore bank to the W, about 3.8 miles NNE of the S end of Ramree Island.

Vessels may approach Ramree Harbor from the S and in such case the channel between Unguan Island and Nerbudda Shoal is recommended. Unguan Island must not be brought to bear less than 350° until well N of Nerbudda Island, when a 046° course may be steered through mid-channel.

Vessels approaching from the SE should pass SW of Gungasager Rocks and Osprey Rocks at distances of 2 and 2.5 miles, respectively. Vessels should pass between 2.5 and 4 miles W of Magyi Kyun and then a N course towards The Gates then steered, taking care to avoid fishing stakes in the near approach to the entrance of the harbor. A course of 054° leads through The Gates in mid-channel.

Then, when the N point of Sagu Kyun bears 140°, course should be altered to the NNE and the W of the two clumps of trees on the N coast of Sagu Kyun kept bearing 208° astern. This leads between Dragon Shoal and the shoals and rocky patches lying off the Ramree Island shore and between Dragon Shoal and Flat Reef. Vessels should be kept to the deeper water towards Flat Reef. Caution is advised. Having passed Flat Reef, course should be shaped to pass about 0.5 mile E of Low Islet and then at similar distances E of Oyster Rock and Cutters Rock, taking care to avoid any fishing stakes.

When N of Cutters Rock, vessels approaching the entrance of the Ramree River should keep about 0.8 mile off the W shore of the harbor. Caution is necessary between White Rock and Flat Reef, and in the vicinity of Oyster Rock, Cutters Rock, and Nepal Rock.

Mingaug Chaung connects the head of Ramree Harbor with the inner part of Kyaukpyu Harbor, via Fletcher Hayes Strait. Vessels drawing 2.4m or less can use this channel.

The Ramree River has its entrance almost 8 miles N of Kyangyaung Point and about 17 miles within The Gates. At ordinary HW, vessels drawing 2.7m or less can enter the river and proceed to within 1.5 miles of the village of Ramree. Local knowledge is necessary.

A road connects the village with a wharf about 5 miles within the river's entrance.

The entrance of the shallow **Kayaing River** (18°45'N., 94°09'E.) lies about 11 miles SE of the N point of Sagu Kyun.

A series of long, low islands forms the coast for about 14 miles SSE of the entrance of the Kayaing River to the entrance of the Sandoway River. The Kyaukpyu mountain range backs this part of the coast. The SW point of Singaung Kyun, the southernmost island along this section of coast, lies on the N side of the entrance of the Sandoway River. A rest house stands on the SW point.

Several detached reefs and rocks, which dry, lie between the entrance of the Kayaing River and Magyi Kyun to the W. The positions of these dangers can best be seen on the chart.

**7.52 Whalers Rock** (18°37'N., 94°12'E.), awash, lies about 2.5 miles WNW of the N end of Singaung Kyun and 2 miles offshore.

Between Whalers Rock and Drunken Sailor Rock, about 5 miles to the S, the coast is bordered by an area of foul ground which extends up to 2.5 miles offshore in places.

**Drunken Sailor Rock** (18°33'N., 94°13'E.), which nearly dries and breaks at LW, lies about 2 miles W of the SW point of Singaung Kyun. Under certain conditions of tide and wave height, the rock may be visible at other times.

Zalat Taung, an island 52m high, lies on the S side of the entrance of the Sandoway River, about 0.8 mile SW of the SW point of Singaung Kyun. Foul ground extends about 0.8 mile SW from the central part of the island and a detached 9.1m patch lies about 0.5 mile farther SW.

Singyat Kyun lies close SE of Zalat Taung and is separated from it by a foul channel.

**Gaw Taung** (18°31'N., 19°16'E.), a 168m high hill, lies near the coast about 3 miles SE of the Sandoway River entrance. This hill is a good landmark, being the highest elevation along this section of coast.

Open anchorage can be taken, in a depth of 11m, mud, about 1.3 miles N of Drunken Sailor Rock, with the rest house on Singaung Kyun bearing 120°, distant 2.3 miles.

During the Northeast Monsoon, vessels with local knowledge can anchor about 0.8 mile S of Drunken Sailor Rock. During the Southwest Monsoon, this anchorage is exposed and dangerous.

A heavy surf breaks on this coast in the vicinity of the Sandoway River entrance when the wind is W of N.

**7.53 The Sandoway River** (18°33'N., 94°13'E.) is entered between the SW point of Singaung Kyun and Zalat Taung Island. The river is tidal for a short distance above the town of Sandoway. Vessels drawing 2.4m can ascend the river at ordinary HW from its entrance to within 4 miles of the town. Only small craft can be accommodated.

The low sandy rock-fringed coast between Gaw Taung and Apaw-ye Kyun, about 9 miles SSE, is backed inland by some isolated hills and ranges.

**Apaw-ye Kyun** (18°23'N., 94°19'E.), a bluff island, rises to an elevation of 90m. Mud volcanoes were reported to lie about 1.8 miles W and almost 1 mile SSW of this island.

**Andrews Bay** (18°20'N., 94°20'E.), entered between an unnamed point and Money Point, about 3.3 miles SSW, is clear of dangers in its central part, but bordered by foul ground around its shores and inner reaches.

Money Summit rises to an elevation of 0.8 mile SSW of Money Point. This summit, topped with detached trees, is a conspicuous landmark and easily identified from the offing.

**Mills Patch** (18°19'N., 94°15'E.), the shoal remains of a mud volcano with a least depth of 6.1m, lies about 4.5 miles W of Money Point and is a hazard to vessels bound for Andrew Bay.

Depths are regular in the near approach to Andrew Bay, decreasing gradually to a depth of 18.3m between the entrance points. Depths within the bay, up to 2 miles within the en-

trance, range from 18.3 to 9.1m, but much less elsewhere. Depths have been reported to be less than charted in Andrew Bay.

Good anchorage is provided with good holding ground, but the bay is exposed to the full force of the Southwest Monsoon. Shelter is provided from the force of the monsoon in Mayo Bay in the SE part of Andrew Bay, but the swinging room is restricted by a shoal patch in the middle part of the bay.

**Sadoway Bay** (18°22'N., 94°21'E.), a small shallow indentation, lies on the N shore of Andrew Bay close within the entrance. Two beacons, in line bearing 348°, lead to the anchorage within the bay.

A beacon lies on the E side of the bay about 0.8 mile E of the lighthouse on the N entrance point of Andrew Bay. A radar buoy is moored about 0.5 mile E of the same lighthouse.

**7.54 Mayo Bay** (18°18'N., 94°22'E.) lies near the SE corner of Andrew Bay and provides sheltered anchorage during the Southwest Monsoon.

Berthing facilities consist of a pontoon jetty and a 112.8m causeway with a depth of 5.2m alongside. Beacons, in line bearing 147°, lead to a position close off the head of this pier.

A large promontory, with Money Point as its NW extremity, extends about 5 miles W from the general line of the coast close S of Andrew Bay. Mawyon Pagoda, conspicuous from seaward when the sun shines on it, stands on the SW part of this promontory.

Dangerous foul ground, marked by numerous above and below-water rocks, fronts the W side of the promontory up to 3.5 miles offshore. A detached drying rocky patch lies about 4.3 miles WSW of Money Point and is the outermost danger. A drying rock lies about 1.3 miles S of the SW extremity of the promontory; a foul patch lies about 1.5 miles SE of the same extremity.

**Remarkable Rock** (18°14'N., 94°22'E.), 9.1m high and conspicuous, lies about 2.5 miles ESE of the pagoda mentioned above.

The shallow Kamgit River and the Salu River enter the sea about 4.8 miles SE and 6.8 miles SSE of Remarkable Rock.

**7.55 Bluff Cape** (18°00'N., 94°26'E.), about 14 miles SSE of Remarkable Rock, rises steeply from the sea to a height of 137m and is a fairly conspicuous landmark. The shallow Kyeintali River discharges about 2 miles E of the cape.

Between Bluff Cape and the Gwa River, about 24 miles SSE, the coast is bordered by several hills and peaks which are easily identified from the offing. Taungnela, 1,146m high, lies about 12.5 miles E of Bluff Cape. Kungyaung Taung, 707m high, lies about 14 miles SE of Bluff Cape. High Peak, 12 miles SSE of Bluff Cape, rises to a height of 585m. Taunglun Taung, 253m high, lies almost 4 miles S of High Peak and Button Hill, 124m high, lies 3 miles S of Taunglun Taung.

The Sathwa Chaung (Hswathwa River), almost entirely obstructed by a reef at its entrance, discharges into the sea about 14 miles S of Bluff Cape. A narrow passage leads through the reefs to the village of Hswathwa just within the entrance.

An area of foul ground, marked by numerous drying rocks, extends about 2.5 miles SW from the entrance of the Sathwa Chaung. A 9.1m patch lies about 0.8 mile W of the outer edge of this foul ground.

**Gwa Bay** (17°37'N., 94°34'E.) is entered between a 63m high peninsula and an unnamed point about 2 miles S.

The N entrance point is fringed by foul ground which extends about 0.5 mile SSW and 0.8 mile W from it. A detached drying reef lies 1.8 miles W of the S entrance point. A similar reef lies 0.5 mile SSW of this reef. **Gwa Kyun** (17°34'N., 94°31'E.), 44m high, lies near the outer edge of the foul ground which extends about 3 miles SW from the S entrance point of Gwa Bay. The island is an excellent landmark.

Anchorage is provided, in depths of 7.3 to 11m, within Gwa Bay, but W winds are experienced.

During the Northeast Monsoon, vessels occasionally call at the village of Gwa on the E side of the entrance of the river on the S side of the bay.

The coast between Gwa Bay and Broken Point, about 42 miles SSW, is indented by several small bays which provide anchorage in good weather. During the Southwest Monsoon, little shelter is provided except in Danson Bay.

Depths of 4.9 to 5.5m lie within 2 miles S of Gwa Island and up to 1.8 miles offshore. With the exception of the above depths, all of the other dangers lie within 1.3 miles of the shore between Gwa Island and Bomie Bay, about 13.7 miles to the S.

**Bomie Bay** (17°20'N., 94°33'E.), small in extent and shallow, is available only to small craft.

**7.56 Pontamau Island** (17°19'N., 94°30'E.), 54m high and reef-fringed, lies about 3 miles W of Bomie Bay. Myauk Island lies near the outer edge of the shoal ground which extends about 0.5 mile NE from Pontamau Island.

Round Hill, 194m high, and Thumb Hill, 238m high, lie 5.3 and 8 miles SSE of Pontamau Island. Both hills are conspicuous and form excellent landmarks.

**Danson Bay** (17°12'N., 94°29'E.) is entered about 6 miles SSW of Pontamau Island; unlike other bays found along this section of the coast, is sheltered from S and SW winds. Foul ground, marked by numerous rocks, extends about 3.5 miles W from the SW entrance point of Danson Bay. West Sandy Islet, 4.6m high, lies on this foul ground about 0.5 mile from its outer edge.

The central part of the bay has depths ranging from 5.5 to 14.6m, but its shores are bordered by foul ground which extends up to 1 mile offshore in places.

Large vessels can anchor, in depths of 9.1 to 11m, with Round Hill bearing 056° and Thumb Hill bearing 098°. This anchorage is sheltered from all except NW winds. Vessels, when entering, should give West Sandy Islet a berth of 2 miles.

The coast between West Sandy Islet and High Island, about 9.3 miles S, is indented by an open bay in its N part and fringed by shoal ground which extends up to 2 miles offshore in places. High Island rises to a height of 40m. Shoal ground, with depths of 5.5m and less, extends about 3.3 miles NW from High Island. Sandy Island, 10.5m high, lies on this shoal ground about 1.3 miles NW of High Island.

**7.57 The Kyaungtha River** (16°57'N., 94°26'E.), entered close N of High Island, is shallow and available only to native boats.

Between Broken Point, about 3.3 miles SW of High Island, and Koronge Island, about 24 miles SSW, the coast is rocky and irregular.

The Thitpok River enters the sea about 11 miles S of Broken Point. Round Island, 39.6m high, lies about 0.8 mile N of the entrance and 0.5 mile offshore. The river is available only to boats.

**Vibart Shoal** (16°43'N., 94°19'E.), small in extent and irregular, with a least depth of 4.6m, lies about 2.8 miles SW of Round Island.

**Alligator Head** (16°36'N., 94°19'E.) is the S extremity of a large, rocky promontory about 19 miles S of Broken Point. When viewed from the offing, it resembles an alligator's head facing S.

**Ngayot Taung** (16°32'N., 94°24'E.), one of the most conspicuous peaks along this coast, rises to a height of 401m, about 6.3 miles SE of Alligator Head.

**Milestone Rock** (16°40'N., 94°17'E.), a detached steep-to rock 12.2m high, lies 4.5 miles NNW of Alligator Head.

**Little Quoin Island** (16°39'N., 94°20'E.) lies about 3.5 miles NNE of Alligator Head.

**High Island** (16°37'N., 94°18'E.) lies about 2 miles NW of Alligator Head, North Reef, South Reef, and West Reef lie about 1 mile S through W to N of High Island. Saba Island lies between South Reef and Alligator Head. Two small shoals, with depths of 8.2 and 16.5m, lie about 2.8 miles WNW of High Island.

**Ngayot Bay** (16°34'N., 94°18'E.), entered between Alligator Head and the N end of Koronge Island, about 5.3 miles SW, provides little protection except from the S. Large vessels should not enter this bay because of the numerous dangers lying within it. A small shallow river empties into the S part of the bay.

**7.58 Koronge Island** (Goyangyi Kyun) (16°32'N., 94°15'E.), 81m high and rugged, is wedge-shaped and rocky. North Rock lies close off the NE end and West Rock lies close off the SW end of the island.

Koronge Island has been reported to be a good radar target up to 16 miles.

Goyangyi Kyun Light is shown from a black framed tower with white bands standing on a rising ground near the center of the island.

Good anchorage, protected from the N and NW, can be taken, in a depth of 11m, sand, between the S end of Koronge

Island and the mainland. The anchorage should be approached cautiously to avoid Crawford Shoal and the drying rock on the S side of the approach.

Between Koronge Island and Cape Negrais, about 29 miles to the S, the coast is indented by numerous small coastal inlets.

Round Cape, 104m high, thickly wooded, and conspicuous, lies about 15.5 miles S of Koronge Island. Conical Mount, 224m high and cone-shaped, lies about 4 miles SE of Round Cape and is conspicuous from all directions.

**Spike Hill** (16°22'N., 94°18'E.), about 7.5 miles NE of Round Cape, rises to a height of 259m. Fat Hill, 4 miles NE of Cape Negrais, is 198m high. All of the above peaks comprise the most conspicuous summits between Koronge Island and Cape Negrais.

**Crawford Shoal** (16°29'N., 94°13'E.), a group of drying rocks, lie about 3 miles SW of Koronge Island. A spit, with a depth of 5.5m at its outer end, extends about 0.5 miles S from Crawford Shoal.

**7.59 White Rock** (16°29'N., 94°15'E.), which dries, lies about 2.3 miles SSE of Koronge Island.

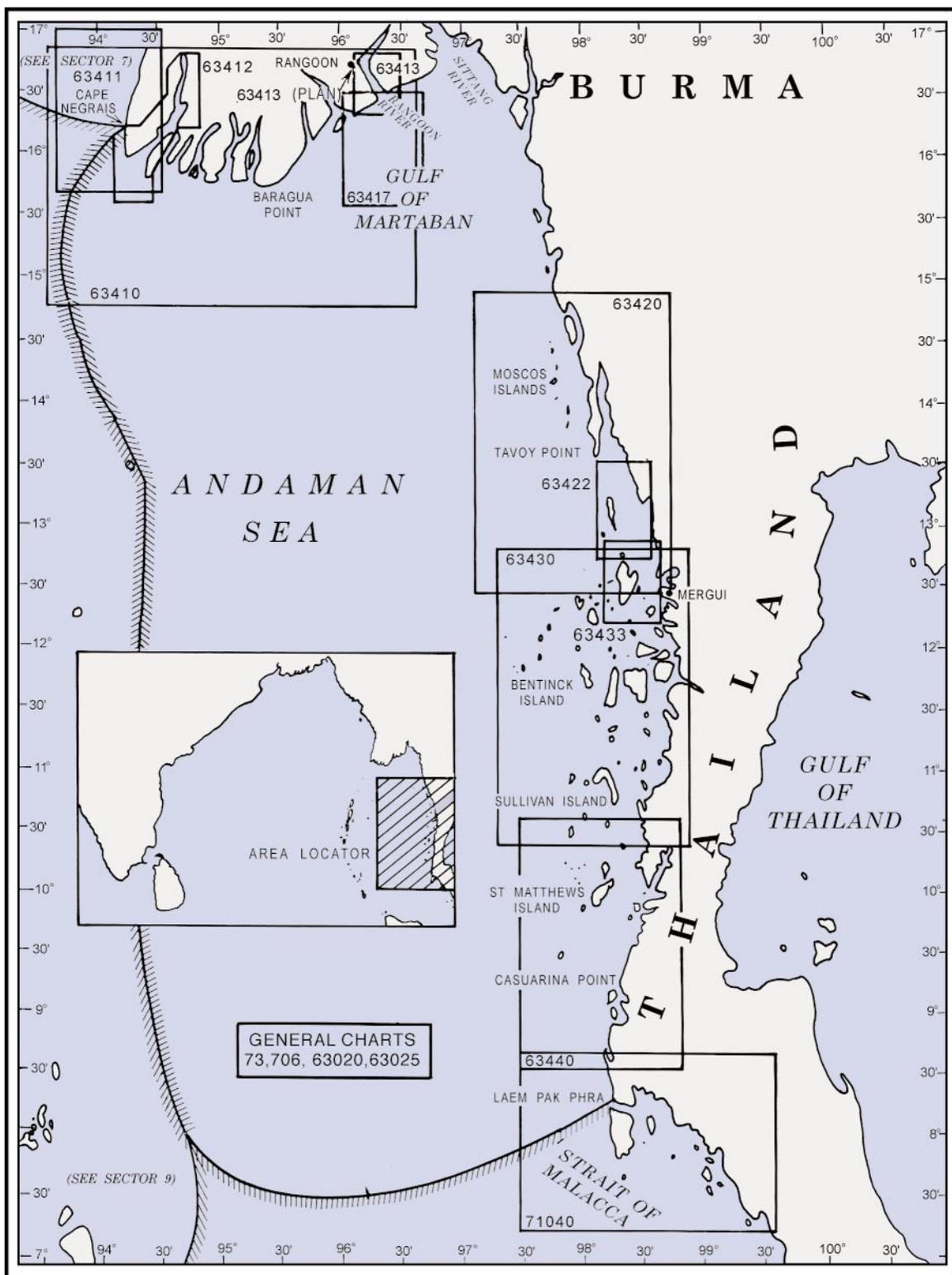
May Gaumgaun, Ung Chune, and Lichune form a group of islands which lies between 6 and 9 miles S of Koronge Island. Rocks and foul ground fringe the three islands. A narrow shoal, with a least depth of 4.9m, lies centered about 1.3 miles SW of May Gaumgaun. A rock, 3.4m high, lies on the S edge of a shoal area about 0.5 mile SW of Lichune.

A stranded wreck lies close N of Lichune (Leik Kyun).

**Saingbain Kieu** (16°20'N., 94°11'E.), a group of large conspicuous rocks, some appearing white, parallel the coast for about 3 miles and 2.5 miles offshore. North Twin, the N rock, lies 6 miles NNW of Round Cape. South Twin, the S rock, lies about 4 miles NW of Round Cape. Several detached shoal patches lie between this group and the coast.

Mushroom Rock, 2.7m high, lies about 2 miles N of Round Cape. Several detached shoal patches, with depths of 9.1m and less, lie within 1.5 miles W through 1.5 miles NW of Round Cape.

Black Rock, 1.2m high and dark-colored, lies about 4.5 miles SW of Round Cape.



Additional chart coverage may be found in NGA/DLIS Catalog of Maps, Charts, and Related Products (Unlimited Distribution).  
**SECTOR 8 — CHART INFORMATION**

## SECTOR 8

### BURMA—SOUTH AND WEST COASTS AND THAILAND—WEST COAST

**Plan.**—This sector describes the S and W coasts of Burma (Myanmar) and the W coast of Thailand between Cape Negrais and Ko Phucket and includes the Irrawaddy River Delta, the Gulf of Martaban, and the Mergui Archipelago. The descriptive sequence is E and then S.

#### General Remarks

**8.1** Between Cape Negrais and the Sittang River, the Irrawaddy coast, the Bassein River and the Rangoon River, which include the ports of Bassein and Rangoon are described first. A description of the Tenasserim Coast then follows as far S as the Tavoy River and includes the port of Moulmein, Bentinck Sound, the Ye River, Heinze Chaung, and the off-lying Moscos Islands. Bentinck Sound provides some shelter.

The coast of Burma, between Tavoy Point and Victoria Point, is indented by many inlets of little or no commercial value to ocean shipping. Many mountain ranges parallel this coast. The only ports of any importance along this entire section of coast are Tavoy and Mergui.

The Pakchan River forms the boundary between Burma and Thailand. **Victoria Point** (9°58'N., 98°33'E.) lies on the N side of the entrance of this river.

The coast of Thailand, between the entrance of the Pakchan River and the entrance of Takua Pa Inlet, is mostly low, densely wooded, and intersected by many rivers and creeks. It has not been closely examined. A range of mountains backs this coast. A number of islands, many surrounded by reefs, lie off this coast; others are joined to the mainland by sandbanks. Takua Pa Inlet is formed by a large river which flows into the sea by way of four channels between the parallels of 9°15'N and 8°52'N.

The coast between the S entrance of the Takua Pa Inlet and the N entrance of Chong Pak Phra is regular and is fronted by the Similan Islands. Chong Pak Phra is the narrow strait between the coast and Ko Phuket, a large island to the S. The W coast of the latter island is indented by several open bays. The N part of this coast, with the exception of a small area, is low, wooded, and backed by hills of moderate elevation. The S part rises steeply to a mountain range from about 262 to 518m high, densely wooded, and sloping gradually to the N and S.

The Mergui Archipelago, which consists of approximately 1,000 islands ranging in size from mere hummocks of rock to King Island, the largest of the group, with an area of about 175 square miles, lies within the 95m curve. The archipelago extends from Tavoy Island, the N extremity of which is nearly 20 miles S of Tavoy Point, to the Similan Islands, a distance of about 285 miles. The Great Western Torres Islands, the outermost islands, lie about 70 miles off the mainland. Some of the islands have mountain peaks which attain a height of 762m. The outer islands are steep and wooded; the nearshore islands are low and covered with jungle. There are no ports of significance, but there are many sheltered anchorages.

**Winds—Weather.**—The weather and climate of Burma have been previously described in paragraph 7.25.

The climatic seasons of the Tenasserim Coast and the W coast of Thailand are based on two major wind systems, namely the Northeast Monsoon and the Southwest Monsoon, each with its own weather characteristics.

The Northeast Monsoon, which is associated with the Northern Hemisphere winter, extends from early December through late March. This is the dry season, but a flow of warm moist air from across the South China Sea covers the before-mentioned coasts and causes somewhat higher cloudiness, occasional thunderstorms, higher temperatures, and humidities than over the remaining areas. The greatest contrasts are in November, December, and January, when these coasts are hot, humid, and rainy. Thunderstorms reach their lowest frequency during the Northeast Monsoon. Temperatures reach their lowest values, except at some stations along these coasts where all seasons are about equally warm and humid. Cloudiness is at a minimum, with the lowest averages usually occurring in January. Visibilities are usually good, but there is some early morning fog.

The spring intermonsoon season, usually from mid-March to mid-May, is the period in which the dry NE winds give way to the moist SW winds. Weak and variable winds occur in April and May. There is a slight increase in rainfall in April and a big increase in May. Thunderstorm frequencies rise sharply, and are most frequent during May. Temperatures reach their maximum values in April. Relative humidities and cloudiness increase.

The Southwest Monsoon, which extends from mid-May through late September, is the rainy season. Daily intermittent light rain, interspersed with occasional heavy rainstorms or thunderstorms accompanied by torrential downpours, occur. Cloudiness reaches a maximum during the Southwest Monsoon. Maximum cloud cover reaches 80 to 95 per cent. Temperatures decrease slightly at most places due to the increased cloud cover. The average daily temperatures are in the upper 27° or low 32°C; relative humidity reaches its highest values. Visibility is usually good. Poor visibility occurs mainly during heavy rain squalls.

The autumn intermonsoon season is normally limited to the months of October and November. During this period, the moist Southwester Monsoon is replaced by moist E winds over these coasts. Weak and variable winds, with land and sea breezes prevailing, occur until the Northeast Monsoon is established. Rainfall decreases, but thunderstorms increase slightly over these coasts. Temperatures and relative humidity remain high. Cloudiness decreases, except over the S of the Tenasserim coast and the W coast of Thailand. Periods of low visibilities are rare.

**Tides—Currents.**—The current W of the entrance of the Irrawaddy River is irregular in the fine weather season and varies with the direction of wind, here the current has no apparent connection with the rise and fall of the tide.

During November, December, and January, little or no flood current is observed S of Alguada Reefs, except at springs.

The tides along the Tenasserim coast and along the W coast of Thailand are semidiurnal with a small diurnal inequality in both time and height. The tides approach these coasts from the SSW and progress N. The mean spring ranges increase from about 3m at the Burma-Thailand border to over 5.2m at Mergui.

The currents flow at an average rate of 0.4 knot, with a maximum of about 0.7 knot. The set and drift of the currents in local areas often varies from the patterns shown below. This is due to frequent storms. Near the coast, the tidal currents will also exert great influence and will either augment or deter the non-tidal currents.

The currents along the Tenasserim coast and along the W coast of Thailand usually set N in January and S in February. In March the water flowing N from the Strait of Malacca causes a N current to flow along these coasts. This flow continues through April. In May the currents set from S to SW, except for the extreme S part of this area where a N current still exists. The currents set S in June and July and N from August through December.

The tidal current movement is usually semidiurnal in character with some variations in the velocities and durations of the flows. The tidal currents, as a rule, set from ENE to NNW on the rising tide and from WSW to SSE on the falling tide. Considerable variation in set and drift is to be expected between the many islands off these coasts and in the confined areas and estuaries.

Tidal currents are strong along the entire coast between Tavoy Point and the Burma-Thailand border. Between Tavoy Point and Forrest Strait, the tidal currents usually set N on the rising tide and S on the falling tide at rates of 2 to 4 knots. The tidal currents attain a rate of 2.3 knots through Forrest Strait. In deeper water offshore, the tidal effect becomes negligible and the general circulation predominates. Tidal bores occur in the mouths of rivers and bays.

There is comparatively little reliable information concerning the tidal currents off the W coast of Thailand. These tidal currents seldom exceed 2 to 3 knots and are seldom experienced over 8 miles offshore.

### Cape Negrais to the Sittang River

**8.2 Cape Negrais** (16°02'N., 94°12'E.), the seaward extremity of a spur of the Arakan Yoma range, is fronted by conspicuous cliffs which rise about 0.8 mile inland to a high summit. The cape has been reported to be a good radar target up to 24 miles.

The coast of the Irrawaddy Delta is low along its entire length between the Bassein River and the Sittang River. The only high coastal ground lies on the W side of the mouth of the Bassein River; here the S extremity of the Arakan Yoma Range terminates in the vicinity of Maw Dengi. Between the Bassein River and the China Bakir River there are no landmarks and the navigational aids are few in number.

**Depths—Limitations.**—Between positions S of Purian Point and Baragua Point, the 20m curve lies about 10 to 20 miles offshore. The 10m curve roughly parallels the 20m curves at distances of about 2 to 8 miles within the latter curve.

Shoal depths of 5.5m and less lie between the 11m curve and the shore.

The 20m curves lies about 18 miles SE and 21 miles E of Baragua Point and then extends E to the vicinity of Kalegauk Island, and approximates the outer limits of the Gulf of Martaban.

The 10m curve to the SE and E of Baragua Point lies only about 1 to 2 miles within the 20m curve, but to the ENE it lies between 8 and 30 miles offshore.

Those depths and dangers which lie within the 10m curve are described together with the principal description of that part of the coast which they front.

A shoal, with a depth of 9.1m, was reported to lie about 46 miles S of Elephant Point.

**Caution.**—Vessels should not approach within a distance of 3 miles of the coast in the vicinity of Cape Negrais. A fringing reef and off-lying rocks make caution advisable even outside this distance.

The shallow bank, which fronts the delta shore between Purian Point and Baragua Point, should not be shoaled to depths of less than 18.3m.

**8.3 Yadana Gas Field** (15°08'N., 94°47'E.). A platform with a light flare is situated about 48 miles SE of Purian Point. A second platform with a light flare is situated about 2 miles N of the first platform.

A submarine pipeline runs E from the S platform to shore about 9 miles S of Dolphins Nose.



**Yadana Platform**

A 500m restricted zone surrounds platforms, navigation, fishing, and anchoring is prohibited.

The coast between Cape Negrais and Maw Dengi, about 6 miles SSE, consists of a series of low, densely-wooded hills. In the vicinity of Maw Dengi these hills have some conspicuous, reddish slopes of driven sand which leave well-defined edges of dark foliage near their summits.

The coast between Cape Negrais and Maw Dengi is fringed by reefs and shoal patches which extend up to 1.3 miles offshore in places.

**Maw Dengi** (Pagoda Point) (15°57'N., 94°15'E.), about 30m high and flat, terminates in a bare bluff. A pagoda lies on the point and is visible above the trees. A small 2.7m high obelisk lies on the reef on the SE extremity of Maw Dengi.

A shoal, with depths of 5.5m and less, lies up to 0.5 mile S and W respectively of the point. A detached 5.5m patch lies about 1 mile W of the point.

## The Irrawaddy River Delta

**8.4** The Irrawaddy River rises in the N part of Burma and generally flows to the S. Augmented by numerous tributaries, the Irrawaddy River flows into the Bay of Bengal by way of several channels through an extensive delta lying approximately between the meridians of 94°15'E and 96°50'E. This delta is being constantly extended seaward by the deposit of silt. Many low islands are formed near its seaward extremity by tidal backwaters and smaller cross channels which connect with the main channels.

The only channels through the Irrawaddy Delta used by ocean-going vessels are the Bassein River and the Rangoon River, the furthest W and E, respectively.

## Approaches to the Bassein River

**8.5** Maw Dengi, which lies on the NW side of the entrance of the Bassein River, has been previously described in paragraph 8.2.

**Purian Point** (15°50'N., 94°24'E.), low and backed by a group of trees 23m high, lies on the SE side of the entrance of the Bassein River. White sandstone low bluffs extend 1.5 miles NE from the point. Higher bluffs begin about 1 mile NNE of the point and extend to the N for about 1.3 miles.

**Tides—Currents.**—Tides in the entrance of the Bassein River are semidiurnal.

The tidal currents set strongly across Phaeton Shoals; the flood current sets E and the ebb current sets W.

About 1 mile N of Thamihla Kyun the tidal currents are rotary during spring tides. At the beginning of the flood tide, the current sets 152° and changes through 090°, so that at the end of the flood it sets about 057°. With the commencement of the ebb tide, the current sets about 315° and changes through 270°, setting at the end about 225°. The greatest velocity, 1.5 knots, is attained during the second and third quarters of each tide.

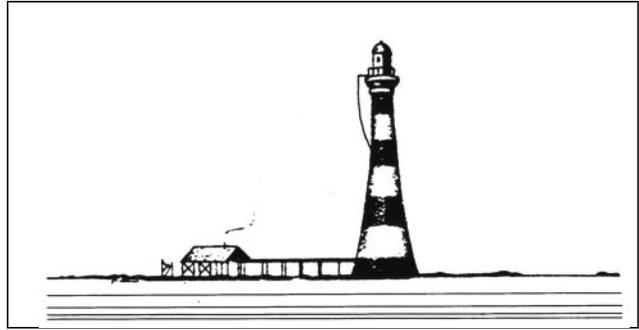
Near the entrance bar, the flood current sets about E and the ebb current sets between SW and SSW at velocities of 1.5 to 3.5 knots during spring tides. At spring tides, during the rainy season, the ebb current may reach a velocity of 6 knots.

**Depths—Limitations.**—**Alguada Reef** (15°42'N., 94°12'E.), almost awash at HWS, has detached sunken rocks extending a considerable distance from it. Hugh Rose Rock, which is awash, lies off the N end of the reef about 2.5 miles NNE of the light, which lies near the SW end of the reef. A 4.1m patch lies about 1.3 miles S of the light. Depths of 10.1m and less extend about 0.8 miles farther SW.

**Caution.**—Less water than charted has been reported to lie in an area between 19 miles W and 18.5 miles SSW of Alguada Reef Light.

Several detached shoal patches, with depths of 5.5 to 14.6m, have been reported to lie within a 1 mile radius of a position about 17 miles WNW of Alguada Reef Light.

**8.6 Phaeton Shoals** (15°47'N., 94°14'E.), a group of shoal patches with a least depth of 4.3m and 2 miles in extent,



**Alguada Reef Light bearing 092°**

lie centered about 10.3 miles S of Maw Dengi. Depths of 11 to 18.3m surround these shoals.

**Thamihla Kyun** (15°52'N., 94°17'E.), flat and wooded, lies about 5.5 miles SSE of Maw Dengi. Reefs and shoals extend about 2 miles SSW and 0.8 mile NE from the island. Rocky patches, with a least depth of 7.9m, extend about 0.8 mile W from the island. Thamihla Kyun has been reported to be a good radar target up to 18 miles.

**Baroni Rock** (15°52'N., 94°17'E.), with a least depth of 4.9m, lies about 0.5 mile NE of the N end of Thamihla Kyun.

**Haing Gyi Shoal** (15°57'N., 94°17'E.), with depths of 5.5m and less, extends about 5.5 miles S into the river entrance from the shore about 3.3 miles NE of Maw Dengi.

Depths in the channel between Thamihla Kyun and the shore bank extending about 6 miles WNW from Purian Point range from 6.1 to 9.1m. Depths in the approach to and within the entrance channel W and N of Thamihla Kyun range from 18.3 to 7.3m.

**Pilotage.**—Pilotage is compulsory. Pilots will board off the pilot station, located about 0.3 mile SE of Dalhousie Point.

During the Northeast Monsoon, if no pilot is readily available, a vessel should proceed to the anchorage SE of Thamihla Kyun.

To avoid delay, the vessel's ETA should be sent to the Port Officer at Bassein at least 48 hours prior to arrival.

**Directions.**—Vessels approaching the entrance of the Bassein River from the S should not approach Alguada Reef Light closer than 3 miles. The summit of Haing Gyi Kyun bearing 020°, and well open E of Thamihla Kyun, leads about 0.5 mile E of the easternmost shoal depths of Alguada Reef and Phaeton Shoals. Having passed Phaeton Shoals, course should be shaped for the anchorage SE of Thamihla Kyun. Care should be taken to allow for the tidal current.

A course of 350° should be steered to pass E of the two lighted buoys E of Thamihla Kyun, passing N of Broni Rock and then altering course to the NE, entering the river between Haing Gyi Shoal and Purian Bank. When 3 miles S of Rocky Point, alter course NNE and pass not less than 0.2 mile W of Burgess Rock. Having cleared that rock course should be altered to the NE and then proceed to the anchorage off the pilot station at Dalhousie Point.

Vessels approaching the entrance of the river from the W, if proceeding to the anchorage SE of Thamihla Kyun, should pass about 1 mile N of the island so as to clear the shoal depths N of Baroni Rock. When Thamihla Kyun Light bears 206°,

steer for the anchorage. This approach is not recommended during the Southwest Monsoon, when the vessel should proceed directly to the anchorage off the pilot station.

**Anchorage.**—During the Northeast Monsoon, good anchorage can be taken, in depths of 8.2 to 9.1m, about 1 mile SE of Thamihla Kyun. When anchored in this position, the summit on Haing Gyi Kyun should bear about  $016^\circ$  and the light structure on Thamihla Kyun about  $322^\circ$ .

## The Bassein River to Bassein

**8.7** The Bassein River, the W of the channels leading through the Irrawaddy Delta, is the means of access for ocean-going vessels calling at the port of Bassein, about 75 miles above the river's entrance.

The river entrance has been reported to be a good radar target up to 15 miles.

**Winds—Weather.**—The weather generally is hot and humid. The heavy rainfall, which sometimes exceeds 2,700mm annually, occurs during the Southwest Monsoon between June and September.

Storm and weather signals are displayed at Thamihla Kyun in accordance with the Indian Extended System. The Extended System is in use at Bassein; the port receives information but no signals are displayed. Further information on these storm signals may be found in Pub. 160, Sailing Directions (Planning Guide) South Atlantic Ocean and Indian Ocean under "India—Signals."

**Tides—Currents.**—Large diurnal inequalities and seasonal variations best describe the tides at Bassein.

Tidal currents at springs attain velocities of 1.5 to 2 knots during the flood and up to 3 knots during the ebb. During freshets the velocity may reach 5 knots.

A tide gauge lies on Ashby Rockys near the W bank of the river and just N of Panmawaddy Flat. A white cage topmark and red, black, and white plaques from the top downward, respectively, mark the tide gauge. Each plaque represents 0.3m; the lower edge of the topmost white plaque marks the 7.9m level.

**Depths—Limitations.**—The least depth in the channel over the bar which lies across the entrance of the Bassein River is about 6.1m. The bar lies between the shallow flat close E of the Maw Dengi and the W and SW edges of Purian Bank. The channel over the bar leads between Purian Bank to the E and Haing Gyi Shoal to the W.

The controlling depth in the river channel between Thamihla Kyun and Bassein is the depth over Panmawaddy Flat. In 1964, the channel was dredged to 5.2m.

Changes in the channel are frequent and the navigational aids are scarce. This lack of navigational aids makes navigation at night impracticable.

Due to the narrowness of the river at Bassein, single-screw vessels exceeding a length of 137m and twin-screw vessels exceeding a length of 145m are advised not to attempt the upriver passage.

Deep-draft vessels await HW in order to cross the entrance bar; HW is essential to cross Panmawaddy Flat. Successive periods of HW are usually required and the passage in both directions ordinarily takes more than a day.

In heavy weather, the best time to cross the bar is between half tide and 2 hours after HW at Thamihla Kyun. During the Southwest Monsoon, a clearance of at least 1.2m under the keel is considered necessary when crossing the entrance bar.

**Haing Gyi Kyun** ( $16^\circ00'N.$ ,  $94^\circ19'E.$ ), an island with a 135m high densely-wooded summit on its NE extremity, lies with Rocky Point, its S extremity, about 5 miles ENE of Maw Dengi. A 22m high tree on Southeast Point, about 0.3 mile NNE of Rocky Point, is a good mark.

**Wolf Rock** ( $15^\circ59'N.$ ,  $94^\circ20'E.$ ), with a depth of less than 1.8m, lies about 0.4 mile off the E side of Haing Gyi Kyun. Foul ground extends about 0.4 mile E and S from the rock.

The E bank of the river between Purian Point and Ward Point, about 10.8 miles to the N, forms the SE side of the river entrance.

**8.8 Purian Bank** ( $15^\circ53'N.$ ,  $94^\circ22'E.$ ) lies within the limits of the shore bank which extends about 6 miles NW and then 9.8 miles NE to Ward Point. Depths over this bank and shoal are less than 5.5m.

**Burgess Rock** ( $16^\circ00'N.$ ,  $94^\circ22'E.$ ), with a least depth of 5.5m, lies about in the middle of the main fairway, about 2.8 miles WSW of Ward Point.

Dalhousie Point, on the W bank about 2.5 miles N of Ward Point, is marked by several pagodas.

**Long Sand** ( $16^\circ04'N.$ ,  $94^\circ28'E.$ ), which consists of two islands lying on a long, narrow shoal, lies about 3 miles ENE of Ward Point. Shoal depths extend about 3 miles WSW and NNE from Long Sand.

**Tazingyun** ( $16^\circ09'N.$ ,  $94^\circ32'E.$ ), which consists of two islands close together, lies on the E side of the fairway about 4 miles above Long Sand.

**Ransom Reach** ( $16^\circ17'N.$ ,  $94^\circ39'E.$ ) is entered about 7.5 miles upriver from Tazingyun. Sesostris Rocks lie on the W side of the reach; two small islands lie on the E side of the reach.

**Sinswe Kyun** ( $16^\circ23'N.$ ,  $94^\circ42'E.$ ) lies in mid-channel at the N end of Ransom Reach. Alexander Rock, with a least depth of 4.6m, lies in mid-channel about 0.5 mile S of Sinswe Kyun. Pariah Rock, with a depth of less than 1.8m, lies about 1.8 miles N of Sinswe Kyun at the outer edge of Enterprise Flat.

**Amazon Point** ( $16^\circ29'N.$ ,  $94^\circ41'E.$ ), on the E bank of the river about 5.3 miles N of Sinswe Kyun, marks the S entrance point of the shallow Panmawaddy River. Panmawaddy Flat, with a least depth of 0.3m and surrounded by shoal depths of 5.5m and less, lies with its N end about 1.3 miles SW of Amazon Point.

**Cockatoo Point** ( $16^\circ30'N.$ ,  $94^\circ40'E.$ ), on the W bank of the river, lies 1.8 miles NW of Amazon Point. Ashby Rocks, marked by a beacon, lie close N of Cockatoo Point.

**Elbow Point** ( $16^\circ32'N.$ ,  $94^\circ41'E.$ ) lies about 2.8 miles NNW of Amazon Point. Elbow Shoal, as defined by the 6m curve, lies about 1 mile SSW of Elbow Point at the outer end of a spit extending from the shore.

Rangoon Creek, on the SE side of Junction Reach, flows into the Bassein River about 8.5 miles above the entrance of the Panmawaddy River. Two conspicuous masts support telegraph wires across its entrance.

**Anchorage.**—Anchorage can be taken, in depths of 9.1 to 10.1m, about 1 mile E of Dalhousie Point.

Vessels suspected of or infected with yellow fever must anchor off Dalhousie Point, not less than 0.5 mile distant from the LW line. Vessels with plague or cholera on board may anchor off Takaing Pagoda on the W bank of the river about 2 miles below Bassein. Vessels with other diseases on board may anchor anywhere below the wharves.

**8.9 Bassein** (16°47'N., 94°44'E.) (World Port Index No. 49640), Burma's second-largest seaport, lies on the E bank of the Bassein River, about 75 miles above the mouth. Vessels usually frequent the port between January and September. Bassein is primarily a rice-exporting center. The port is open to vessels up to 145m in length and 7m draft during the fine season and up to 7.3m draft during the Southwest Monsoon.

Each rice mill has one or more jetties, with alongside depths of 5.2 to 7.6m. About 732m of berthing space is provided for lighters and native craft.

Three fixed moorings, capable of accommodating vessels up to 107m in length, lie off the jetties, in depths of 5.5 to 6.7m. Larger vessels sometimes anchor or moor off the jetties.

Tugs and an ample supply of lighters are available for handling cargo.

Between Purian Point and Baragua Point, the S extremity of the Pyapon District, about 55 miles to the E, the coast is indented by many of the outlets of the Irrawaddy River, including the Hetkethaung River, the Ywe River, the Pyamalaw River, the Irrawaddy River, and the Bogale River, five of its principal mouths. This section of coast is low and nothing conspicuous is visible from outside the shallow banks which front it.

A bank, on which the depths are less than 5.5m, fronts the whole coast between Purian Point and Baragua Point and extends as much as 17 miles offshore from a position about 10 miles W of the latter point; numerous drying patches lie on the E part of the bank including Baragua Flats, which extend about 8 miles SW from Baragua Point. The coast is not visible from the S extremity of this bank.

Vessels should not approach this section of coast in depths of less than 18.3m.

Baragua Point has been reported to be a good radar target up to 29 miles.

## The Gulf of Martaban

**8.10** The Gulf of Martaban is entered between Baragua Point and the coast extending N abreast of Kalegauk Island, about 140 miles to the E. The Sittang River flows into the head of the gulf, about 75 miles N of the entrance. The Rangoon River and the Moulmein River enter the sea on the NW and E sides, respectively, of the gulf.

The entire area of the gulf is shallow and anchorage can be taken anywhere with a suitable draft, but prior to anchoring the direction of the tidal current should be noted and very little chain veered until the vessel stems it.

In 1981, a dangerous wreck was reported to lie in position 15°20'20"N, 96°36'12"E, about 60 miles SSE of Rangoon River Western Channel Entrance.

In 1985, natural gas was discovered in large quantities up to 100 miles offshore in the Gulf of Martaban.

From Baragua Point, the coast extends NE for about 35 miles to the mouth of the Pyapon River, the W outlet of the China Bakir River, and then ENE for about 23 miles to the main outlet of the China Bakir River, which enters the sea through extensive mud flats.

**U Pe Beacon** (15°44'N., 95°24'E.) lies about 4.5 miles ENE of Baragua Point and 1.5 miles inland. Pymbong Beacon lies near the coast about 6.8 miles ENE of U Pe Beacon.

**8.11 Krishna Shoal** (15°41'N., 95°37'E.), with a least depth of 2.3m, extends about 12.5 miles NE as a narrow ridge of hard sand, from a position about 11 miles SE of U Pe Beacon.

Sanda Lightship is moored 7.5 miles ESE of the SW end of Krishna Shoal, but was reported (1978) to lie 7 miles NE.

A mud volcano, the position of which is approximate, was reported to lie about 30 miles ENE of Pymbong Beacon.

A 9.1m detached patch was reported to lie about 43 miles ESE of Pymbong Beacon.

The **China Bakir River** (16°19'N., 96°06'E.) entrance may be identified by a clump of coconut palms on the W side and by Kanyingon Village on the E side. A ruined pagoda stands in the village and Tazaung Tower stands about 2.5 miles farther E. Bassein Creek, navigable by small craft at HW, branches off from the main outlet of the China Bakir River about 2.5 miles within the entrance and connects with the Rangoon River about 10 miles below the city of Rangoon.

An extensive mud bank, which dries, fronts the coast between the mouth of the China Bakir River and Elephant Point and extends up to 4.5 miles offshore. This mudbank, Dedaye or Desaing Flats, and formerly China Bakir Flats, form the SW part of the bank and Mye Saon Sand the NE part. The remains of China Bakir Light are near the SE point of the bank. The Flats form the NW side of Western Channel.

## The Rangoon River—Approaches

**8.12 Elephant Point** (16°28'N., 96°20'E.), about 16 miles NE of the entrance of the China Bakir River, marks the W side of the entrance of the Rangoon River.

Elephant Point Tower stands 0.3 mile SW of the point; another tower stands 0.5 mile farther SW.

**Grove Point** (16°30'N., 96°23'E.) which lies on the E side of the entrance of the Rangoon River, is low and lies about 3.5 miles ENE of Elephant Point. The low land on both sides of the entrance of the river is not visible from seaward until about 7 miles from the coast.

Beacons stand on Spit Sand, about 2.3 miles S and 4.5 miles SSW, respectively, of Elephant Point and are reported to be conspicuous. These white, conical, framework beacons with black topmarks stand on black bases. A survey beacon stands close offshore, about midway between the entrances of the China Bakir River and the Rangoon River.

**Winds—Weather.**—The winds at the entrance of the Rangoon River are NE in December and veer E, blowing fresh during the day. The weather is generally good. In January the wind is more N, but sometimes a strong E wind prevails for several days. Towards the end of the month, light land and sea breezes are observed in conjunction with thick and hazy weather.

In February and March, the land and sea breezes are regular. Near the shore the sea breezes are fresh and generally the strongest at the time of spring tides. Thick fogs prevail.

The Southwest Monsoon commences about the middle of April. After a few stormy days the weather is clear until the beginning of May, when the monsoon develops fully and continues with few breaks until the end of October. In May and October, there is heavy but not continuous rainfall; in July and August continuous rainfall is often experienced.

**Tides—Currents.**—Tides in the approaches to and in the Rangoon River are semidiurnal.

Between a position about 22 miles SSW of Baragua Point and the entrance of the Rangoon River, the tidal currents set NE and SW, on the flood and on the ebb, respectively. During the Northeast Monsoon, the velocity at springs is 2 to 4 knots; near the entrance of the Rangoon River the velocity is greater. The ebb current is the stronger. Occasionally in October and November, a W set is observed sufficiently steady and strong enough to overcome the flood which sets to the NE.

There are rotary tidal currents, which shift clockwise, off the mouths of the Irrawaddy River and off Baragua Flats. During the Northeast Monsoon, these currents attain velocities of 1.5 to 2 knots at springs and about 0.8 knot at neaps. Close to the mouths the tidal currents set in and out of the channels, attaining their greatest velocities at HW and LW.

In the vicinity of the pilot vessel station, about 20 miles S of Elephant Point, the flood current sets about 034° and the ebb about 214°. The time of HW in this vicinity occurs about 1.5 hours earlier than at Elephant Point.

In Western Channel the flood current begins setting NE toward the entrance of the river, but after the flats nearby are covered, about 2.5 hours after LW, the flood current changes direction and sets strongly onto Mye Soan Sand over which it runs directly for Elephant Point. The velocity at springs is 5 to 6 knots.

Considerable eddies may be experienced off Elephant Point, especially on the first of the flood. The great body of the flood passes E into the Sittang River. In Eastern Channel the flood current is comparatively weak and sets in 0.3 to 0.5 hour later than the flood current in Western Channel.

The ebb current sets SW in Western Channel outside Elephant Point. In Eastern Channel the ebb sets SE at first and then rounds the SE edge of Eastern Sands and sets SW. The velocity of the ebb is 6 knots at springs. Southeast of Elephant Point, the ebb currents set across the channel onto a part of Eastern Sands.

A tide gauge and a tide gauge tower stand on Elephant Point.

**Depths—Limitations.**—Changes in the depths and in the positions of the flats and shoals in the Rangoon River and its entrance are so constant that the chart must be used with great caution. A shifting bar, with fluctuating depths, obstructs the approaches to the entrance of the river. The bar has a soft silt bottom.

The 11m curve lies about 26.5 miles S of the river entrance; depths within this curve shoal gradually toward the flats which lie in the river mouth and on either side of the main fairway.

**Eastern Grove Flats** (16°28'N., 96°28'E.), an extensive drying bank, extend almost 7 miles SE from Grove Point. These flats form the E side of a channel which lies between the flats and Eastern Sands. A shoal area, with depths of less than 5.5m,

extends up to 8 miles farther SE from the S edge of Eastern Grove Flats.

A detached 4.6m patch lies about 20 miles SE of Grove Point. Depths in this vicinity have been reported to have shoaled considerably.

**Eastern Sands** (16°26'N., 94°24'E.), a shoal which dries up to 2.4m in places, lies on the E side of Eastern Channel between 2 and 7 miles S of Grove Point.

A flat, which dries 0.3m, lies about 5.8 miles SSW of Grove Point.

The entrance channels leading into the Rangoon River shift frequently as the result of excessive silting. The navigational aids which mark these channels are moved as necessary to conform to these changes. Buoys may be missing or unlit.

Western Channel is the main channel for entry into the Rangoon River. The channel is approached via Lanthaya Light Float (Fairway Light Float) and Lower Light Float. The channel then leads N for 12 miles, converging with Desaing Flats and Mye Saon. The channel is marked by a light float and by lighted buoys, a number of which have been reported unlit.

Eastern Channel, an unmarked fairway with a least depth of 2.4m, lies between Eastern Grove Flats and the E side of Eastern Sands.

**Pilotage.**—Pilotage is compulsory for merchant vessels of over 200 grt.

The following information required by the Harbor Master Port Trust Rangoon, should be radioed not less than 48 hours, with changes radioed not less than 24 hours, prior to arrival:

1. Vessel's ETA at the pilot station.
2. Fresh water draft fore and aft.
3. Speed.
4. GRT.
5. Length overall.

The pilot vessel is usually at anchor about 20 miles S of Elephant Point. In the vicinity of the pilot vessel, the current sets about 034° during the flood and 214° during the ebb.

Vessels of 8m draft and over must anchor S of Lanthaya Light Float (Fairway Light Float) and await instructions.

A vessel approaching the pilot vessel to obtain a pilot should pass astern of and never ahead of the pilot vessel; when in this position, the vessel should make a lee for the boarding boat to the prevailing weather.

To enable vessels to locate the pilot vessel during thick weather, whether at anchor or underway, on the sound of a vessel's whistle or siren being heard, the pilot vessel will sound, on its whistle or siren, two long and two short blasts (letter Z of the Morse code), and will repeat this signal at such intervals, and for so long a period, as may be necessary to enable the approaching vessel to locate the pilot vessel.

**Anchorage.**—Deep-draft vessels, awaiting a pilot or anchoring for other reasons, should anchor SE of Lanthaya Light Float. In good weather, sea and swell permitting, medium-draft vessels may anchor about 2 miles E of **Lanthaya Light Float** (Fairway Light Float) (16°12'N., 96°17'E.)

Deep-draft vessels drawing over 7.3m may not anchor at the pilot station. A message from the pilot vessel will advise of a safe anchorage and also when to return to embark the pilot.

**Signals.**—The pilot vessel is radio equipped and displays the following signals:

1. By day—The regulation pilot flag (Hotel) and, if at anchor, a black ball.

2. At night—Lights and signals as prescribed by the Regulations for Preventing Collisions at Sea.

**Directions.**—A vessel approaching the Rangoon River from the W should pass about 5 miles S of Alguada Reef and then steer to pass about 26 miles S of Baragua Point. Course may then be altered to the NE to make for a position 8 miles S of Rangoon Pilot Station, passing approximately 2 miles SE of Sanda Light Vessel. Once S of the pilot station, course should be altered N for the pilot vessel and then NNE to pass E of Lanthaya Light Float (Fairway Light Float) and into the river entrance.

During February and March, when thick fogs are liable to occur, great caution is necessary when approaching the entrance of the Rangoon River, as there is not a sufficiently marked change in the depths in the channel to enable a vessel to determine its position by sounding.

Vessels approaching the Rangoon River from the E should keep in depths of 10.1 to 11m until the position has been ascertained. Consideration must be given the tidal current, remembering that the flood or NE current sets very strongly toward and over the shallows of the entrance of the Sittang River.

**Caution.**—Soundings are not an accurate guide in approaching the entrance of the Rangoon River. It is important to remember that the shore of the Irrawaddy Delta is so low as to be invisible until within a few miles of it and that shallow banks extend in places to considerable distances offshore. During February and March, when thick fogs are frequent, great caution is necessary when approaching the entrance.

Changes in depths in the river and approaches are so rapid and frequent that charts of the area should not be taken as a sure guide.

Dangerous wrecks lie approximately 4 miles S of Thuriya Light Float and 11 miles ENE of the charted position of Sanda Light Vessel. Numerous wrecks, best seen on chart, lie ESE of Lanthaya Light Float. The partially submerged wreck of the Dagon Light Vessel lies approximately 12 miles SSW of Lanthaya Light Float. A large navigational buoy (LANBY) is anchored near the wreck.

## The Rangoon River to Rangoon

**8.13** The Rangoon River, the E channel through the Irrawaddy Delta, flows into the Gulf of Martaban between Elephant Point and Grove Point. The river channel leads in a general NNW direction from Elephant Point to the port of Rangoon, about 21 miles above the entrance. Most of the low, flat, and sparsely-wooded land bordering the river consists of rice paddies. Compact clumps of trees lie in the vicinity of the villages.

**Winds—Weather.**—The climate in Rangoon is tropical throughout the year, with three distinct seasons, which are the monsoon period, the cool period, and the hot period.

During the monsoon season (Southwest Monsoon), from about mid-May through September, Rangoon receives most of its average 2,700mm rainfall for the year. Temperatures are moderately warm, 24° to 32°C, but the humidity is very high.

After a brief period of warm, humid weather following the monsoon, the cool season begins about mid-November. From

this time until March, the weather is pleasantly cool, 18 to 29°C, and dry with low humidity. Days are sunny with the nights being cool and the weather is clear.

Beginning in March the temperature and humidity commence to rise uncomfortably and the dry land bakes in the hot season until the first of the monsoon rains bring relief. During this season the temperature may rise to 41°C, although the average would be about 35°C.

**Tides—Currents.**—Tides at Rangoon are semidiurnal. The Rangoon River tides are subject to a large diurnal inequality; the times of HW and LW may occur as much as 1 hour before or after the computed times. The rise and fall of the tide at the port as well as near the entrance of the river is considerable.

Several tide gauges stand on the banks of the river between its entrance and the anchorage S of Hastings Sand.

A tide gauge and a tidal semaphore stand in the harbor, about 0.3 mile W of Monkey Point.

The position of the three arms of the tidal semaphore, as observed from S, indicate the height of the tide above LWS tide level, as follows:

1. Upper arm
  - a. Inclined to the right at 45° angle—1.8m.
  - b. Placed horizontally to the right—3.7m.
  - c. Inclined to the right at 45° angle below horizontal—5.5m.
  - d. Inclined to the left at 45° angle—7.3m.
2. Center arm
  - a. Inclined to the right at 45° angle—1.8m.
  - b. Placed horizontally to the right—3.7m.
  - c. Inclined to the right at 45° angle below horizontal—5.5m.
  - d. Inclined to the left at 45° angle—1.2m.
  - e. Placed horizontally to the left—1.5m.
3. Lower arm
  - a. Inclined to the right at 45° angle—0.09m.
  - b. Placed horizontally to the right—0.18m.
  - c. Inclined to the right at 45° angle below horizontal—0.27m.

In the river, the current follows the course of the channel. Along this course, during spring tides, there are strong eddies off the points of land; the tidal currents attain excessive velocities.

Close within the entrance of the river above Elephant Point, the channel is confined between Middle Bank and the W bank of the river; here the flood current attains velocities of 5 to 6 knots at springs. Above Middle Bank the velocity decreases.

The tidal current attains its maximum velocity of 5 to 6 knots in the channels on the night of the second day after full or new moon. The interval of slack water is only a few minutes. After neap tides the tidal current gradually increases in velocity and is rapid until the moon quarters, when the velocity suddenly decreases. On the second and third day after the moon quarters, there is slack water on the flood current for 1.5 hours and for 1 hour on the ebb.

At springs, the flood current sets in abruptly and the tide rises 1.8m in the first hour. During this period the ebb current continues running in mid-channel; slack water occurs at the end of this hour. The flood current turns earlier inshore than in mid-channel.

The effect of the rains which augment the river during the rainy season, June to September inclusive, is to weaken the flood current and strengthen the ebb. At times the flood current is weakened to the extent that vessels moored in Rangoon Harbor do not swing to it.

During spring tides, at times other than the rainy season, tidal currents in the harbor may attain velocities of 5 to 6 knots. The flood current commences about 0.5 hour after time of LW and the ebb about 1.3 hours after time of HW.

Tidal bores, about 0.9m high, sweep up the Pegu River in the sudden rising of the early flood, especially in February, March, and April.

**Depths—Limitations.**—The port of Rangoon is accessible to ocean-going vessels drawing 9.1m, subject to tide and monsoon conditions. A draft of 8.5 to 9.1m can be taken over the bar at Monkey Point during spring tides, however; in early 1967, because of heavy silting, the maximum draft that could be taken over the outer bar was reduced to 7.9m. The bend in the channel at Monkey Point imposes a maximum length limitation of 182.9m to vessels which can be safely taken through the channel in this vicinity. There is no beam restriction. Vessels over 183m in length are usually moored off Hastings Sand.

Night navigation on the river is practicable up to within the harbor limit, S of Hastings Sand.

Bars in the river, caused in part by excessive silting, cause fluctuations in the depths. Usually the controlling river depths over the bars range between 7.3 and 9.4m at HW, but vary depending on the tides which have considerable variance throughout the year. The maximum depths occur toward the end of the monsoon season, August to November. The minimum depths occur prior to the monsoon season, February to May.

The positions of the bars and banks, as well as the depths over them, are constantly changing; the chart should not be accepted as completely accurate and up-to-date.

Draft limitations are calculated according to the prevailing depths over the bar at the entrance of the river. Provisional drafts, subject to change without notice, are forecast for each month.

The description of the Rangoon River between its entrance and the port of Rangoon is confined to the shoals and banks in mid-river. Navigational aids mark most of these dangers.

**Middle Bank** (16°30'N., 96°20'E.), a continuation of Eastern Sands to the NW, lies in mid-channel with its NW end about 4.5 miles NW of Elephant Point. The whole bank dries from 0.3 to 3.7m. The SW or fairway side of this bank is marked by buoys.

**Hmawun Lumps** (16°34'N., 96°15'E.), which dry from 0.3 to 1.2m, lie on the E side of the main channel about 2 miles NW of the NW extremity of Middle Bank.

A small shoal, with a least depth of 5.2m, lies on the W side of the main channel about 1.3 miles NNW of the N end of Hmawun Lumps.

**D'Silva Shoal** (16°38'N., 96°15'E.), with a least depth of 0.6m, lies on the NE part of a narrow bank with depths of less than 5.5m, which parallels the W bank of the river. The S end of this bank lies 2.5 miles NNW of Hmawun Lumps and the N end closes the shore about 3.3 miles to the N.

A line drawn between Sinha's Beacon, on the shore abreast of the N end of the above bank and North Beacon on the opposite shore, marks the S limit of Rangoon Harbor.

An obstruction, with a depth of 7m, lies about 1 mile E of Sinha's Beacon.

**Chokey Shoal** (16°41'N., 96°14'E.), with depths of less than 5.5m, lies in the middle of the river with its S end about 1.5 miles NNW of Sinha's Beacon.

Chokey Track, which leads between Chokey Shoal and the E bank of the river, is subject to sudden shoaling and may have depths of less than 3.7m between August and March.

Falan Range Lights, in line bearing 136°30' astern, stand 0.5 mile S of Devil's Hole. A mooring buoy lies close NE of this alignment 1.5 miles NW of Falan Front Range Light.

**Hastings Sand** (16°44'N., 96°13'E.), a drying bank about 1 mile long, lies on the W side of the main fairway about 5.5 miles NNW of Sinha's Beacon.

**Kings Bank Sand** (16°44'N., 96°12'E.), a similar drying bank, lies about 0.5 mile SW of Hastings Sand.

The **Pegu River** (16°46'N., 96°13'E.) flows into the Rangoon River between Thanlyin Point and Pegu Point. Thanlyin Point lies on the E bank of the river about 1 mile NE of Hastings Sand, and Pegu Point lies about 1 mile NE of Thanlyin Point. The Pegu River is navigable by light-draft vessels only.

**Monkey Point** (16°46'N., 96°12'E.), the SW entrance point of Pazundaung Creek, lies at the E end of the city of Rangoon about 0.5 mile SW of Pegu Point. The port of Rangoon comprises a 3.5 mile-long section of the Rangoon River W of Monkey Point. A beacon stands on Mower's Point, on the S bank of the Rangoon River, about 3.3 miles W of Monkey Point.

**Twante Canal** (16°46'N., 96°08'E.) is entered close W of Mower's Point and Kanaungto Creek is entered about 0.5 mile W of the point. The NW limit of the Port of Rangoon is defined by beacons on both shores of the creek about 3.5 miles NW of Mower's Point.

## Rangoon (Yangon) (16°46'N., 96°10'E)

World Port Index No. 49650

**8.14** Rangoon (Yangon) is the capital, chief city, and principal port of the Union of Burma. It lies on the N bank of the Rangoon River, between Monkey Point and Kanaungto Creek 3.8 miles to the W.

Modern alongside berthing facilities are provided as well as numerous mooring berths in the river abreast of the city.

The port of Rangoon is a first port of entry.

**Depths—Limitations.**—Wrecks and obstructions still exist in the river abreast of the city of Rangoon, especially between positions 1.3 and 3.3 miles W of Monkey Point.

Between positions about 1 and 1.8 miles W of Monkey Point, depths in the river range from 6.4 to 9.1m. These depths exist abreast of the small wharves closest to Monkey Point, but are subject to rapid change because of heavy silting. Farther W, abreast of Brooking Street Wharf and Sule Pagoda Wharf, the depths range from 7.6 to 12.2m. Abreast Mower's Point, the depths range from 9.1 to 18.3m.

The following wharves are available for ocean-going vessels:

1. Sule Pagoda Wharf Berth No. 1 through Sule Pagoda Wharf Berth No. 7, with depths alongside of 7.3 to 9.1m, can accommodate seven vessels.
2. Brooking Street Wharf, can accommodate two vessels, has alongside depths of 7.3 to 9.1m, and provides container handling facilities.
3. Ahlone Wharf, with depths alongside of 7.9 to 8.5m, can accommodate one vessel. This berth is used solely for loading rice.
4. Hteedan Wharf No. 1, with depths alongside of 7.9 to 9.1m, can accommodate one vessel.
5. Hteedan Coal Berth, with depths alongside of 7 to 8.5m, can accommodate one vessel.
6. A pontoon jetty at the Port Health Station, with a large floating pontoon 152.4m long, has depths alongside of 7.6 to 8.5m, and can accommodate one passenger vessel.

Two tanker berths are available; one can accommodate a vessel 160m long, with a draft of 8.7m; the other can accommodate a vessel 171m long, with a draft of 7.9m.

Numerous mooring buoys in the harbor W of Monkey Point provide fixed and free-swinging berths.

The maximum length of vessel that can be accommodated, due of the spacing of the mooring buoys, is 168 to 175m. Vessels with slightly longer lengths can be accommodated by removing a buoy. Mooring buoys are laid for large vessels in the river off Syriam. Vessels secure to the pendants with their own cables; all mooring shackles must be in good working order.

**Pilotage.**—General pilotage information applicable to the approaches to the Rangoon River has been previously described in paragraph 8.12.

Near the river bend abreast of Monkey Point, a harbormaster and mooring crew take over direction of the inbound vessel from the pilot. The vessel is berthed alongside a wharf, anchored, or moored to buoys at the discretion of the harbormaster. Unmooring is accomplished by a similar crew. Berthing operations within the harbor are limited to daylight hours.

Masters of vessels preparing to depart must apply for a pilot at least 24 hours prior to the time of sailing. Immediately after a vessel has cleared its moorings or otherwise cast off, the outbound pilot takes over direction of the vessel.

**Regulations.**—Port officials board vessels off Monkey Point. Vessels with a draft of 8m or more must anchor about 8 miles S of the pilot station, and await instructions from the pilot.

The boarding pilot will hand the master a book of port rules and regulations. This book will cover in detail the majority of the vessel's activities in the port of Rangoon, as well as items of general information. Fines are imposed for violation of many of the rules; a close study of them is obviously important.

**Signals.**—Vessels intending to transit Monkey Point Channel during daylight should display the International Code Flag Signal BB when passing Dry Tree Point. If the intentions of the vessel are changed, the signal should be lowered for the information of outbound vessels.

Storm and weather signals are displayed from a flagstaff near the port commissioner's offices; the Indian Extended System is used. Further information on these storm signals may be found

in Pub. 160, Sailing Directions (Planning Guide) South Atlantic Ocean and Indian Ocean under "India—Signals."

**Anchorage.**—Anchorages for cargo vessels, vessels carrying explosives, vessels carrying dangerous petroleum products, and quarantine anchorages are described in the port rules book.

The anchorage for vessels carrying explosives lies in the E side of the river NW of Chokey Point.

The lower quarantine anchorage, the same as that for vessels carrying dangerous petroleum products, lies in the E side of the river NNW of Chokey Point and N to Hastings Sand. This anchorage is used by vessels awaiting favorable tide conditions to cross the bar at Monkey Point; vessels also use the anchorage for topping-off purposes.

The upper quarantine anchorage lies in the harbor W of Monkey Point.

**Caution.**—Submarine pipelines are laid across the mouth of the Pegu River and close within the mouth of Pazundaung Creek; anchorage is prohibited in these areas.

Two submarine cables border the limit of the harbor in the Pegu River.

## The Irrawaddy River

**8.15** The navigable length of the Irrawaddy River and its branches totals about 800 miles from the sea to Bhamo. Intensive traffic is carried on by native craft and by river craft of varying draft belonging principally to the Inland Waterways Transport Board. This traffic is facilitated by the rise of the river due to seasonal heavy rains.

Ocean-going vessels, as a rule, proceed no farther than the ports of Bassein and Rangoon, where the industrial and maritime activities of the entire region converge.

Changes in the channels, the depths, and the velocity and direction of the current are so frequent and so marked that navigation of the Irrawaddy River is always complicated. For example, different routes between the same two river towns often exist; the route is selected only after considering the draft and length of the craft and the season of the year, dry or rainy.

Craft with drafts of 1.2m can reach Bhamo at all seasons; craft with drafts of 1.8m can reach Thayetmo. The passage was once accomplished in July by a vessel drawing 3.1m.

**Tides—Currents.**—The tidal influence is observed as far as Danubyu, about 70 miles from the coast.

The seasonal rise of the river begins in March and attains its maximum height in September. At Prome, 318 miles above Rangoon, the mean high level is about 1m above the dry season level. The rise varies, but as a rule the rise below Prome is somewhat less and above Prome, it is somewhat more than the mean high level.

The average velocity of the river current is 3 knots in portions of the river above the limit of the tidal influence. At some points it is 5 to 6 knots; at Akaukaung (18°25'N., 95°11'E.), a velocity of 7.5 knots has been recorded in August.

**Pilotage.**—The frequent fluctuations of the river can be closely followed only by the local pilots, of which many are natives. Each pilot is qualified for a portion of the river about 65 miles long. They are considered trustworthy.

**8.16 Mandalay** (21°59'N., 96°08'E.), about 350 miles N of Rangoon, is the headquarters of the division and district of

Mandalay as well as the chief city of Upper Burma. Mandalay is connected to the railway and telegraph systems; river steamers communicate regularly with the city. The following table gives the names of the more important cities and towns on the waterway and the distances, in miles, by river.

Rangoon to Thayetmyo	305
Thayetmyo to Minhla	46
Minhla to Yenangyaung	40
Yenangyaung to Pagan	42
Pagan to Myingyan	40
Myingyan to Mandalay	65
Mandalay to Kabwet	56
Kabwet to Myadaung	70
Miles Myadaung to Modah	45
Modah to Bhamo	53
Rangoon to Bhamo (total)	762

## The Gulf of Martaban

**8.17** The Gulf of Martaban lies N of an imaginary line between Baragua Point and Kalegawk Island about 135 miles to the E. The gulf is relatively shallow within its limits, with the 20m curve lying about even with the imaginary line between Baragua Point and Kalegawk Island. Depths N of this curve decrease gradually N toward the shore and the mouth of the Sittang River.

The coast ENE of the entrance of the Rangoon River to the mouth of the Sittang River is low and fronted by an extensive shallow mud and sand bank. This area is very dangerous to shipping.

## The Sittang River to the Tavoy River

**8.18** The **Sittang River Entrance** (16°50'N., 96°55'E.) lies at the head of the Gulf of Martaban and is fronted by shallow dangerous depths. Only native craft can transit the river. Canals within the entrance lead through the inland waterway system.

A dangerous bore sweeps up the Sittang River at spring tides and is often followed by an equally dangerous choppy sea.

The coast E of the entrance of the Sittang River and that part of the coast fronting the Gulf of Martaban SSE to the entrance of the Moulmein River is low and alluvial. From the entrance of the Moulmein River SSE to abreast of Kalegawk Island, the remaining coast is low with a few scattered hills of less than 305m high.

In the vicinity of the entrance of the Ye River, the hills become more numerous and mountain ranges begin to parallel the coast. South of the Ye River to Heinze Chaung, some conspicuous peaks rise from these ranges.

Southsoutheast of Heinze Chaung to the entrance of the Tavoy River, coastal ranges with prominent peaks continue to parallel the coast. Between Maungmagan Bay and Tavoy Point the bold, rocky coast is broken by many small indentations.

**Depths—Limitations.**—Depths of 11 to 18.3m lie off the coast between the SW shore of Bilugyun Island and the N end of Kalegawk Island.

Between Kalegawk Island and Tavoy Point, the 20m curve lies at distances of 11 miles to less than 1 mile offshore.

From a position about 10 miles W of the entrance of the Heinze Chaung, the 40m curve is charted in a very irregular pattern to the W. Toward the Gulf of Martaban, depths of less than 36.6m lie N of the curve.

Between Heinze Chaung and Tavoy Point, the 40m curve lies at distances of about 7 to 24 miles offshore. All of the off-lying islands and dangers between Bilugyun Island and Tavoy Point lie inside the 40m curve.

Depths and dangers which lie inside the 20m curve are described in detail together with that part of the coast which they front. Ross Sand is the only exception.

**Headlam Patch** (15°08'N., 97°38'E.), which has a least depth of 11.9m, lies about 8.5 miles WSW of Pagoda Point and is about 2.5 miles long and 1 mile wide.

**Shearme Sand** (15°04'N., 97°35'E.), a long, narrow shoal with a least depth of 11m, lies about 12.8 miles SW of Pagoda Point.

**Ross Sand** (14°55'N., 97°41'E.), a narrow shoal about 9 miles long, with depths of less than 11m, lies with its N end about 5 miles W of Da That Island. The N part of the sand has a least depth of 3m and is usually marked by discolored water and tide rips. A narrow shoal, with depths of 11.9 to 18.3m, lies about 2 miles W of Ross Sand.

**Sinclair Shoal** (14°53'N., 97°21'E.), with two detached 9.1m patches, lies about 14.5 miles WNW of the S end of Ross Sand.

## The Moscos Islands

**8.19** The **Moscos Islands** (14°10'N., 97°48'E.) comprise three groups of uninhabited islands known as the Heinze Islands (North Moscos), the Maungmagan Islands (Middle Moscos), and the Launglon Bok Islands (South Moscos). The groups lie parallel to the coast for a distance of 42 miles with North Island, the N island, lying about 14 miles SSW of Kandaung Promontory. The group lies within the 40m curve and are generally steep-to on their W sides.

**North Island** (14°28'N., 97°47'E.), 138m high, is the N island of the Heinze Islands. Some rocks, 8.5m high, lie 0.5 mile NNE of North Island.

North Patch, which dries 2.4m, lies about 2 miles N of North Island. East Ledge, which dries 4.6m, lies about 1.5 miles E of North Island.

Heinze Bok, 312m high and the largest of the Heinze Islands, lies about 2 miles S of North Island. Two islands and some above-water rocks lie in between. Reef Islet, 51.5m high, lies 1.5 miles E of the S end of Heinze Bok. A rock, with a depth of less than 1.8m, lies close S of Reef Islet.

**Bok Ye-gan** (14°16'N., 97°49'E.), 359m high and the furthest S of the Heinze Islands, lies about 6.5 miles SSE of Heinze Bok. Two islets lie within 1 mile of the NE side of Bok Ye-gan and four islets lie between Bok Ye-gan and Heinze Bok.

The Maungmagan Islands comprise four densely-wooded islands. **Sabyat** (14°12'N., 97°47'E.), 119m high and the northernmost island of the group, lies 3.8 miles SSW of Bok Ye-gan. North Island, the largest of the group, lies 1 mile farther S.

Pasut Kyun lies 0.5 mile SE of the middle of the SE side of North Island, and South Island lies 0.8 mile SE of the S extremity of North Island.

Kyank Butaung and Nghettaik Taung lie 3 miles E of North Island.

**Maungmagan Passage** (14°00'N., 97°50'E.), a deep clear channel with depths of 25.6 to 42.1m, lie between the Maungmagan Islands and the Launglon Bok Islands.

North Island, Hngetthaik Kyun, and South Island are the principal islands of the Launglon Bok Islands. All lie close together in a N and S direction. Atema Kyun lies close off the E side of North Island; Kama Kyun lies close off the E side of South Island. All islands of the group are densely wooded.

**Kyaukpyu Kyun** (13°46'N., 97°55'E.), a jungle-covered rocky islet 49m high, lies 1 mile SE of the S extremity of South Island.

South Ledge, which dries 4.6m, lies about 0.8 mile S of the S extremity of South Island.

During bad weather, it is recommended that anchorage be taken E of Maungmagan Island, in depths of 16.5 to 21.9m, between Nghettaik Taung and South Island and, in depths of 16.5 to 18.3m, E of Sabyat Kyun.

Anchorage can be taken E of North Island of the Launglon Bok Group, in depths of 21.9 to 25.6m, with Atema Kyun bearing 350°.

**Moscoc Channel** (14°30'N., 97°51'E.) lies between the three groups of the Moscos Islands and the coast to the E. Depths in the fairway range from 18.3 to 36.6m, except at its N end E of North Ledge and North Patch, where the depths are less than 18.3m.

## The Moulmein River

**8.20 The Moulmein River** (16°09'N., 97°31'E.) has its source about several hundred miles inland and discharges into the Gulf of Martaban between the S end of Bilugyun Island and the mainland. The Martaban River branches off from the Moulmein River abreast of the city of Moulmein and discharges into the gulf between the N end of Bilugyun Island and the mainland. This latter river is not navigable.

The entrance of the Moulmein River lies between Tounzoun Point and Amherst Point, about 9 miles to the S.

The port of Moulmein, about 26 miles N of the river's entrance, lies opposite the NE extremity of Bilugyun Island.

**Depths—Limitations.**—The river is generally navigable from the gulf to Moulmein by vessels drawing 3.7 to 4.9m at HWN and 5.8 to 7.3m at HWS. The draft varies according to the monsoon seasons. In 1960, vessels with drafts up to 7.6m entered the port.

Vessels approaching the entrance of the Moulmein River from the W should pass 6 to 8 miles S of Sanda Light Vessel in depths of 25.6 to 29.3m and then steer to make Double Island. This island should be passed a convenient distance to the W and kept bearing less than 153° until the lighthouse on Green Island bears 048°, when the outer anchorage should be steered for on that bearing.

During March, when the land near the entrance of the Moulmein River is seldom seen from a greater distance than 0.5 mile, a landfall must be made well S of the entrance and a posi-

tion off Double Island ascertained before shaping course for the river entrance.

In clear weather and often on a bright-moonlit night, the high mountains on the mainland E of Double Island may be sighted before the lighthouse or the light on Double Island.

In thick weather and during the Southwest Monsoon, the land a little S of Kalegawk Island should be made if the position of the vessel is doubtful. In bad weather, particularly at or near spring tides, vessels should not proceed to the anchorage off Amherst, but should pass inside of Kalegawk Island and anchor in Bentinck Sound.

When proceeding from Rangoon to the entrance of the Moulmein River in fine and clear weather, the lofty peak of the Zingyaik Range and the high land of Bilugyun Island and of Sin Taung may all be identified. In thick weather, especially during February, March, and April, it is advisable to make the land between Button Island and Setse Yele Paya.

Vessels frequently run aground on Bilugyun Sands in fog as a result of being too far N of the landfalls mentioned for approaches in thick weather. Soundings do not give warnings of the near approach to the banks, rocks, and shoals which border the E shore of the Gulf of Martaban.

When proceeding from Rangoon to Moulmein, great care should be exercised to allow for the strong tidal currents.

For a distance of about 10 miles S of Dolphin's Nose, vessels should not approach within 7 miles of the coast. The depths are less than 9.1m. Farther S, a closer approach to the coast may be made abreast Luce Hill and Sieve Hill.

Vessels transiting Moscos Channel during the day should pass E of North Ledge. At the S entrance of the channel, vessels should not pass between Kyaukpyu Kyun and South Ledge.

**Tides—Currents.**—Between the entrance of the Rangoon River and the Moulmein River, the flood current sets toward and into the Sittang River. On the Rangoon side of this area the set is NNE and N; on the Moulmein side the set is NNW. The general direction of the flood current in other parts of the Gulf of Martaban is NNE. It becomes more N as the E shore is approached; within a distance of 10 miles it parallels the shore. The ebb current in all parts of the gulf sets almost invariable in a direction opposite to that of the flood current. The velocities of the tidal currents at springs increase from 2 to 3 knots in depths of over 36.6m to from 6 to 7 knots in position 16°15'N., 97°00'E. During and immediately after the Southwest Monsoon, the duration and velocity of the ebb current are increased and those of the flood current are decreased. The duration of slack water at springs does not usually exceed 0.5 hour.

In the approaches to the entrance of the Moulmein River the flood current sets N along the coast. The ebb current at first sets WSW and then S. The velocity of the ebb current is considerable as a result of the flow from the Sittang River and the Moulmein River.

In the vicinity of Double Island, the flood current sets N and the ebb S. The velocity at springs is 4.5 knots and neaps 2 knots. The tidal currents turn about 0.5 hour later than at Amherst Point.

Tidal currents attain velocities of 3 knots at springs in the channel between Hnetthalk Kyun and the mainland W of Tavoy Point.

**8.21** The coast E of the entrance of the Sittang River is low and backed by the Zingyaik Mountains, which roughly parallel the coast about 9 miles inland N of Biligyun Island. Pagodas stand on the northernmost summits which have the greatest elevation.

As the mountains rise a considerable distance inland from navigable waters, their value as navigable aids are greatly reduced. However, on a clear day they are visible up to distances in excess of 50 miles.

**Biligyun Island** (16°23'N., 97°31'E.), about 17 miles long and 8 miles wide, has a range of wooded hills on its N part which attain elevations of over 180m. Several isolated lower hills rise in the S part of the island. Steep-to shoals front the W side of the N part of the island as far as 4 to 5 miles offshore. Touzoun Point and an unnamed point about 0.8 mile to the E are the S extremities of Biligyun Island.

Under normal conditions, the length of a vessel entering the port is limited to 137.2m if a single-screw vessel and 144.8m if a twin-screw vessel. Reports indicate a vessel with a length of 152.4m may be taken to Moulmein under ideal conditions.

The navigable depth available is related to the power of the vessel. Because of strong cross-channel currents, the deepest channel is not always available to vessels not capable of a 10-knot speed.

Entrance into the river at night is not permitted. No vessel should attempt to enter the river without a pilot on board.

During the monsoon season, the maximum sailing draft from Moulmein, in May to September, ranges from 4.6 to 7.4m. During the dry season, October to April, the draft ranges from 3.4 to 6.9m.

**Winds—Weather.**—From July to September, the weather is stormy. In December, January, and February, the winds are light and the weather is fine.

The mornings and evenings of days in January are misty; towards the end of the month the weather becomes foggy. Fogs become thick and frequent toward the end of February and throughout March. During this interval, they last at times for 3 or 4 days and obscure even the banks of the river.

When the farmers burn waste-paddy straw, dense smoke further reduces visibility.

Rainfall is heavy between May and September.

Storm and weather signals are displayed from the port office flagstaff; the Indian General System is used. Further information on these storm signals may be found in Pub. 160, Sailing Directions (Planning Guide) South Atlantic Ocean and Indian Ocean under "India—Signals."

**Tides—Currents.**—Tides at Amherst Point and Moulmein are semidiurnal.

Tides in the river to the port of Moulmein are subject to large diurnal inequalities and seasonal variations.

Tide gauges stand in the following positions:

1. Near the landing about 0.5 mile ENE of Amherst Point.
2. On the E bank of the river, about 7 miles NNE of Amherst Point.
3. Off the W side of New Kingyaung Island.
4. On the W side of the river, off the point at Nathmaw.
5. Off the E bank, about 0.5 mile SSW of Mupon Pagoda.

6. Off the port office at Moulmein.

These gauges are painted in red, black, and white bands which comprise a 1.8m section. To the top of the red band is 1.8m, and to the top of the white band is 0.9m. Each band is 0.3m high; the 0.6m black bands between the red and white bands have narrow white lines across the middle, marking two equal divisions of 0.3m each.

Each bar in the river has its own particular tide gauge, which is moved as the bar shifts.

The zeros of the tide gauges are set to the level of Indian Spring LW.

A tidal semaphore, 24.4m high and painted red, stands on the W bank of the river at Nathmaw, about 1 mile WSW of the S end of Yele Kyun. It is visible from the S end of Ameila Crossing, about 2 miles E of the S extremity of Hinthia Kyun. Another semaphore, 15.2m high and painted white, stands at Thetkaw on the W bank, about 2 miles above Nathmaw. It is visible from the S from abreast the N part of Hinthia Kyun and N from the berths off Mupon.

The system is the same as the one used in the Karnaphuli River and registers the rise of the tide during daylight hours.

In the offing abreast Amherst, the flood or N current commences about 0.5 hour after LW at Amherst Point; the ebb or S current commences about 0.5 hour after HW. The velocity of the current is 3.8 knots at springs and 2 knots at neaps. The interval of slack water is very short.

Off the entrance of the Moulmein River the flood current sets towards Longstones Reef; when the outer banks are covered it sets strongly E or NE over the sands.

Off Green Island during the dry season, the flood current commences at the time of LW at Amherst while the ebb current commences 1 hour after HW at Amherst.

During the dry season, the velocity of the river current is 3 knots. In the rainy season the velocity is higher; during August, the rains raise the level of the river to 8.5m and a velocity of 7 knots is attained.

At Anchoring Creek, on the E side of the river abreast the S end of Hinthia Kyun, the flood current commences 2.3 hours after LW at Amherst; the ebb current commences 1.5 hours after HW at Amherst.

At Nathmaw, the flood current commences 3.2 hours after LW at Amherst while the ebb current 1.7 hours after HW at Amherst.

The durations of the flood and ebb tidal currents at Amherst are the same the year round.

Moulmein		
Time	Duration of	
	Flood	Ebb
October through January	4 hours	8 hours
February through May	5 hours	7 hours
June	3 hours	9 hours
July through September	There is no flood current except at maximum spring	—

**Depths—Limitations.**—Considerably less water than charted is reported to exist in the approaches to the entrance of the Moulmein River.

After every monsoon, marked changes are observed; alterations in the arrangement of the channel and the river banks occur and the bars are often found in new positions, with altered depths over them.

The entrance of the Moulmein River is greatly encumbered by extensive sand banks and reefs.

Drying banks of mud and sand, with shoals with depths of 5.5m and less on the seaward side of them, lie within a distance of about 3.8 miles SSW of Tounzoun Point. Similarly, the above dangers lie about 3 and 4 miles W and WNW, respectively, of Tounzoun Point.

**8.22 Bilugyun Sands** (16°10'N., 97°32'E.), which dry in places, cover most of the middle of the entrance and are separated from the shoals S of Bilugyun Island by a channel. This passage is sometimes narrow and shallow and at other times wide and deep. At such times it becomes the main channel leading into the river. The sands are steep-to on their seaward side and soundings give no warning when approaching them.

**Goodwin Sands** (16°07'N., 97°35'E.), which dry up to 3m, lie on the S side of the river entrance E of Bilugyun Channel and N and NE of Amherst Point.

Bilugyun Channel lies between Bilugyun Sands and Goodwin Sands. In 1966, there was a least depth of 6.4m in this channel at MLWS. Channel depths to Moulmein have charted depths of as little as 3m.

**Longstones Reef** (16°06'N., 97°32'E.), which has its outer edge about 2 miles NW of Amherst Point, consists of drying and sunken rocks, with depths of less than 5.5m.

An area of rocky shoals, with depths of 5.5m and less, lie within 0.5 mile WSW and 0.8 mile S of the outer edge of Longstone Reef. A detached 8.2m patch lies 2.8 miles W of Amherst Point.

**Devils Horn** (16°05'N., 97°33'E.), a rock which dries up to 3.7m, lies between Longstone Reef and Amherst Point and about 1 mile NW of the latter. Foul ground and shoal patches, with depths of less than 5.5m, lie within 1 mile W to NW of Amherst Point.

Except at slack water, the channels between the rocks should not be attempted without local knowledge.

**Green Island** (16°04'N., 97°33'E.), about 1 mile SSW of Amherst Point, is surrounded by foul ground. An approach of less than 0.5 mile to the island is dangerous.

The coast up to several miles S of Amherst Point is fringed by foul ground which extends about 0.5 mile offshore in places. Shoal depths of less than 5.5m lie up to 1 mile offshore along this section of coast.

When approaching the Moulmein River Entrance, care should be taken to avoid the fishing stakes about 5 miles WNW of Tounzoun Point.

**Aspect.—Tounzoun Point** (16°14'N., 97°32'E.), on the N side of the entrance, is the S extremity of a ridge about 0.5 mile long which slopes toward the point from a height of about 51.8m. Kwanhla Pagoda stands on a hill about 1.3 mile NE of the point and is a good landmark. Two other pagodas stand on a hill about 0.8 mile E of the Point.

**8.23 Amherst Point** (16°05'N., 97°34'E.), on the S side of the entrance, is fronted by a bluff with an old pagoda on it. A conspicuous pagoda stands on piles on a drying reef close NNW of Amherst Point. Another pagoda stands near a cliffy point about 1 mile S of the point. Sin Taung, a 285m high hill, about 4.8 miles SE of the point, is conspicuous when viewed from the W. The village of Amherst stands just within Amherst Point.

During the month of March the land near the Moulmein River Entrance is seldom visible more than 0.5 mile.

The various channels and crossings between Bilugyun Channel and the port of Moulmein are subject to constant change and no detailed description will be made of them.

When entering the Moulmein River, red conical buoys indicate the E or starboard side of the channel and black can buoys indicate the W or port side of the channel.

The buoys are numbered consecutively from seaward; on each buoy is painted the initial letter of the channel it marks. The buoys are moved to conform to the channel which shifts with the seasons. After heavy freshets, the positions of the buoys may be unreliable.

**Anchorage.**—Anchorage can be taken outside the entrance of the Moulmein River, with Green Island Light bearing 090°, distant 2 miles. Shelter is provided against the strong spring ebb current during freshets. The depth in this position is about 18.3m, mud, with good holding ground.

There are several anchorages in the river, but vessels must moor as they cannot lie at single anchor.

Anchorage can be taken by two vessels of not more than 137.2m in length, in a depth of 6.4m, at the N end of Long Island Channel E of the S end of Hintha Kyun.

Deep-draft vessels may moor off Natmaw, about 1 mile SW of the S end of Yele Kyun.

Mupon Anchorage lies off Mupon Pagoda, about 1.3 miles N of the N end of Yele Kyun, with depths (1964) of 11 to 12.8m. There are mooring buoys, for the use of naval vessels, close inshore, about 0.5 mile N of Mupon Pagoda.

Moulmein Anchorage lies abreast the town of Moulmein, about 2 miles N of Mupon Pagoda. There are three mooring buoys for vessels up to 152.4m in length and drawing up to 7m. There is also an anchorage berth for a vessel of up to 1,000 grt.

Anchorage can also be taken abreast of the N part of Moulmein, where there are three berths for vessels with drafts of 6.1 to 7.6m; a mooring buoy is available at this anchorage.

**Pilotage.**—Pilotage is compulsory for merchant vessels of over 200 grt displacement.

The pilot station is situated on Amherst Point. If arranged for in advance, a pilot is available on display of the usual day signal or by a blue light at night. Entrance into the river at night has been discontinued.

Vessels should send their ETA, draft, and speed about 24 hours before arrival to Port of Moulmein via Rangoon Radio. The pilot must travel to Amherst by launch or car. There is no pilot vessel.

Pilots will board vessels in the vicinity of the outer anchorage, W of Green Island. It is advisable to arrive at the anchorage 2 hours before time of HW at Amherst and anchor while awaiting the pilot.

A pilot beacon, 1.8m high, which is a wooden mast with a white corrugated-iron topmark, stands about 0.2 mile SW of

Water Pagoda. A light, for the use of the pilot only, is displayed from the mast.

A signal station is situated on Amherst Point; flags of the International Code of Signals are displayed from a mast.

**Regulations.**—There shall be no communication between any vessel, which is liable under Quarantine Regulations to display the International Code of Signals Flag L, and the shore of any other boat or vessel, except to receive the pilot and his servant and baggage, until permission is granted in writing by the Health Officer.

If there is a suspected case of plague on board or if more than two deaths from any cause have occurred during the voyage, the pilot anchors the vessel in Halfway Anchorage to await the Health Officer; in other cases vessels are anchored in the lower end of Mupon Reach.

Vessels which have, within a period of 2 months immediately preceding their arrival, started from or touched enroute at a port infected with yellow fever, or communicated, except orally without contact or by signal, with a vessel which is either infected with yellow fever, or communicated, except orally without contact or by signal, with a vessel which is either infected with yellow fever or which has left a port infected with yellow fever within that period, shall be allowed to anchor only at the outer anchorage W of Green Island.

### Moulmein Harbor (16°29'N., 97°37'E.)

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**8.24** Moulmein Harbor comprises a 4-mile section of the river from Mupon Pagoda N to Battery Point. The width of the river within the limits of the harbor range from 0.2 to 0.5 mile.

Moulmein, Burma's third-largest city and third-ranking port, lies on the E bank of river about 22 miles N of the entrance.

Ocean-going vessels capable of transiting the river load and discharge cargo at the mooring buoy berths in the river abreast of the city.

Moulmein is a first port of entry.

**Depths—Limitations.**—In 1966, the harbor depth in the middle of the fairway, other than the depths over Fairway Rocks and Town Rock, ranged from 4.9 to 2.5m. These depths are subject to change because of silting.

Mupon Reef lies close off the E bank of the river, almost 0.5 mile N of Mupon Pagoda. Patches of rock on this reef dry about 0.6m at LW during the dry season, February and March.

Sirrocco Rock, with a least depth of 2.4m, lies on the E side of the channel a little more than 1 mile N of Mupon Pagoda and about 0.4 mile off the E bank.

A rock, with a depth of 1.5m, lies on the E side of the channel about midway between Mupon Reef and Sirrocco Rock, and about 0.8 mile N of Mupon Pagoda.

Rocky, foul ground lies about 0.2 mile NE of Sirrocco Rock.

**Fairway Rocks** (16°28'N., 97°37'E.), with a least depth of 2.1m, lie in mid-channel about 0.3 mile NNW of Sirrocco Rock. A rocky patch, with a depth of 4.9m, lies midway between Sirrocco Rock and Fairway Rocks.

**Wales Rock** (16°28'N., 97°37'E.), with a depth of 0.9m, lies close off the E bank about 1.5 miles N of Mupon Pagoda. A 3.3m patch lies close NW of Wales Rock.

**Castle Rocks** (16°28'N., 97°37'E.), with depths of less than 1.8m and rocks awash at their S end, lie about 0.5 mile N of Wales Rock.

**Town Rock** (16°29'N., 97°37'E.), with a least depth of 1.8m, lies near mid-channel about 0.5 mile NW of Castle Rocks. A sunken rock, with depths of less than 1.8m in the vicinity, lies close offshore about 0.5 mile NNE of Town Rock.

A reef lies close off the E bank, about 0.3 mile SW of Battery Point which lies at the N end of the city. Depths of less than 1.8m surround the reef and border the shore in the vicinity of Battery Point.

The port has about 304.9m of principal wharfage, which consists mostly of small pontoons and finger piers.

Tavoy Jetty, a pontoon wharf about 76.2m in length with a depth of 4.9m alongside at LW, lies about 2.5 miles N of Mupon Pagoda.

Salween Wharf, a finger pier with a short outer face and a depth of 3.4m alongside, lies close N of Tavoy Jetty.

Moulmein Railway Jetty, about 0.3 mile N of Salween Wharf, is used primarily by local ferries.

Big Bazaar Jetty, 49m in length, is used only by river craft.

Numerous jetties line the shore between Mupon Pagoda and Battery Point, but are for the sole use of lighters and river craft.

Several small tugs and an ample supply of barges and lighters are available to work cargo at the river mooring berths.

Martaban, a shallow port area used exclusively by river craft and barges, stands on the W bank of the river about 2 miles N of Battery Point.

The N part of this section of coast between Amherst Point and Bluff Point, about 21 miles SSE, is high, rocky, indented, and marked by occasional cliffs. The low S part of the coast is covered with dense jungle growth.

**Setse Yele Paya** (15°57'N., 97°36'E.), a small islet close to the coast about 8.25 miles SSE of Amherst Point, is marked by a 21m high pagoda.

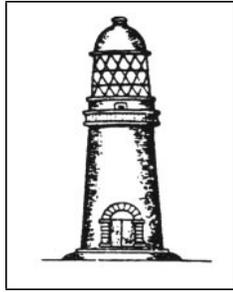
**Button Island** (16°00'N., 97°34'E.), 53m high and close offshore, lies about midway between Amherst Point and Setse Yele Paya. Sin Taung, a high peak about 2.5 miles ENE of Button Island, is a good mark from the W along this section of coast.

**Bluff Point** (15°46'N., 97°42'E.), which rises to a height of 100m, lies 12.5 miles SSE of Setse Yele Paya. A pagoda stands on a reef about 1.3 miles N of Bluff Point.

**Double Island** (15°52'N., 97°35'E.), lies about 12.3 miles S of Amherst Point and about 6.5 miles offshore. The island lies on the NW edge of a shoal, with depths of less than 11m, which is about 1.3 miles long and 0.3 mile wide. Less water than charted has been reported to exist in the vicinity of Double Island. Vessels when passing should give it a wide berth.

**Caution.**—Should the light on Double Island appear to darken for short intervals, it signifies that the lighthouse keepers require assistance. Notify the local authorities as soon as possible.

**8.25 North Rocks** (15°46'N., 97°39'E.) consist of two groups of rocks, about 1.3 miles apart, which lie on a shoal about 3 miles WNW and a similar distance NW of Bluff Point. A rock in the S group is 6m high, but the N group dries up to 5.2m. The channel between North Rocks and the coast is unsafe and should not be attempted.



**Double Island Light**

**Pagoda Point** (15°37'N., 97°44'E.), about 45m high, lies about 8.5 miles S of Bluff Point. Drying mud and sand flats extend up to 1 mile offshore between these points.

Evans Ridge, a range of coastal hills 91 to 128m high, extends 2 miles SE from a position 3.3 miles SSE of Bluff Point.

**Kakana Taung** (15°41'N., 97°43'E.), a small islet 55m high, lies 4.5 miles S of Bluff Point.

**Bentinck Point** (15°29'N., 97°44'E.), a low projection, lies 8 miles S of Pagoda Point. The coast between the points is fronted by shallows and drying flats which extend up to 1.5 miles offshore. A reef and sunken rocks extend about 1 mile NW from Bentinck Point.

**Phaungkala Taung** (15°35'N., 97°50'E.), 393m high and conspicuous, is the highest summit of an isolated range which rises about 6 miles ESE of Pagoda Point. Wara Taung, 440m high, lies about 8 miles ESE of Bentinck Point and is a useful mark for entering Bentinck Sound.

Kyaikhalaing Pagoda, 12m high, stands on a reef about 3 miles N of Bentinck Point. Another pagoda stands on a reef about 0.5 mile NW of the point.

## Bentinck Sound

**8.26 Bentinck Sound** (15°35'N., 97°42'E.) lies between the coast to the E and Galloper Sand, Kalegauk Island, and Cavendish Island to the W.

**Galloper Sand** (15°38'N., 97°40'E.), as defined by the 2m curve, extends about 7.8 miles S from a position about 3.8 miles SSW of Bluff Point. Several drying patches lie within the limits of this shoal.

**Kalegauk Island** (15°33'N., 97°40'E.), lies close S of and is separated from Galloper Sand by a narrow clear passage. Portland Point lies at the N end of Kalegauk Island and at the NW end of the passage mentioned above. Kalegauk Summit rises to a height of 159m in the N part of the island and is a good landfall for vessels bound for Moulmein during the Southwest Monsoon. Kalegauk Island lies abreast of the S limit of the Gulf of Martaban.

**Cavendish Island** (15°30'N., 97°40'E.), 97m high, lies close S of Kalegauk Island.

**South Shoal** (15°28'N., 97°39'E.), about 2.8 miles long with a least depth of 8.2m, lies close S of the shoal extending about 0.5 mile S from Cavendish Island. A narrow passage separates the two shoals. An obstruction, with a least depth of 4m, was reported to lie on the outer edge of the NE part of South Shoal.

**Tides—Currents.**—In the N entrance of Bentinck Sound, the tidal currents attain a rate of 5 knots and set across the

channel. Inside the sound the rates are 2 to 3 knots. The flood sets on the inner side of Galloper Sand and the ebb sets on the outer or seaward side.

**Depths—Limitations.**—The fairway depths in the N entrance of Bentinck Sound range from 10 to 16.5m, which has a least width of 0.3 mile. The S entrance has depths of 12.8 to 16.5m and a width of about 3 miles.

**8.27 Middle Ground** (15°38'N., 97°42'E.), a long narrow shoal with a least depth of 8.2m, lies in the middle of the N part of the sound with its S end about 1.8 miles W of Pagoda Point.

Kalegauk Island is generally steep-to seaward of the 10m curve which nowhere lies more than 0.5 mile offshore.

The Peepers, two small rocks close together and low, lie about 1 mile NNW of the S extremity of Kalegauk Island.

The best anchorage, sheltered from the Southwest Monsoon, lies, in depths of 11 to 14.6m, about 0.5 mile E of the middle of the E side of Kalegauk Island.

**Directions.**—Deep-draft vessels without local knowledge are advised not to use the N entrance leading into the sound. Sufficient aids are not available to make good a course against the strong cross channel currents.

When entering the N entrance pass midway between the N end of Galloper Sand and the shallow LW fronting the coast N of Pulau Kropik by keeping the S end of Pulau Kropik in range 129° with Phaungkala Taung. When the N summit of Evans Ridge bears 078°, pass between Galloper Sand and Middle Ground by steering 182°. Consideration should be given to the set of the flood toward Galloper Sand and the ebb toward Middle Ground.

To enter Bentinck Sound by way of the S entrance, keep Wara Taung bearing not more than 078° until the E side of Kalegauk Island is open E of the E side of Cavendish Island, bearing more than 002°. Course may then be shaped to the NNE to pass 1 mile E of Cavendish Island, having regard for the dangers S of that island.

**Hope Point** (15°21'N., 97°43'E.), about 8 miles S Bentinck Point, is rocky with a 110m high hill behind it. The bay between the two points is covered with mud and sandy flats which dry in places and extend up to 1.3 miles offshore in places.

The coast for about 6.8 miles S of Hope Point is cliffy and backed by heavily-wooded hills. Palein, a peak 521m high, lies about 4 miles SSE of Hope Point. Notched Peak, the highest of five summits, is 334m high and lies 3 miles S of Palein Hill.

**Kokunye Kyun** (15°18'N., 97°43'E.), 140m high, lies about 3.3 miles SSW of Hope Point. Shoal ground, with depths of less than 5.5m and parts of which dry, extend S from a position 0.5 mile NW of Hope Point to Kokunge Kyun.

**Toby Rock** (15°16'N., 97°43'E.), which dries to a height of 5.2m and is awash at HWS, lies about 2 miles S of the E end of Kokunye Kyun.

## The Ye River

**8.28 The Ye River** (15°11'N., 97°47'E.) enters the Bay of Bengal between Pagoda Point and the W extremity of Sidaw Taung. Sidaw Point, on the S side of the entrance, lies about 0.5 mile NE of the W extremity of Sidaw Taung. The town of Ye stands about 8 miles above the river entrance.

Three sets of range beacons lead from the river entrance to within 1 mile S of Sonma Kyun.

A beacon, consisting of a white globe in a tree, lies on a point on the W side of the river, almost 1 mile N of Sidan Point. A prominent pagoda stands on the W bank about 1 mile N of the beacon.

The navigable channel of the river lies S of Sonma Kyun, a large island about 2 miles above the entrance. The river from its entrance to the town follows a winding course with many abrupt bends. Only short vessels can negotiate them. Local knowledge is required.

**Pagoda Point** (15°12'N., 97°46'E.) lies on the N side of the entrance of the Ye River and should not be confused with Pagoda Point on the E side of Bentinck Sound. From the NW, this point appears as a hummock at the end of a level stretch of beach. Rising steeply from the beach this 46m point is conspicuous. A pagoda stands on the point.

**Sidaw Taung** (15°10'N., 97°48'E.), a bold headland 176m high, lies about 1.8 miles SE of Pagoda Point, on the S side of the entrance of the Ye River. This headland appears flat-topped when viewed from the W and NW and conical when viewed from the S.

Damatha Taung, a 158m high headland, lies 9.5 miles S of Sidaw Taung. The coast between these two headlands is low, but the high ranges inland give it the appearance of being steep.

There are no recommended passages between the islands and sands which extend S and parallel the coast for about 22 miles from a position about 2 miles WNW of Pagoda Point and terminate in Ross Sand.

Soundings provide the best guide when passing seaward of Livermore Shoal, as it lies just within the 20m curve.

Pagoda Point, in line with the W slope of Sidaw Taung and a dip in the distant high land bearing 129°, leads N of Livermore Shoal and the shoal N of Wa Kyun.

**Tides—Currents.**—The flood tidal current in the vicinity of the entrance of the Ye River sets N along the coast at a rate of about 3 knots at springs. The ebb sets S at the same rate. At springs, the water outside the islands is discolored.

**Depths—Limitations.**—Livermore Shoal, a 2.5 miles long ridge of hard sand with depths of 3.7 to 9.1m, lies with its least depth about 5.5 miles W of Pagoda Point.

**Wa Kyun** (15°12'N., 97°44'E.), the N island of the chain of islands which lies off the entrance of the Ye River, lies about 2 miles W of Pagoda Point. The N summit of two which lie on the island rises to a height of 135m. This island lies in about the middle of a shoal about 2.3 miles long with depths of less than 5.5m. Depths of 9.1m and less lie within a narrow tongue which extends 4 miles NNW from the N end of Wa Kyun.

**8.29 Hngetpyaw Kyun** (15°11'N., 97°43'E.), 46m high, small and wooded, lies almost 1 mile SW of Wa Kyun. Some rocks, which dry about 5.5m and are awash at HWS, lie about 0.2 mile NW of the N point of the island. Depths of less than 9.1m lie up to 1 mile N of the island.

**Nat Kyun** (15°10'N., 97°44'E.), 135m high, lies 0.5 mile SE of Hngetpyaw Kyun. A drying ridge of hard sand extends about 3.8 miles S from Nat Kyun. Depths of 9.1m and less lie from 0.5 to 0.8 mile off the W side of this ridge. The sea breaks heavily over the ridge. A drying bank, which breaks heavily, lies close N of Nat Kyun. The channel, which lies between Nat

Kyun and Hngetpyaw Kyun on the SW side and Wa Kyun on the NE side, has a least depth of 9.6m but is not recommended.

**Ghorparay Rock** (15°10'N., 97°43'E.), which dries about 0.9m, lies about 0.5 mile W of the S end of Nat Kyun.

**Pascoe Shoal** (15°10'N., 97°45'E.), with a least depth of 0.9m over its central part, lies centered about 1.3 miles E of Nat Kyun. Depths over the remainder of this shoal are less than 5.5m. A detached 4.9m patch lies about 0.3 mile N of the N end of Pascoe Shoal.

**Kyettaik Kyun** (15°10'N., 97°45'E.), 24m high to the tops of the trees, lies about 1.3 miles SE of Nat Kyun. A narrow shoal, with depths of less than 5.5m, extends about 0.3 mile SW from the island.

**8.30 Simpson Shoal** (15°08'N., 97°45'E.), about 2 miles long and 0.3 mile wide with depths of less than 5.5m within its limits, lies about 0.8 mile S of Kyettaik Kyun. The E extremity of Nat Kyun in range 352° with the SW extremity of Wa Kyun leads through the S part of the channel between Simpson Shoal and the drying ridge of sand which extends S from Nat Kyun. The channel E of Simpson Shoal and Pascoe Shoal is preferred. Kyettaik Kyun, bearing 351° and open W of the high land near the coast to the N, leads E of Simpson Shoal.

**Kyungyi** (15°05'N., 97°44'E.), 2.5 miles long and marked by four distinct, wooded hills, lies about 4.5 miles S of Nat Kyun. The S hill is 163m high and the N hill is 76m high.

Shoal ground, with depths of less than 5.5m, lies up to about 1.5 miles W of Kyungyi. A tongue of shoal ground, with a drying sand ridge on its N half, extends about 5.5 miles S from a position about 1.5 miles W of the central part of Kyungyi. The sea breaks over the drying sand ridge.

**Dathat Island** (15°00'N., 97°46'E.), small in extent and 79m high, lies about 4 miles SSE of the S end of Kyungyi. Magyi Island, 44m high, lies about 3.3 miles SSE of Dathat Island.

Several small islets lie close S of Magyi Island.

**Anchorage.**—Anchorage can be taken in the channel between Kyungyi and the coast, in depths of 16.5 to 18.3m, with the N end of Kyungyi bearing 328°, almost 1 mile distant.

Anchorage can be taken in the channel E of Wa Kyun, in a depth of 11.9m, mud, with the N extremity of the island bearing 299° and the S extremity bearing 215°.

Anchorage can be taken E of Pascoe Shoal, in depths of 9.1 to 11m, with the E extremity of Kokunye Kyun in line bearing 339° with the W extremity of the mainland, located about 3.8 miles SSE of the E extremity of Kokunge, and Kyettaik Kyun bearing 212°.

**Directions.**—If approaching from the N, steer to pass 1.5 miles W of Kokunye Kyun after sighting Kalegawk Island. When Wa Kyun is sighted, steer 147° for the N summit of the island. When Pagoda Point bears 129° and is in range with the W slope of Sidaw Taung and with a dip in the distant high land, steer for the point. This course leads about 0.2 mile N of the shoal which lies N of Wa Kyun. When the E extremity of Nat Kyun is open E of the E side of Wa Kyun and bears about 190°, change course SSE for the anchorage E of Wa Kyun.

To arrive at the anchorage E of Pascoe Shoal, maintain the 129° course for Pagoda Point until the E end of Kokunye Kyun is in line bearing 339° with the W extremity of the mainland, located about 3.8 miles SSE of the E end of Kokunye Kyun. Then change course SSE, keeping the range astern, and steer

for the anchorage. Note that the charted anchorage position is about 2.3 miles from the position where the stern range is picked up.

If approaching the entrance of the Ye River from the S, steer 000° for Kyungyi passing W of Magyi Island and E of Ross Sand. When Dathat Island bears 045°, steer to pass midway between Kyungyi and the mainland. Pagoda Point, in line bearing 004° with a notched peak, 2.5 miles to the N of the point, leads E of Simpson Shoal to a position off the entrance bar of the Ye River, E of Pascoe Shoal.

The entrance bar from the NW almost dries and can be crossed by vessels only at HW. At springs, a vessel drawing 4m might reach the town; at neaps, the maximum draft is less than 2.1m.

**8.31 Ye** (15°15'N., 97°51'E.) (World Port Index No. 49670), a small river port, lies on high ground on the N bank of the river. The pagodas in the town can be seen for a considerable distance and are good landmarks.

A wooden pier abreast of the town is available only to small vessels.

The coast between Damatha Taung and White Point, about 9 miles to the S, rises to high land several miles inland, but closes the coast in the vicinity of White Point.

**Pawdi Taung** (14°57'N., 97°52'E.) rises to an elevation of 789m about 7 miles NE of White Point. Kinbun Taung, 774m high, lies 1.5 miles N of Pawdi Taung. Several other peaks in the vicinity make these two peaks difficult to identify.

The coast between White Point and the Dolphin's Nose, about 11 miles SSE, is bold and rocky. A mountain range, with elevations of 305 to 634m, rises close inland along this stretch of coast.

## Heinze Chaung

**8.32 Heinze Chaung** (14°43'N., 97°54'E.) is an estuary formed by the confluence of three large creeks which flow into the sea between high hills. The funnel-shaped estuary is about 4 miles long and 0.8 mile wide at its narrowest part.

The entrance to Heinze Chaung is encumbered by a bar which lies between South Sands and the outer part of North Sands. The outer part of the bar is fairly level, but farther in between the sands, there are a number of shoal patches which may reduce the depth in the channel to about 2.7m or less in spots. These patches are steep-to and marked by tide rips during maximum flood or ebb. Vessels with drafts to 7.6m can enter Heinze Chaung at HW springs and those with a draft of 5.5m at HWN.

**Dolphin's Nose** (14°43'N., 97°52'E.), the N entrance point of the estuary, rises to an elevation of 304.8m. Other hills on the same side of the estuary rise to heights of up to 451m.

**Kandaung Promontory** (14°40'N., 97°53'E.), an isolated hill 28m high, is the S entrance point of the estuary.

The shores of the estuary, with the exception of a few rocky points and some creeks, are fringed by mangroves. Kwethongyima, a jungle-covered low peninsula, lies between the mouths of the two creeks which flow into the estuary from the N. Fish Trap Point, on the S side of the estuary, lies S of and nearly opposite Kwethongyima. East Point, on the S side of the es-

tuary at its narrowest part, lies about 3 miles NE of Kandaung Promontory.

**Tides—Currents.**—The currents in the approaches to Heinze Chaung turn from 2.5 to 3.5 hours after HW and LW at Mergui. In the offing, the flood tidal current sets N parallel with the coast and the ebb current sets in the opposite direction. At the entrance of the N channel, the currents also set parallel with the coast.

Outside South Sands, the tidal currents set across the bar and through the S channel until the sands are covered, when they set slightly across them at velocities estimated at 1.5 to 3 knots.

In the entrance of Heinze Chaung, the flood current commences about 14 hours after LW at Mergui and has a velocity of about 0.8 to 1.8 knots. The ebb current commences about 1.3 hours after HW at Mergui and has a velocity of 1 to 3 knots. Inside the entrance, the flood current commences about 0.8 hour after LW at Mergui and the ebb current commences at about the same time that it does in the entrance.

The observations upon which these statements are based were made during the dry season. During the rainy season, the ebb current will be considerably stronger, perhaps even to the point of overcoming the flood current.

**Depths—Limitations.**—Vessels drawing up to 7.6m can enter Heinze Chaung at HWS and vessels drawing up to 5.5m can enter at HWN. Local knowledge is required.

No attempt should be made to cross the entrance bar unless the channel has first been thoroughly examined and buoyed to mark it.

**North Sands** (14°41'N., 97°50'E.), with general depths of 3.7m and which dry in places, extend about 4.8 miles SSW from the coast between Dolphin's Nose and a position on the coast about 2 miles WNW.

**Position Rock** (14°42'N., 97°52'E.), which dries 4.3m and is awash at HWS, lies near the inner edge of North Sands about 0.5 mile SE of the Dolphin's Nose.

**South Sands** (14°39'N., 97°52'E.), with general depths of less than 3.7m and which dry in places, extend about 3.5 miles SSW from Kandaung Promontory.

The entrance bar lies between the outer part of North Sands and South Sands. The depths are fairly uniform on the outer part of the bar, but on the inner side of the bar the depths are shoal in places.

Shoal patches on the bar separate the entrance into N and S channels. In the past these channels had a least depth of 4m.

The S channel passes close along the edge of South Sands and of the two channels it has less LW to be crossed. Shoals along the channel are steep-to and are usually marked by tide rips.

**Anchorage.**—Anchorage can be taken outside the entrance W of North Sands, with the Dolphin's Nose bearing between 080° and 102°, distant 3 miles. The depth in this position is about 8.2m.

Anchorage can be taken anywhere within the estuary after passing Kandaung Promontory, but the depths are more convenient and the currents are weaker on the S side.

Good anchorage can be taken within the estuary, in a depth of 12.8m, midway between Fish Trap Point and the S end of Kwethonyima Promontory.

The estuary is usually closed during the Southwest Monsoon to all shipping.

The coast between Heinze Chaung and Pazin Kyun, about 55 miles SSE, is backed by mountain ranges and fronted by the Moscos Islands.

Between Kandaung Promontory and the mouth of a creek, about 16 miles SSE, the coast is fronted by depths of 9.1m and less which lie from 1.5 to 7 miles offshore.

**Caution.**—Local knowledge is absolutely essential for passage; vessels should not attempt to cross the bar without thoroughly examining and buoying the channel which it is intended to take. During the Southwest Monsoon, the port is usually closed to shipping.

**8.33 North Ledge** (14°31'N., 97°49'E.), a 0.9m high rock with shoal depths extending about 0.5 mile NE from it, lies about 9.5 miles SSW of Kandaung Promontory.

**Tapir Hill** (14°36'N., 97°55'E.), a densely-wooded summit about 369m high, lies about 5.5 miles SSE of Kandaung Promontory. Middle Hill, 513m high and densely wooded, lies 24 miles ESE of Tapir Hill. Yetagun Taung, 905m high, lies about in the middle of another mountain range 7.5 miles SE of Middle Hill. Paungchon Taung, 1,167m high, marks the S end of this range about 5.5 miles S of Yetagun Taung. This latter peak appears blunt when viewed from the W, but appears sharp when viewed from the S.

Luce Hill, 706m high, and Sieve Hill, both densely wooded, lie close together about 17 miles SSE of the entrance of Heinze Chaung. False Peak, 445m high, lies about 2.8 miles S of Sieve Hill. Another densely-wooded hill, a high close to Fenton Point, lies about 4.5 miles S of False Peak. A pagoda stands close SE of Fenton Point.

**Maungmagan Bay** (14°09'N., 98°04'E.) lies between Fenton Point and Pagoda Point, about 134 miles to the SSE. Taungbadaung, a peak with a height of 482m, lies on the S part of a mountain ridge about 3.5 miles ENE of Pagoda Point.

An obstruction, with a least depth of 3.7m, lies about 5.8 miles NNW of Pagoda Point.

A rock, awash, lies almost 1.5 miles N of the same point.

**Letkat Taung** (13°55'N., 98°06'E.), 600m high with a pagoda on its summit, lies 10 miles S of Pagoda Point.

**Pazin Kyun** (13°48'N., 98°04'E.), 145m high, lies close offshore about 17 miles S of Pagoda Point. The island appears as part of the mainland when viewed from the W. The island has been reported to be a good radar target up to 23 miles.

The coast between Pazin Kyun and Tavoy Point, about 17 miles SSE, is bold and rocky.

Several mountain ranges, which are lower than those to the N, attain elevations of well over 305m along the S part of this section of coast.

**8.34 Nyawbyin Bay** (13°40'N., 98°08'E.), the largest of several bays which indent this coast, lies about midway between Pazin Kyun and Tavoy Point. Nyawbyin Point marks the S side of the entrance of the bay. A large fishing village lies close E of this latter point.

Kyanak Taung, about 3 miles S of Nyawbyin Taung, rises to a height of 390m.

**Myinkwa Aw** (13°33'N., 98°09'E.), entered between Than Maw and Tavoy Point, lies about 5 miles S of Nyawbyin Taung.

**Hngetthaik Kyun** (13°32'N., 98°08'E.), 159m high, lies about 0.5 mile S of Than Maw. The island is steep-to on its W side, but has depths of less than 9.1m extending from its E side. A depth of 7.9m, rocky bottom, lies about 0.2 mile S of Than Maw, otherwise the channel between Hngetthaik Kyun and the coast is deep and clear.

## The Tavoy River and Approaches—Tavoy Entrance to Mergui Island

**8.35** The Tavoy River, which is about 120 miles long, has its main source in the W slopes of the range that separates Burma from Thailand. Tavoy, a river port of some importance, lies on the left bank, about 39 miles N of Tavoy Point. The river traverses a broad plain about 3 miles above the town; sand banks and alluvial islands, which are constantly changing in form and position, impede the course of it. Many tidal creeks intersect the plain between the river and the foot of the hills on either side of it.

The hills extend N and S in parallel ranges on the W side of the estuary. Shinmaw Daung, 344.4m high, is located about 0.8 mile N of Tavoy Point on the small peninsula forming that point. Kyan-eik Taung, 390m high and densely wooded, lies about 3 miles NW of Shinmaw Daung. The hills, farther N, gradually recede from the W bank of the river. At a position about 16.5 miles N of Tavoy Point, the crest of the range, which is about 610m high, is located about 2.5 miles from the W bank. Abreast Tavoy, the range again closely approaches the river bank.

Low hills, with parallel ridges behind them, are found on the E side of the estuary. These ridges gradually rise to a height of 1,125m at Nanpayok Taung which is located about 19 miles E of Tavoy Point. Bok Taung, a steep summit, 670m high and conspicuous, is located about 9.5 miles northward of Bok Taung and is similar in appearance to that hill.

At Elbow Point, located on the E bank of the river, about 9.5 miles W of Tetchaung Taung, the river narrows considerably. Between Elbow Point and Shive Taung, a hill 243m high, about 7 miles NNE, the hills approach the E bank and at Shive Taung are within about 1.5 miles of it. This distance is maintained as far as Tavoy where they again recede from the banks and rise in successive ranges to Nwalabo Taung, 542m high and prominent, this peak is located about 14 miles ESE of Tavoy.

Between the mouth of the Tavoy River and Mergui Island, the best landmarks are Shittaunggyi Taung and Round Hill. The former, located 16 miles ESE of Tavoy Point, is 457m high. The latter is 198m high and lies about 10 miles SSE of Shittaunggyi Taung.

The coast between Round Hill and Kalwin Point forms the E side of the inner route to Mergui Harbor.

Mountain ranges with distinctive peaks back the coast for about 40 miles SSE of the entrance of the Tavoy River. Chimun Taung, 1,616m high, is located about 20 miles ENE of Round Hill and is the S peak of the highest range.

A 119m hill, located close within Zotzit Point, the S extremity of Zotzit Island, about 10.5 miles SSE of Round Hill, serves as a good mark. Seinnat Taung, 168m high and located about 6 miles SSE of Round Hill, is prominent. Durbar Peak, 661m high, is located about 9 miles NE of the same hill. Flat Hill, 193m high, and Barn Hill, 317m high, serve as useful

marks. They are located 7.5 and 14 miles, respectively, SE of Zotzit Island.

**Winds—Weather.**—Tavoy receives weather information but no signals are displayed. For additional information on winds and weather, see paragraph 8.1.

**Tides—Currents.**—The mean range at Tavoy is 3.2m; the spring range is 4.7m. The tidal currents attain a rate of 3 to 4 knots during the dry season and up to 7 knots during the rainy season. During the latter season, the ebb currents may run continuously. At Simbyubin, springs rise 5.3m and neaps rise 3.7m.

**Depths—Limitations.**—The 40m curve lies about 11.5 miles W of Tavoy Point and up to 18.5 miles off the S end of Tavoy Island. A least depth of 10m is found in the fairway of the Inner Route, between Tavoy River and Mergui Harbor. The dangers off this coast, except for the outer islands of the Mergui Archipelago, lie within the 40m curve and are described with their related coastal features.

**Caution.**—Depths in the vicinity of Tavoy Point and in some of the river channels were reported to be less than charted.

**Yetagun Marine Terminal** (13°04'N., 96°51'E.), an oil production platform and an FSO, lies about 80 miles W of Tavoy Island. A submarine pipeline runs NE to the Burmese Coast, as seen on the chart. The prohibited zone that surrounds the terminal is 5 miles in diameter. Pilotage is compulsory. They will board about 3 miles from the terminal. Vessels not involved should keep a wide berth.

## The Tavoy River

**8.36** The estuary of the Tavoy River is about 12 miles wide between Tavoy Point and an unnamed point about 7 miles W of **Nanpayok Taung** (13°35'N., 98°29'E.).

The W bank extends in a general N direction for about 11 miles above Tavoy Point. The S part of this coast is bordered by several islands.

## The Tavoy River Entrance

**8.37** The E bank extends in a general NW direction for about 12.5 miles above the river entrance to Thamokmo, where above the river width is about 3 miles. The land on the E side is flat, open, and has many rice paddies. Several hills, with heights of 76 to 305m, lie along this stretch of coast. The higher mountain ranges inland have been previously described in paragraph 8.33. Three small rivers discharge into the Tavoy River between Thamokmo and a point about 3 miles to the SE.

Above Thamokomo, both banks extend in a general N direction for about 21 miles to Tavoy. Thamokmo is densely covered with mangroves. Between Thamokmo and the village of Sinbyubin, about 7.5 miles to the N, the E bank of the river is marked by paddy fields and clumps of trees.

**Depths—Limitations.**—The main channel passes close E of the islands off the S part of the W bank and then close off the W bank. North of Kathema Kyun, the E side of the channel is formed by a spit of sand and mud that extends about 5.5 miles S from Pyin-gyi and divides the river into two channels. Depths of less than 3.7m exist on the spit. The recommended channel passes W of the spit and then W of the island.

Depths of not less than 7.3m are found in the fairway of the entrance channel for a distance of about 10 miles above the entrance, except for charted depths of 6.4m and 6.1m, about 1.5 miles NNE and 1.3 miles NE, respectively, of the N end of Mibya Kyun. Depths of not less than 3.4m are found as far as Goodridge Plains, about 16.5 miles N of Tavoy Point. The river is shallow above Goodridge Plains and is navigable only by shallow-draft river craft.

Vessels up to 61m in length, with a draft of about 3.7m, can proceed to Simbyubin, about 14 miles below Tavoy, at HWN.

**Caution.**—Soundings in the Tavoy River between Mibya Kyun and Pyingyi-ashé differ from charted depths.

Hnggethaik Kyun, which lies about 2 miles W of Tavoy Point, has been previously described in paragraph 8.31.

Puklaji, a rock awash at LW, lies about 2 miles NE of Tavoy Point.

**8.38 Mibya Kyun** (13°36'N., 98°12'E.), 143m high, lies about 4.3 miles NNE of Tavoy Point. Both sides of the island are fairly steep-to. A shoal, with a least depth of 1.2m in its central part, extends about 1 mile S from a position 0.2 mile SE from the SE end of the island. A shoal, with a least depth of 3.6m, extends about 0.5 mile SSW from the S end of the island.

**Whale Rock** (13°36'N., 98°13'E.), 0.9m high, lies about 0.3 mile NE of the SE part of Mibya Kyun.

**Thin-bon Kyun** (13°38'N., 98°11'E.), 221m high and densely wooded, lies about 0.8 mile NW of Mibya Kyun. Satlaik Kyun, a tree-covered islet, lies close E of the E extremity of Thin-bon Kyun. A narrow shoal, with a drying rock on its central part, extends about 3 miles SSW from Satlaik Kyun.

**Kathema Kyun** (13°40'N., 98°11'E.), 167m high and densely wooded, lies close offshore about 0.5 mile N of Thin-bon Kyun. A pagoda stands on a large boulder on the NE point of the island. A 4.3m patch lies about 0.8 mile N of the pagoda.

**Mahratta Rock** (13°42'N., 98°11'E.), a pinnacle with a least depth of 2.1m, lies about 2.3 miles NNW of the pagoda on Kathema Kyun. Two rocky patches, with depths of 3.7 and 5.5m, lie close together about 0.3 mile E of Mahratta Rock. Two similar patches, with depths of 3.7 and 4.3m, lie close together about 0.7 mile N of Mahratta Rock.

**Pyingyi** (13°47'N., 98°12'E.), a long, narrow island, lies in mid-channel, about 2.5 miles NNE of Mahratta Rock. A conspicuous high tree lies on the E side of the island, about 2 miles from its N end.

**8.39 Chaukdaw Rock** (13°46'N., 98°11'E.), with a least depth of 3m, lies about 2.3 miles NW of the S end of Pyingyi.

Many alluvial islands, which are connected by shoals, lie in the river between Pyingyi and Tavoy.

Nauwi Rocks, 1.2m high, lie about 10.8 miles ESE of Tavoy Point. A rock, awash at LW, lies about 1 mile SSW of these rocks and two detached rocks, awash at HW, lie about 1.5 miles SSE of the same rocks.

An extensive shore bank, with depths of less than 5.5m, fronts this entire shore and extends up to 7 miles offshore to a position about 6.5 miles WNW of Nauwi Rocks.

A detached 3.7m patch lies close off this shore bank, about 4.8 miles ENE of Tavoy Point.

**Anchorage.**—Anchorage can be taken, in a depth of 7.3m, about 1 mile N of Puklaji.

Deep-draft vessels can anchor, in depths of 9.1 to 10.4m, about 0.8 mile E of Mibya Kyun Light. Vessels with similar drafts can also anchor, in depths of 9.4 to 11.6m, about 0.5 mile NE of Saitlaik Kyun. Anchorage can be taken, in depths of 9.8 to 12.2m, about 0.5 mile E or 0.8 mile NNE of Kathema Kyun. A mooring buoy, used by lighters, is anchored about 0.5 mile N of the same island.

Light-draft vessels with local knowledge can anchor, in 5.8m, from 1.3 to 1.5 miles SSW of the S end of Pyingyi. Similar vessels with local knowledge can anchor, in 4m, off Goodridge Plains with a waterfall bearing 270°, distant about 1.5 miles.

**Directions.**—A vessel may approach the Tavoy River in a 345° direction, from a position 5.5 miles, bearing 121° from the pagoda on Tavoy Point, which leads towards the anchorages off Mibya Kyun, Satlaik Kyun, and Kathema Kyun. If proceeding to the anchorage about 0.8 mile NNE of Kathema Kyun, from a position about 0.5 mile E of Mibya Kyun Light, a course of about 350° should be steered, which leads to the anchorage. If proceeding to the anchorages upriver, when N of the 4.3m patch about 0.8 mile N of Kathema Kyun, course should be altered to the W to bring the NE point of Kathema Kyun in line bearing 173° astern with the W edge of Satlaik Kyun. This stern range leads in the fairway to the anchorage SSW of the S end of Pyingyi, passing between Mahratta Rock and the 3.7m shoal which lies about 0.3 mile E of it, but it leads very close E of the 3.7m patch located about 0.8 mile N of Mahratta Rock.

**8.40 Tavoy** (14°04'N., 98°11'E.) (World Port Index No. 49680) lies on the E bank of the Tavoy River, about 35 miles above the entrance. An extensive export trade is maintained with Rangoon, Penang, and Thailand.

There are a number of jetties, pontoon piers, and finger piers suitable only for small light-draft craft. Almost all of the vessels calling at the port are coastal craft and all but the smallest of these anchor near the mouth of the river and work cargo to and from lighters. An ample number of small lighters, launches, and native craft are available for this purpose.

### Mergui Harbor and Approaches—North End of the Bentinck Route

**8.41 Kantu Rocks** (13°20'N., 98°24'E.), two small isolated rocks, lie about 5.5 miles WNW of Round Hill. The outer rock lies about 4 miles offshore. A shoal extends about 0.5 mile S from these rocks.

The W side of the channel leading to Mergui Harbor from the N is formed by Tavoy Island and the islands to the S of it. The E side of the channel is formed by flats and banks fronting the mainland from abreast of Round Hill to Mergui Island. Middle Passage and Iron Passage lead into the Inner Route from the W.

The S approach to Mergui Harbor is made through an 18-mile long channel, the SW extremity of which connects with the Bentinck Route.

Mergui Harbor has some commercial importance. Other ports and harbors are available which provide sheltered anchorage and which can be reached through deep channels.

**Winds—Weather.**—Mergui receives weather information but no signals are displayed. For additional information refer to the winds and weather described in paragraph 8.1.

**Tides—Currents.**—The tide may fall 0.3m lower than the datum to which the soundings on the chart are reduced in the perigee spring tides of February and March.

During the rising tide the tidal currents set S off the E coast of Tavoy Island through Port Owen at rates of 1 to 2 knots at springs in the dry season, but may attain a strength of 4 knots during the rainy season. During the falling tide these currents set N at rates of 2 to 3 knots at springs during the dry season. During the rainy season, the rates are weaker and at neaps, the set may be to the S.

The tidal currents set through the channel between the N part of Tavoy Island and the extensive flat that extends W from the adjacent mainland at a rate of 1.5 knots at springs. The tidal currents on the rising tide set towards this flat.

Strong eddies, tide rips, overfalls and tidal currents occur in Middle and Iron Passages, especially during the Southwest Monsoon. In both passages, the tidal currents appear to set E on the rising and W on the falling tide. The tidal currents attain a rate of more than 3 knots at springs in Iron Passage.

Between **Pinbwa Island** (12°17'N., 98°20'E.) and Christmas Island, about 20 miles SW, in the SW approach to Mergui Harbor, the tidal currents set SE on the rising tide. In the vicinity of **Shrub Rocks** (12°15'N., 98°21'E.), these currents set E on the rising tide and are strong at springs.

In Fell Passage, E of King Island, the tidal currents on the rising tide enter at both ends, meeting abreast of Yemyok. The tidal currents set NE in the narrows N of Payi Kyun from 6 hours after to 1 hour before HW at Mergui at a rate of 1.25 knots at springs. The tidal currents in the S approach to Fell Passage are described with the Bentinck Route in paragraph 8.64.

**Depths—Limitations.**—There is a least depth of 10m over a width of 2.8 miles in the fairway of the navigable channel between the N part of Tavoy Island and the extensive flat which extends W from the adjacent mainland. Soundings give no warning of the approach to this flat.

Middle Passage and Iron Passage are deep and clear of dangers.

The approach channel to Mergui from the S is shallow. Vessels with a draft not exceeding 2.4m and having local knowledge can use this channel at HW.

The dangers off this coast, except for the outer islands of the Mergui Archipelago, lie within the 40m curve.

**Aspect.**—Vessels approaching from the N and using the Inner Route should shape course to pass about 2 miles E of the N extremity of Tavoy Island and then alter course to pass about the same distance off Cornwall Point, the E extremity of that island. A direct track, which is free from dangers, then leads between Iron Island and Long Island.

Vessels approaching from the W should proceed through either Middle Passage or Iron Passage. Care is necessary in both passages because of the strong tidal currents and tide rips usually encountered.

Iron Island, King Island, and Plantain Island appear as one lofty island to vessels approaching from the N. From a position about midway between Iron Island and Long Island, a vessel should steer 167° for the steep E extremity of Plantain Island. When Thita Kyun bears 113°, course should be altered to 150° with the summit of Pataw Island ahead. When the NE end of Plantain comes in line bearing 312° with the summit of Little Cannister Island, it should be brought astern and kept on that bearing until the old light structure off Kalwin Point can be identified. At such time the light structure should be brought in line bearing 130° with Pawdawmu Pagoda. This course of 130° leads to the outer anchorage NW of Kalwin Point.

The approach from the S is suitable only for light-draft vessels with local knowledge.

### North Approach to Mergui Harbor—West Side

**8.42 Tavoy Island** (13°13'N., 98°15'E.), narrow and mountainous, lies with its N end about 10.8 miles SW of Kantu Rocks. Its W side is steep and rises to an elevation of 687m about 7 miles S of its N end. Its E side is low and terminates in Cornwall Point. A small white pagoda, not visible from the N, stands on the E side of the island about 2 miles N of its S end.

**Port Owen** (13°06'N., 98°19'E.) lies on the E side of Tavoy Island about 7.5 miles SSE of its N extremity. Edward Island, William Island, Rich Island, and Campbell Island lie on the N side of the port and the peninsula terminating to the E in Cornwall Point forms its S side. North Button Island, Rat Island, and Mouse Island lie within 0.5 mile N of the N end of the above group of islands.

A few small villages lie in the vicinity of Port Owen. The principal village stands at the head of Fisher Bay on the S side of Port Owen.

**Anchorage.**—Anchorage can be taken in Port Owen, in depths of 12.8 to 23.8m, but the holding ground is not good. During the Southwest Monsoon, sudden squalls may sweep down from the mountains. There is a least depth of 11m in the approach to the anchorage and depths of 5.5 to 9.1m in the S approach between Cambell Island and the N side of the peninsula forming the S side of the port. An obstruction, with a least depth of 7.3m, lies about 0.8 mile SW of the SE end of Campbell Island.

**South Island** (12°54'N., 98°19'E.), densely wooded and 153m high, is separated from the S end of Tavoy Island by a narrow unnavigable channel.

**South Rocks** (12°50'N., 98°19'E.), a chain of rocky islets, extend about 2 miles SSE from a position 0.5 mile S of South Island.

Kyun Taung Island, Cochin Island, and South Button Island lie between 8 and 3 miles N of the S end of Tavoy Island.

**Iron Island** (12°45'N., 98°20'E.), 365m high in its S part, lies about 2.5 miles SSE of the S end of South Rocks. The W side of the island is precipitous. Middle Passage separates Iron Island from South Rocks; Iron Passage separates Iron Island from Kadan Kyun to the S.

**Anchorage.**—Anchorage can be taken, in a depth of 22m, sand and mud, off the E side of Iron Island.

**8.43 Kadan Kyun** (12°40'N., 98°21'E.) is large and densely wooded. Its NE side forms the W side of the inner route.

**Lys Shoal** (12°39'N., 98°25'E.), which consists of two rocky patches, lies about 5 miles SE of the S end of Iron Island. The NW patch has a least depth of 3m and the SE patch a least depth of 3.7m. The SW extremity of Iron Island bearing 308° and in line with the SW extremity of Little Canister Island leads close NE of Lys Shoal. The N entrance of Padaw Aw bearing 248° leads S of the shoal.

**Kadan Kyun Sound** (12°37'N., 98°26'E.) is entered between a point about 1 mile SW of Lys Shoal and the N end of Plantain Island, about 2.5 miles ESE. The latter island appears to be a peninsula. A 406m high peak rises just within the N end of the island. Panella Island, low and small, lies 0.4 mile NW of the N end of Plantain Island. A shoal, with a depth of 8.7m, lies about 0.8 mile NE of Plantain Island.

Kadan Kyun Sound is almost entirely filled by shoals and drying flats except near its entrance. Anchorage can be taken, in a depth of 12.8m, with the W entrance point of the sound bearing 341°, distant 0.5 mile. Caution is necessary because this anchorage lies only about 0.2 mile from the edge of a 3.7m shoal.

### North Approach to Mergui Harbor—East Side

**8.44** The coast between Round Hill and Zatzit Point, about 10.5 miles SSE, is fronted by extensive sand and mud flats. Shoal ground, as defined by the 9.1m curve, extends up to 9.5 miles offshore. Zatzit Flat, which dries in places, extends 7 miles W from Zatzit Point.

**Kyunhla Taung** (13°02'N., 98°28'E.), a conical island 165m high, lies about 6.8 miles SW of Zatzit Point.

**Kumla Patch** (12°58'N., 98°28'E.), with a least depth of 4.9m, lies about 3.8 miles SSW of Kyunhla Taung.

Anyinpo Island, 142m high, lies about 11 miles S of Zatzit Point and Anyinma Island, 107m high, lies about 1.5 miles farther S. Both islands are densely wooded. Reefs and shoal ground lie between these islands and the coast.

**Mandrell Reef** (12°57'N., 98°32'E.), a low isolated islet, lies about 1 mile NNW of Anyinpo Island.

A beacon marks a drying reef about 1.5 miles SW of Anyinma Island.

**Galbraith Rock** (12°50'N., 98°34'E.), which dries 2.7m and is surrounded by shoal depths, lies about 4 miles S of Anyinma Island.

**Gladys Island** (12°49'N., 98°36'E.), 103m high, lies about 2.3 miles ESE of Galbraith Rock.

**Long Island** (12°48'N., 98°31'E.), 134m high, lies about 6.8 miles SSW of Anyinma Island and is the outermost island of a group which lie within the limits of a shoal which extends about 7.3 miles NW from the coast.

The other islands of the group consist of Daisy Rocks, Cone Island, and Two Spade Island.

Kadwe Rock, a detached rock 1.2m high, lies 2.8 miles S of Long Island.

**Pyinban Rocks** (12°44'N., 98°34'E.) consists of a chain of rocks which lies about 2.5 miles E of Kadwe Rock. The furthest S, Peak Island, rises to a height of 36m. A rock awash lies about 0.2 mile S of Peak Island.

**White Rocks** (12°41'N., 98°34'E.), 4.3m high, lie about 1.8 miles S of Peak Island. A drying rock lies 0.5 mile SW and a similar rock lies 1 mile SSE of White Rocks.

High Rock, 11.3m high, lies about 3.8 miles SE of White Rocks. Cap Rock, 6.7m high, lies 4.5 miles SSW of White Rocks. Thitya Kyun, a steep-to square rock 26m high, lies 1.3 miles SE of Cap Rock. These three islets or rocks lie on an extensive shoal, as defined by the 10m curve, which extends about 13 miles NW from a position about 0.8 mile N of **Kalwin Point** (12°29'N., 98°36'E.).

### Mergui Harbor—West Approach

**8.45 Islands west of the south end of Tavoy Island.**—**Pinnacle Rock** (12°59'N., 98°14'E.), West Rock, and Mali Kaing are a group of high, steep-to black rocks lying about 3 miles W of the S part of Tavoy Island.

**Paine Kyun** (12°55'N., 98°11'E.), densely wooded and 370m high, lies about 6.5 miles W of the S end of Tavoy Island. Sinthama Kyun, conical, densely wooded and 311m high, lies about 5.5 miles SSE of Paine Kyun.

The **Birds Nest Islands** (12°53'N., 98°15'E.), a group of three gray rocky islets, lie about 3.3 miles WSW of the S end of Tavoy Island. Mali Don, the largest of the group, rises to an elevation of 103m.

The channels between these island groups are clear of all known dangers.

**8.46 Outer islands.**—**Kabosa Island** (12°48'N., 97°51'E.), the N outer island of the Mergui Archipelago, lies about 26 miles W of the N end of Iron Island. The densely-wooded island has four summits arranged in the form of a square. The two S summits rise to elevations of about 396m. A rock lies about 183m off the SW end of the island.

**West Canister Islet** (12°41'N., 97°43'E.), 144m high, steep, and covered with jungle growth, lies about 8.3 miles SW of Kabosa Island. North Pinnacle and South Pinnacle, two low rocks, lie on a detached rocky patch about 4.5 miles E of the above islet.

**Freak Islet** (12°41'N., 97°53'E.), conical in shape and 37m high, lies about 4.8 miles ESE of North Pinnacle. A few scattered trees lie on this islet.

**Investigator Passage** (12°45'N., 97°48'E.), deep and clear, lies between the above three islands to the S and Kabosa Island to the N.

**Tenasserim Island** (12°34'N., 97°51'E.) lies about 10.5 miles S of Kabosa Island. Tenasserim Peak, 494m high, is the highest and furthest S of several peaks which, from a distance, appear as separate islands. Herbert Island and Howard Island, both high, lie close N of Tenasserim Island. West Islet, 106m high, lies close off the SW side of the same island and appears to be a part of that island. East Islet, 82m high and not easily distinguished, lies close S of the E end of the same island. All of the above islands are densely wooded and steep-to.

**Rock Islet** (12°35'N., 97°54'E.), 20m high and white in appearance from the E, lies about 1 mile NE of the E end of Tenasserim Island.

Anchorage can be taken, in a depth of 16.5m, near the head of an inlet which lies about in the middle of the NW side of Tenasserim Island. Protection is provided during the Northeast Monsoon.

The outer islands of the Mergui Archipelago, S of Tenasserim Island, are somewhat similar in appearance. All are high, steep, and usually densely covered.

**8.47 Saurin Island** (12°30'N., 97°48'E.), 178m high, lies about 5 miles SW of Tenasserim Peak. Two small islets, Ramsey and Morgan, lie 2.5 miles ESE and 4.5 miles E of Saurin Island. A breaking rock awash lies about 0.5 mile SSW of Morgan Islet.

The channel between these islands and Tenasserim Island is deep. The currents are irregular and tide rips occur.

**Blundell Island** (12°27'N., 97°50'E.), 284m high, lies about 4.5 miles SSW of Tenasserim Island. Chevalier, a small high islet, lies about 1.5 miles W of the S point of Blundell Island. Chevalier Rock, small and low, lies about 0.3 mile S of Chevalier Islet.

**Lion Rock** (12°24'N., 97°49'E.), 40m high and sparsely covered with scrub, lies about 1.8 miles S of Blundell Island.

**Sir Charles Metcalfe Island** (12°17'N., 97°47'E.), about 411m high, lies 6 miles S of Lion Rock.

**Mermaid Passage** (12°22'N., 97°51'E.), entered from the SW between Lion Rock and Sir Charles Metcalfe Island, is deep and clear of known dangers.

**Smart Island** (12°17'N., 97°52'E.), about 268m high, has rocky shores and lies 3 miles E of Sir Charles Metcalfe Island. Numerous rocks lie off the points which form open bays.

**Saddle Island** (12°24'N., 97°55'E.), 77m high, lies 5.5 miles ESE of the S end of Blundell Island. A reef extends about 183m from its SW point.

**Oublee Rock** (12°26'N., 97°58'E.), 16m high, lies 8 miles E of the S end of Blundell Island. A rock, which dries 3.7m, lies about 0.6 mile E of this rock.

**South Direction Island** (12°29'N., 98°00'E.), 95m high, lies about 10 miles E of the N end of Blundell Island. Two rocks lie about 0.3 mile off its SW side. North Direction Island, 46m high at its S end, lies 14 miles NNW of South Direction Island. A deep channel separates these two islands.

**8.48 Elphinstone Island** (12°20'N., 98°00'E.), irregular in shape, hilly, and densely wooded, lies with its NW end about 8 miles ESE of the S end of Blundell Island. The most prominent summits are Elphinstone Peak, 533m high, and False Peak, 430m high. Both peaks lie on the W part of the island. Elphinstone Peak appears as a separate conical island when viewed from the N.

A large bay indents the W side of the island. The bay head extends in a NE direction almost to the foot of Elphinstone Peak, and in a E direction almost to the foot of False Peak. During the Northeast Monsoon, vessels with local knowledge can anchor in convenient depths, sand, near the head of the bay.

**Port Maria** (12°23'N., 98°03'E.) lies within the limits of an open bay that indents the N side of Elphinstone Island. The bay is sheltered except from the N and NE.

The W side of the bay is irregular and broken, with many islets close off that side. The steep-to E side of the bay is bordered by hills which slope down to the high-water line.

Castle Island, topped by three peaks, lies on the W side of the N approach to the bay about 0.8 mile NNW of the W entrance point. The highest peak rises to a height of 52m. Sack Island, 137m high, lies 0.5 mile SW of Castle Island. Two islets lie about 0.3 S of Sack Island. All of these islets and islands appear to be a part of Elphinstone Island when viewed from the N.

**Entrance Islet** (12°28'N., 98°03'E.), 66m high, lies about 2 miles NE of Castle Island and about in the middle of the N approach to the bay. A fringing reef extends from the E and S side of the islet. The E part of this reef just covers at HW.

**Burne Island** (12°27'N., 98°05'E.), 112m high and narrow, lies 1.8 miles ESE of Entrance Islet. Three small islets lie off the SE point of the island.

Tidal currents in the vicinity of Port Maria are weak. Cross currents are sometimes encountered in the N approach to the port

**Anchorage.**—When Crab Islet, about 1.8 miles S of the W entrance point, is in line bearing 261° with Elphinstone Peak, anchorage can be taken, in a depth of 12.8m. This position is exposed to N and NE winds.

**Directions.**—Vessels approaching Port Maria can pass on either side of Entrance Islet and then steer directly into the bay, favoring the E side until a bay at its W end opens.

## Islands and Dangers Between Elphinstone Island and Iron Passage and Middle Passage

**8.49 Bowers Island** (12°30'N., 98°06'E.), small, steep, and 74.7m high, lies about 4 miles NE of Entrance Island.

**Corbin Island** (12°29'N., 98°09'E.), irregularly shaped and 136m high, lies about 2.5 miles SE of Bowers Island. This densely-wooded island is the furthest N of a group of islands and rocks lying E of Elphinstone Island and in the NW approach to the Bentinck Route.

**Hayes Island** (12°29'N., 98°11'E.), 91m high and densely wooded, lies about 1 mile E of Corbin Island. A sunken rock lies about 1 mile NNE of Hayes Island. The channel between Hayes Island and Corbin Island is deep.

**Maingy Island** (12°31'N., 98°15'E.), separated from the W side of King Island by a narrow shallow channel, is high and steep-to on its W side. A peak, 600m high, rises in its SW part. Its SE side is fronted by an extensive flat which dries 1.5m. A small, high islet lies close E of the N end of Maingy Island.

**Page Islet** (12°36'N., 98°10'E.), 26m high, lies 5 miles NW of Maingy Island. This conical-shaped islet is covered with straggly trees.

The **Marcus Islands** (12°39'N., 98°12'E.) consist of a group of four islands which lie close together about 6 miles WSW of the N end of King Island. Marcus Island, 140m high, is the N island of the group. Gifford Island, 134m high, is fringed by a reef which extends about 0.3 mile SW from it; a part of this reef is 3.7m high. Harris Island, 140m high, appears as two islands joined by a narrow sandy strip. Genn Island, the

smallest and E, is 69m high. Strong currents and tide rips are encountered in the deep channels between these islands.

**Brown Rock** (12°41'N., 98°11'E.), 20.1m high, lies about 2.5 miles NW of Marcus Island. Rocks, which dry at times, lie close N and S of it.

**Middle Passage** (12°49'N., 98°20'E.), a deep, clear passage about 2 miles wide, lies between the N end of Iron Island and South Rocks.

**Iron Passage** (12°42'N., 98°22'E.), deep and clear of dangers in the fairway, lies between Iron Island to the N and King Island to the S.

**8.50 Ant Islet** (12°42'N., 98°19'E.), 16m high and scrub covered, lies on the S side of Iron Passage, about 1 mile N of the N end of King Island. Mussel Islet, 8.2m high, lies about 0.3 mile S of Ant Islet. Melhuish Island, 68m high and densely wooded, lies about the same distance NE of the N point of King Island. Three wooded islets lie close off the W shore of an open bight that forms the N side of King Island.

**Directions.**—Middle Passage and Iron Passage lead into the Inner Route to Mergui Harbor.

Vessels proceeding E through Iron Passage should favor the N side of the passage to minimize the effects of the strong eddies and tide rips off Ant Islet and Mussel Islet. The set of the flood current onto Iron Island must be guarded against.

## Mergui Harbor—North Approach

**8.51** The channel leading to Mergui Harbor is about 2.8 miles wide between the NE side of Plantain Island and Cap Rock, about 5 miles ENE. The E side of the channel is formed by an extensive shoal, as defined by the 10m curve, which extends about 13 miles NW from a position about 0.8 mile N of **Kalwin Point** (12°29'N., 98°36'E.).

**Kala Kyun** (12°30'N., 98°30'E.), which is hilly on its W side and fronted by mangroves, is separated from King Island by Fell Passage.

Sa Kyun, 89m high and steep, lies on the W side of the N entrance of Fell Passage, about 2.3 miles NNW of the N end of Kala Kyun.

Kaw Mwe, 61m high and topped by a pagoda, is connected to Kala Kyun by a drying flat. A rocky shoal, as defined by the 6m curve, extends about 2.5 miles N from the N side of Kala Kyun and forms the E side of the N entrance of Fell Passage.

A narrow channel, with depths of 6.1 to 27.4m, extends about 6.5 miles S from Kaw Mwe along the E side of Kala Kyun. South of a line drawn between Kaw Mwe and Kalwin Point to the SE, with the exception of the narrow channel referred to above, the entire area is marked by numerous small islands, shoals, and drying flats.

**Pataw Island** (12°27'N., 98°35'E.), which lies in the SE corner of this shoal area, is divided into two parts by a large mangrove swamp. The S part is known as Pahtet Island. Pataw Taung, rises to a height of 238m near the N end of the island, and Pati Taung, 83m high, lies near its S end. Numerous pagodas lie on various parts of the island.

**Kalwin Point** (12°29'N., 98°36'E.), the NW extremity of Mergui Island, forms the S entrance point of the Kiaupi River. This river separates the island from the mainland and forms one of the outlets of the Tenasserim River.

## Mergui Harbor

**8.52** Mergui Harbor lies at the S end of the channel that separates Pataw Island and Pahtet Island from Mergui Island. The town of Mergui lies on the W coast of Mergui Island abreast the S part of Pahtet Island.

**Tides—Currents.**—The tidal range at springs is about 51m; the mean range is about 3.4m.

The tidal currents set S through the harbor on the flood and N on the ebb. At springs, the rate of the tidal currents at half-tide is about 2 knots during the dry season. During the rainy season, the rate of the ebb is probably greater.

**Depths—Limitations.**—Depths of 10 to 11m are found at the outer anchorage.

Depths of 2.7 to 3m are found in the fairway of the channel from the entrance, about 137m W of Kalwin Point Light to a position about 1 mile S of the entrance. From the latter position, depths of 3 to 4m are found in the fairway to a position about 0.3 mile NNW of the Main Wharf.

Depths of 5.8 to 9.8m are found in the inner anchorages NW and W of the Main Wharf.

A narrow shoal, with depths of 1.2m or less, lies close W of the channel about 0.3 mile within the entrance.

An obstruction, with a least depth of 2.7m, lies on the SW side of the entrance channel, about 0.3 mile NW of the same light structure.

A 1.8m patch lies close E of the fairway about 0.9 mile N of the Main Wharf.

The E sides of Pataw Island and Pahtet Island are fringed by rocks, with the 5.5m curve lying up to 0.2 mile offshore. Drying flats extend up to 0.2 mile off the W side of Mergui Island.

**Aspect.**—Mergui Pagoda, gilded and prominent, stands in the city at an elevation of 73m and is brilliantly illuminated at night. Pawdawmu Pagoda stands at an elevation of 57m, about 2 miles NE of Mergui Pagoda. Some conspicuous oil tanks stand about 2 miles S of Kalwin Point.

**Anchorage.**—Anchorage can be taken in Mergui Outer Harbor, in depths of 10 to 11m, between 1 and 1.7 miles NW of Kalwin Point Light, with Pataw Pagoda bearing between 168° and 181°.

Vessels with local knowledge and drawing more than 5.5m can anchor about 0.2 mile W and 0.3 mile NW of the head of Main Wharf. The swinging room is restricted by the extending shoals.

Vessels of greater draft can anchor in The Pool, a small deep area of the E end of Pahtet Island. The swinging room is restricted and the eddies and currents are strong. Local knowledge is required.

**Directions.**—Vessels should only enter Mergui Harbor during the daytime and under favorable conditions. Navigational aids are inadequate and pilotage is not available.

Vessels drawing up to 3m, and not possessing local knowledge, should not attempt to enter until after the first quarter of the flood; those of greater draft should not enter until after the first half of the same tide. Vessels with local knowledge and having a draft of 4.6m can enter after the first quarter of the flood at neaps.

Vessels entering Mergui Harbor should steer with Kalwin Point red light structure, in line bearing 130° with Pawdawmu Pagoda, until the lighted beacon on the seawall at Mergui is in

line bearing 169.5° with Mergui Pagoda. A course of 169.5° should then be steered until the white pagoda on the SE side of Pawtaw Island bears about 258°. Course should then be altered slightly to the E for about 0.2 mile to avoid the 1.2m patch, located close W of the range lines. Having cleared this patch, vessels should steer for the pagoda, lying about 0.2 mile ENE of Pawtaw Pagoda, on a course of 197° and anchor as convenient.

Care should be taken to clear the wreck, with a depth of 1.2m, which lies close N of the 130° course line.

**8.53 Mergui** (12°28'N., 98°36'E.) (World Port Index No. 49690), the most important town in the southern district of Burma, extends for more than 1 mile along the SW shore of Mergui Island. It is a scheduled port of call for small coastal vessels and is the center of important rubber and tin mining operations.

Main Wharf, a wooden structure on piles with depths of 0.6 or 0.9m alongside, lies at the S end of the seawall which fronts the town. Naukle Jetty extends from the shore S of Main Wharf and was reported to have a depth of 1.5m alongside.

A pontoon wharf, 73.2m long and 6.1m wide, with a reported depth of 4.3m alongside, is situated abreast of the town. Ocean-going vessels normally work cargo into lighters at the anchorages.

## Mergui Harbor—South Approach

**8.54** Mergui Harbor can be approached from the SW by way of a channel 18 miles long, which leads between islands and mud banks that extend SW from Mergui Island. The seaward end of the channel connects with the Bentinck Route in the vicinity of **Shrub Rocks** (12°15'N., 98°21'E.). This channel, which can only be used by light-draft vessels with local knowledge, saves about 15 miles in distance.

**Depths—Limitations.**—The entrance of the approach channel leads between **Tatagyi Island** (12°17'N., 98°23'E.), which lies about 2 miles E of the S end of King Island, and North Round Island, about 0.5 mile S of Tatagyi Island. The entrance lies about 3 miles ENE of the N end of the Bentinck Route.

There are considerable depths in the approaches and within the entrance, but from there to Limlor Anchorage, about 6.5 miles NE of North Round Island, the depths in the fairway range from 6.4 to 9.1m. Only small vessels with local knowledge and drawing not more than 2.4m at HW can proceed from Limlor Anchorage to Mergui.

**Aspect.**—Tatagyi Island is generally low but has some hills on its W, E, and SE sides. The W hill is the highest.

Shrub Rocks, 7m high, lie about 1.8 miles WSW of the S end of Tatagyi Island. A reef extends almost 1 mile NW from the rocks.

**North Round Island** (12°15'N., 98°23'E.), 74m high, lies 0.5 mile S of Tatagyi Island. South Round Island, 41m high, lies about 0.3 mile farther S. A shoal, with a least depth of 4.9m, lies 1 mile NE of North Round Island.

The **Mergui Islands** (12°10'N., 98°25'E.) are bold, densely wooded, and lofty. The higher summit of the S island rises to an elevation of 382m and is pyramidal in shape. Shelving mud banks extend 1.5 miles W from the N island and about 2 miles W from the S island.

**8.55 Saunggyi Kyun** (12°07'N., 98°24'E.), about 1 mile S of the S island of the Mergui Islands, rises to an elevation of 158m. Shoal ground, as defined by the 10m curve, extends about 3.3 miles WSW from the W side of Saunggyi Kyun.

Irregular depths lie between South Round Island and the N island of the Mergui Islands. A 5.5m patch lies about 0.6 mile SE and a rock, which dries 2.7m, lies about 14 miles ENE of South Round Island.

**Thetyagi Island** (12°16'N., 98°26'E.), small in extent, lies on the S end of a drying shoal on the SE side of the approach channel about 2.8 miles ENE of North Round Island.

**Pyin Island** (12°19'N., 98°26'E.), 89m high, lies on a mud flat about 1.8 miles NE of Tatagyi Island. Bertie Island, low, covered with mangroves, and marked by a wooded hill near its SE point, lies about 1 mile NE of Pyin Island. The mud flat, on which the island lies, extends about 1.3 miles E from Bertie Island.

Limlor Island, 62m high, lies about 0.5 mile S of Bertie Island.

**Anchorage.**—Anchorage can be taken, in depths of 12.8 to 14.6m, about 0.2 mile SE of Limlor Island.

**Directions.**—From a position on the Bentinck Route, with the S point of **Cantor Island** (12°13'N., 98°15'E.) bearing 316°, distant 1.8 miles, vessels using the S approach to Mergui Harbor should steer about 049°, with the S end of Tatagyi Island a little on the starboard bow. When Shrub Rock bears about 041°, distant 1.3 miles, course should be altered to 066° in order to pass midway between Tatagyi Island and North Round Island. Allowance should be made for the strong spring tidal currents. After passing the S end of Tatagyi Island, course should be altered to about 042° for 3.5 miles until the E end of Pyin Island bears about 012°. Course should then be altered to 068° for the anchorage S of Limlor Island.

**Caution.**—Only light-draft craft with local knowledge can proceed NE of this anchorage.

The coast between Mergui Harbor and Auckland Bay, about 20 miles SSW, is low and swampy. Several shallow rivers, navigable only by boats, flow out through narrow channels bordered by flats. Large trees usually cover the ridges and hummocks.

**Auckland Bay** (12°07'N., 98°32'E.), which has not been closely examined, is entered between Sellore Island and Pyingi Island, about 10 miles to the NE. Sheltered anchorage, in depths of 7.3 to 22m, can be taken in the outer part of the bay, over a mud bottom. Caution is required.

## Fell Passage

**8.56 Fell Passage** (12°18'N., 98°21'E.), which extends S along the E coast of King Island, is used by coastal vessels proceeding through the Mergui Archipelago. The narrow passage is about 19 miles long. Passage is not difficult on the flood tide, but local knowledge is necessary.

The passage has a depth of 7.9m in the N entrance. A least depth of 6.1m can be carried up to 7 miles S of the N entrance, but up to 5 miles farther SSW there is a least depth of 4.3m in the channel.

Considerable depths are found in the S entrance and up to 5.5 miles NE of this entrance.

The N entrance of Fell Passage, which has a channel width of about 0.3 mile, is entered between **Sa Kyun** (12°33'N., 98°29'E.) and the rocky shoal which extends 2.5 miles N from Kala Kyun.

**Yemyok Island** (12°26'N., 98°27'E.) lies on a drying flat in the middle of the passage about 6.5 miles SSW of Sa Kyun. The preferred channel passes W of this island.

**Bare Island** (12°25'N., 98°26'E.), 45m high with a rounded, wooded summit, lies on the W side of the channel about 0.5 mile SW of Yemyok Island.

**Payi Kyun** (12°22'N., 98°26'E.), 82m high on its SE side, lies in mid-channel about 2 miles SSW of Yemyok Island. A pagoda lies on the NW side of the island. A drying mud flat extends about 1.3 miles NNE of the island and a drying sand flat extends the same distance SW from it. Sakone Island lies close off the E side of Payi Kyun.

Pigale Islet, 33m high, lies about 0.2 mile NW of the previously-mentioned pagoda. A beacon, 3.7m high and topped by a black and white ball, marks the SE end of the rocky shoal extending E from Pigale Islet.

The **Myini Islets** (12°24'N., 98°26'E.), a group of small islets, lie on the W side of the channel about 0.5 mile N of Pigale Islet.

A shoal, with a least depth of 2.7m, lies in the channel about 0.3 mile E of the N end of **Thanpo Islet** (12°23'N., 98°25'E.).

**8.57 Gyun Thaug** (12°20'N., 98°24'E.), about 52m high, lies on a drying bank on the SE side of the channel, 2 miles SW of the SW point of Payi Kyun. The two islands are joined by a narrow, shallow ridge. A 4.9m shoal lies in the fairway about 0.5 mile SW of the NW end of Gyun Thaug.

The S entrance of Fell Passage lies between the S end of King Island and Tatagyi Island, Fell Island, and Passage Island to the S.

Tatagyi Island has been previously described in paragraph 8.54. Tatange Island, 243m high, lies about 0.5 mile W of the N part of Tatagyi Island.

The Lahchi Islands, five small conical islets, lie between 0.3 and 1.3 miles SW of Tatange Island.

**Passage Island** (12°17'N., 98°21'E.), about 1.3 miles SW of Tatange Island, forms the S entrance point of Fell Passage. The 113m high summit is almost flat with a slight dip in the middle. Shoal ground connects the island with the Lahchi Islands.

Shrub Rocks, which lie 1 mile SSE of the Lahchi Islands, have been previously described in paragraph 8.54.

**Directions.**—A vessel should approach the N entrance of Fell Passage with the E extremity of Sa Kyun bearing 203°, and when about 0.2 mile E of the islet lying close N of it, should alter course to about 195°. When nearing the NW side of Kala Kyun, a vessel should keep at a distance of about 0.3 mile from it until the channel between Yemyok and King Island opens; the W side of the passage should then be gradually approached in order to avoid the shoal depths of 2.7m which lie NE of the N point of Yemyok, and a course shaped to pass about midway between the N point of Yemyok and the E side of King Island.

After passing a large double creek, which does not dry, and when **Sakone Islet** (12°23'N., 98°26'E.) is open W of Yemyok Island and bearing 189°, course should be gradually altered until that islet bears 184°, or open twice its own breadth E of Nga-thok Kyun. After passing close E of the latter island, the

channel leads W of the spit extending N from Payi Kyun, and between it and Myini Islets.

A passage leads on either side of Thanpo Islet; the E passage, although narrower, is more convenient for vessels proceeding to the S. Vessels heading N should use the W passage, taking care to avoid the 2.7m shoal lying about 0.3 mile E of the N end of Thanpo Islet.

South of Thanpo Islet, the channel leads between Payi Kyun and Mye-ni-kyun. Care should be taken to avoid the 2.7m shoal which lies about 0.2 mile NE of the latter island. The course then leads W of Kantaung Kyun and the 4.9m patch which lies about 0.5 mile SW of its NW point, and then about midway between King Island on the NW side and Tatagyi Island, Tatange Island, and Passage Island on the SE side. At springs, the eddies are strong between these islands.

Directions for vessels bound S from Fell Passage through the Bentinck Route are continued in paragraph 8.63.

### The Bentinck Route—Northwest Approach

**8.58** The NW approach to the Bentinck Route lies between Elphinstone Island and the S part of King Island. Numerous islands, rocks, and dangers lie between the two islands. There are irregular depths, and because of the nature of the adjacent islands, dangers other than those charted may exist. Tide rips and cross currents occur around these islands. Passage through this area should only be attempted by vessels having local knowledge and then only under favorable conditions.

The islands and dangers N of a line joining the N point of Elphinstone Island and a line joining the SE point of Maingy Island have been previously described paragraph 8.48.

**Macleod Island** (12°25'N., 98°09'E.), close off the NE end of Elphinstone Island, is topped by a densely-wooded summit 173m high. Two small islets, joined to the island by a reef, lie off its NE side. A patch, with a least depth of 6.7m, lies about 0.4 mile N of the N islet, and a 3.7m patch lies about 0.3 mile SE of the S islet.

Between Macleod Island and Corbin Island, about 2.3 miles to the N, the water is deep. Tide rips, overfalls, and variable currents prevail.

**Swirl Rock** (12°25'N., 98°11'E.), an isolated patch of rock, 1.5m high, lies about 1 mile E of Macleod Island. Shoals extend about 0.8 mile S from this patch. Depths of 14.6 to 27.4m exist in the channel between the island and the rock.

**Johnny Island** (12°22'N., 98°14'E.), 149m high, lies 4 miles SE of Macleod Island. This densely-wooded island is fringed by a reef and indented by small shallow bays.

Anchorage can be taken, in a depth of 9.1m, about 1 mile SW of the SW extremity of the island.

Six similar small islands lie between Maingy Island, Macleod Island, and Johnny Island. Wilson Island, Evans Island, and Robert Scott Island comprise one group. Wood Island and Daughlish Island lie between this group and Johnny Island. Several drying patches and shoal areas exist in the vicinity of these islands. Tide rips and cross currents occur in this area.

A sheltered area is formed by the NE side of Elphinstone Island, the S side of Macleod Island, and the N side of Grants Island. This latter island is densely wooded, hilly, and indented by many shallow bays.

**8.59 Allans Island** (12°21'N., 98°11'E.), 155m high; Patons Island; Oates Island; and Bomford Island form the E side of the sheltered area. Numerous other small islands lie within this area which is marked by irregular depths.

The N entrance of this sheltered area lies between Elphinstone Island and Macleod Island, but should not be used because of the narrow channel and foul ground which lies off the NE end of the former island.

The E entrance, which lies between Macleod Island and Bomford Island, should not be used because of the many islands and dangers within the entrance. A drying rock lies 183m NE of Oates Island.

**La-e-ale Island** (12°20'N., 98°15'E.), densely wooded and 93m high, lies a little more than 0.8 mile SSE of Johnny Island. Two small islets lie between these two islands.

**La-e-atet Island** (12°18'N., 98°15'E.), densely wooded with a high prominent peak, lies close S of the above island. This peak appears conical when viewed from the N.

**Haycock Island** (12°17'N., 98°10'E.), densely wooded and 215m high, is the largest and highest of a group of islets and rocky patches which lie from 2.5 to 5.5 miles W of La-e-atet Island. Other islands of this group consist of Rat Island, Rock Island, Flat Island, Humpty Island, Mouse Island, and Dumpty Island. Mouse Island, 82m high, lies about 4.3 miles W of La-e-atet Island. This island should not be confused with another island of the same name about 2.5 miles S of La-e-atet Island.

The channel, between Grants Island and the N side of Ross Island, about 2.3 miles to the S, has a least charted depth of 6.1m in the fairway. The greater depths are found close to the former island. This channel has not been closely examined.

### The Bentinck Route—West Approach

**8.60 Sir Charles Metcalfe Island** (12°17'N., 97°47'E.), at the SW entrance of Mermaid Passage and the islands between it and Kabosa Island, about 29 miles to the N, have been previously described in paragraph 8.47.

West Spur and East Spur, two islets about 1 mile apart, lie on a rocky shoal about 1 mile S of Sir Charles Metcalfe Island. The intervening channel is foul.

**Brunette Island** (12°14'N., 97°52'E.) lies about 5 miles, Greenlaw Island about 8.5 miles, and Lion Island about 11.8 miles E, respectively, of East Spur Islet.

**Thanks Islet** (12°15'N., 98°01'E.) lies about 2.5 miles NE of Lion Island and close SE of the S end of Elphinstone Island. Shagstone Island lies 1 mile SE of Thanks Islet. Knap Island, Basham Island, Middle Island, and Pym Island extend about 5 miles S from Shagstone Island.

**Knap Island** (12°13'N., 98°02'E.) and Basham Island are separated from the W side of Ross Island by a channel restricted to a width of 0.3 mile by rocks, and having a least depth of 5.5m. Pym Island, steep-to and conical, is about 122m high.

**Bailey Island** (12°08'N., 97°44'E.), 354m high in its N part, lies about 7.5 miles SSW of Sir Charles Metcalfe Island. The W islets of a group, that extends about 7.5 miles E, lie 11 miles E of Bailey Island. This group consists of ten islands. Howe Island, the largest and highest of the group, rises to an elevation of 246m.

**Hatgrass Passage** (12°11'N., 97°44'E.) lies between West Spur Islet and East Spur Islet to the N and Bailey Island to the S. The passage is deep and clear.

**Henry Prinsep Island** (12°03'N., 97°38'E.) lies about 5 miles SW of Bailey Island. Tower Rock, an excellent landmark, lies at the N end of the island. Sargent Island, 366m high, is separated from Henry Prinsep Island by a narrow foul channel.

**Chester Island** (12°02'N., 97°46'E.), 290m high, lies about 4 miles E of Sargent Island. Reefs have been reported to extend some distance S from the SW extremity of Chester Island. These dangers may extend across the passage between this island and Mackenzie Island.

**Observation Island** (11°59'N., 97°55'E.), densely wooded and 169m high, lies 9 miles E of Mackenzie Island.

**8.61 Courts Island** (11°57'N., 98°00'E.), 344m high, lies about 3 miles ESE of Observation Island and is bordered along its N side by foul ground. The island summit appears as a volcanic cone when viewed from the N. During the Southwest Monsoon, anchorage can be taken, in depths of 7.3 to 9.1m, in a bay on the NE side of the island. The sandy beach abreast this anchorage is foul up to 137m offshore. During the Northeast Monsoon, good anchorage can be taken, in a depth of 9.1m, off a sandy beach at the E end of the head of the bay on the S side of Courts Island.

**East Islet** (11°57'N., 97°45'E.), 57m high, lies 2.3 miles S of Mackenzie Island. West Island, slightly lower, lies 5 miles SW of the same island. Lunka Rock, which dries 1.8m, lies 8.5 miles ESE of East Islet.

**Hayes Island** (11°52'N., 97°40'E.) lies 7 miles S of Sargent Island and rises to a height of 486m. A rock, 4.6m high, lies close N of Hayes Island. Fletcher Island, 256m high, lies 0.8 mile S of Hayes Island.

The **Great Western Torres Islands** (11°47'N., 97°30'E.) are the W group of the Mergui Archipelago Island group. They lie from 6.5 to 12 miles W of Fletcher Island. The two largest islands of the group are separated by a channel with a least depth of 5.5m in the middle of the fairway.

The Great Western Torres Islands have been reported to be a good radar target up to 23 miles.

Small vessels with local knowledge can anchor in a cove on the shore of the SW island of the two larger islands about halfway through the channel. Larger vessels can anchor off the cove entrance, in depths of 27.4 to 29.3m, but the holding ground is only fair and the anchorage is exposed to swells. Vessels should enter through the NW end of the channel with Northeast Little Torres Island bearing 131° and showing through the entrance. When the cove opens, anchorage can be taken as convenient.

The **Little Torres Islands** (11°43'N., 97°35'E.) consist of Northeast Little Torres Island, of moderate elevation, with a reef about 0.5 mile W of it, and a group of three islets in the form of an ellipse between 4.5 miles SE and 10 miles S of the Great Western Torres Islands. The highest islet of the group appears as two islets and has a needle-shaped rock off it. Vessels should not approach within 3 miles of the Little Torres Islands group.

**Nearchus Rock** (11°42'N., 97°52'E.), which covers at HW, lies about 13 miles SE of Fletcher Island.

**Nearchus Passage** (11°53'N., 97°34'E.) connects with the Bentinck Route from the W and lies between Fletcher Island, Lunka Rock, and Courts Island to the N and the Great Western Torres Islands, Nearchus Rock and Bentinck Island to the S. The peak on Bentinck Island is not conspicuous from this passage.

**Directions.**—From a position about 2 miles N of the Great Western Torres Islands, steer to pass 1.5 miles S of Fletcher Island. Then steer to pass 1 mile S of Courts Island, then about 1 mile NW of Christmas Island which lies about 9 miles ENE of Courts Island, where the track joins the Bentinck Route.

## The Bentinck Route—Fell Passage to Christmas Island

**8.62** The Bentinck Route leads from the S end of **Fell Passage** (12°17'N., 98°21'E.) for about 90 miles S to the N end of Forrest Strait, passing between Bentinck Island to the W and Domel Island to the E.

Pinbwa Island (paragraph 8.41), the Lahchi Islands (paragraph 8.57), and Shrub Rocks (paragraph 8.54) have been previously described.

**Mouse Island** (12°15'N., 98°15'E.), 53m high and conical, lies 5.5 miles SW of the S end of Fell Passage.

**Mayan Island** (12°15'N., 98°17'E.), 62m high and rounded, lies 1 mile E of Mouse Island. Lump Rock, 6.1m high, lies about 1.3 miles S of the same island. Medina Patches, composed of gravel and having a least depth of 2.7m, rise from a sand and mud bank which extends about 3.3 miles ESE from Mayan Island. White Rock, 3.7m high, lies about 1.8 miles SW of Mouse Island.

**Cantor Island** (12°13'N., 98°15'E.), 109m high, lies about 0.8 mile SE of White Rock. A rock, with a depth of less than 1.8m, lies 1.3 miles ENE of the S end of Cantor Island, with foul ground in between.

**Ross Island** (12°13'N., 98°06'E.), marked by a prominent, double summit 245.6m high on its SE side, lies 7 miles W of Cantor Island. The N part of the E coast is foul with drying rocks lying 0.5 to 1 mile offshore. Griffiths Island and Helfer Island, both fairly high, lie between Ross Island and Cantor Island.

**Martin Island** (12°07'N., 98°09'E.), actually an islet 64m high, lies 1.5 miles S of the S point of Ross Island. Two larger islets lie in between.

**Mewstone Island** (12°04'N., 98°02'E.), 152m high, Lloyds Island, Drakes Island, and Criddles Island lie close together from 8 to 13 miles SW of the double summit near the SE extremity of Ross Island. The area between the latter three islands is foul. A rock, 4.6m high, lies close off the NW end of Criddles Island. Button Island, 17m high, lies 2 miles E of the S end of the same island.

The Mergui Islands (paragraph 8.54) and Auckland Bay (paragraph 8.55) have been previously described.

**8.63 Hext Rock** (12°08'N., 98°16'E.), which has a least depth of 0.3m and is marked by ripples or breakers, lies about 4.3 miles S of Cantor Island. The summit of Cantor Island, in line bearing 002° with the 199m peak on La-e-atet Island, leads W of this rock.

**Christmas Island** (12°00'N., 98°09'E.), 137m high to the tops of the trees and lying about 6.5 miles S of Martin Island, is the furthest N island of a group of islets and rocky patches. The island is densely wooded. The S side is bold and fronted by off-lying rocks. The indented N side is fronted by shoals extending 0.5 mile NE from it. The summit of the island is prominent from the S. Vessels can pass 0.5 mile off the W side of the island, but the currents are strong during the flood.

**Double Rock** (12°01'N., 98°11'E.), 13.7m high, bare and having two summits, lies 2.5 miles ENE of Christmas Island. Single Rock, 4.6m high, lies about 0.5 mile N of Double Rock.

**Directions.**—Vessels proceeding S from Fell Passage through the Bentinck Route should pass about 0.5 mile W of Pinbwa Island and should then bring the SW point of King Island in line bearing 340° with the sharp peak on Maingy Island. A course of 160° should then be steered with the range astern until Shrub Rocks bear 046°. Course should then be altered to 229° until the S end of Cantor Island bears 316°, distant 1.8 miles, when course should be altered to 222° which leads about 1 mile NW of Christmas Island.

Note that the double peak on the S end of Ross Island, kept well open S of the S end of Cantor Island, leads S of the banks which extend E from the latter island.

Small vessels can cross the shoal E of Medina Patches by keeping the E side of Pinbwa Island open NW of Tatange Island and bearing less than 034°.

**Caution.**—Vessels must guard against being set S between Cantor Island and Hext Rock.

## The Bentinck Route and Adjacent Coasts

**8.64 Basin Island** (11°59'N., 98°10'E.), 61m high and sparsely wooded on its N side, lies 1 mile SE of Christmas Island. An islet lies about midway between the two islands.

The Bentinck Route leads from the S end of Fell Passage to the N end of Forrest Strait, about 90 miles to the S. It passes between Bentinck Island on the W and Domel Island on the E. The N end of the route has been previously described in paragraph 8.55.

The coastal area abreast of the Bentinck Route is indented by numerous mangrove-filled inlets with meandering tidal currents at their heads. The shores are extensive mangrove swamps and mudflats with a few areas of rocky headlands and several short, narrow, sandy beaches. Mountain rangestrending N and S lie close inland along the S part of this coast.

The coastal islands are low and swampy, whereas, the off-shore islands are generally high, rocky, and well-wooded.

**Tides—Currents.**—In the N approaches to the Bentinck Route, the tidal currents set SSE on the rising tide and in an opposite direction on the falling tide, at rates of about 2 knots in open waters. Tide rips, eddies, and overfalls are found in the narrow channels.

Near the S entrance of Fell Passage and in the vicinity of Shrub Rocks, the tidal currents set E on the rising and W on the falling tide, at rates of about 2 knots.

Between Shrub Rocks and the Pickwick Group, about 14.5 miles SSW, the tidal currents set SE on the rising and NW on the falling tide. Rates of 4 to 5 knots have been reported at springs.

Between Courts Island and Parker Island, about 13 miles E, the tidal currents set NE on the rising and in an opposite direction on the falling tide. A set onto the SW side of Christmas Island occurs during the rising tide. The rate at springs on the rising tide is 1.3 knots; that on the falling tide is 1.8 knots.

Between Bentinck Island and Domel Island, N of West Passage Island, the tidal currents set NE on the rising and SW on the falling tide, with rates at springs of about 2 knots. In the more open waters NE of South Passage Island (11°46'N., 98°07'E.), the tidal currents set N on the rising and S on the falling tide, with rates at springs of about 1 knot.

At a position about 4 miles S of the S end of Bentinck Island, the tidal currents at the start of the rising tide set ESE and then turn gradually through E to NE. The tidal currents set WSW during the falling tide. The rate of both currents at springs is about 1.5 knots.

East of **Maria Island** (11°27'N., 98°00'E.), the tidal currents set SE during the rising and NW during the falling tide, with rates at springs of about 1.3 knots. Between the S end of Domel Island and Carew Island, about 2 miles S, the tidal currents set NE during the rising and SW during the falling tide, with rates at springs of over 3 knots. The tidal currents are also strong between High Peaked Island and Bushby Island, and in Jubilee Channel. Rips occur in this channel, especially off its E entrance.

Between Bushby Island and Owen Island, 8.5 miles SSE, the tidal currents set NE or ENE during the rising tide and in reverse directions during the falling tide, with rates at springs of about 1.5 knots.

In the N approaches to Forrest Strait, between **Bernard Island** (11°11'N., 98°16'E.) and the Dolphin Islands, about 14.5 miles S, the tidal currents set ENE during the rising and in an opposite direction during the falling tide, with rates at springs of about 1.5 knots.

**Depths—Limitations.**—The approaches to the outer islands of the Mergui Archipelago are deep and clear of dangers, but navigation through them is intricate and dangerous. The approaches to the mainland coast are greatly encumbered by these islands and the extensive mudflats and shoals closer inshore.

There are considerable depths in the fairway of the Bentinck Route between Christmas Island and the entrance of Forrest Strait. Caution is necessary, however, because there are no navigational aids and the channels have only been partially examined. The least depth in the fairway between West Passage Island and Elephant Island, about 2.3 miles to the ENE, is 6.4m; the greatest depths are formed near West Passage Island.

**Directions.**—The track from Rangoon to Singapore leads well seaward of the Mergui Archipelago. Navigation through this group is very intricate and dangerous to those not possessing local knowledge.

**8.65 The Bentinck Route.**—Vessels should follow the directions previously given in paragraph 8.63 to a position about 1 mile NW of Christmas Island and then to a position about 1 mile W of that island. From this latter position a course of 176° should be steered, which leads about midway between Warning Rock and Bidy Rock and between Cap and Feathers Rock and West Passage Island. Allowance should be made for

the currents as soundings give little warning of the approach to the dangers in this area.

When the summit of **South Passage Island** (11°46'N., 98°07'E.) bears 270°, course should be altered to 195° which leads about 0.5 mile E of Bluff Point the S extremity of Bentinck Island. When this point comes in line bearing 005° astern with the W end of South Passage Island, course should be altered to about 185° so as to pass about 1 mile W of **Fly Rock** (11°30'N., 98°06'E.).

When Fly Islet, which lies about 2.3 miles SE of Fly Rock, bears 090°, distant 3 miles, course should be altered to 180°, passing about 0.7 mile W of Cone Islet. When the summit of Jane Island (11°22'N., 98°01'E.) bears 279°, course should be altered to 152° which leads about 1.8 miles NE of Celia Rock, about 4 miles NE of Father Island, and about 2 miles SW of High Island at the entrance of Forrest Strait.

South Passage Island is difficult to identify from the S. Vessels bound to the N should keep **Cone Islet** (11°23'N., 98°06'E.) bearing not more than 180° astern, and well open W of Bushby Island until Fly Rock is passed.

### Christmas Island to Bentinck Island

**8.66 Courts Island** (11°57'N., 98°00'E.), on the W side of the Bentinck Route fairway, has been previously described in paragraph 8.61.

**Pickwick Island** (12°01'N., 98°16'E.) and Weller Island, the W islands of the Pickwick Group, are densely wooded, and fairly high and lie about 5.5 miles E of Christmas Island. This group lies on the W side of the entrance of Morrison Bay. Bare Rocks, both small, lie between Weller Island and the N end of Parker Island, about 0.5 mile to the S. During spring tides, strong eddies occur in this vicinity.

**Holly Island** (12°00'N., 98°12'E.), 39m high, wooded, and having a prominent summit, lies 2 miles ESE of Christmas Island. Dangers lie within a radius of 1 mile of Holly Island. Stodart Rock, a small pinnacle with a depth of 1.8m, lies about 2.5 miles S of this island.

**Parker Island** (11°57'N., 98°15'E.), Trotter Island, and Money Island, which lie S of the Pickwick Group, form the E side of the Bentinck Route. All three islands are densely wooded; their W sides are indented by small sandy bays. An intricate, but rather deep channel about 0.5 mile wide, separates Parker Island from Trotter Island. Strong currents set through this channel. The channel between Trotter Island and Money Island almost dries. The channel between Money Island and Domel Island is narrow and intricate.

**Amie Island** (11°56'N., 98°13'E.), small but high and densely wooded, lies 4.8 miles SE of Christmas Island. A prominent summit tops the island.

**Williams Reef** (11°55'N., 98°11'E.), which dries 1.2m, lies about 1.8 miles SW of Amie Island. Bidly Rock, with a least depth of 4.9m, lies 1.5 miles farther SW.

**Warning Rock** (11°54'N., 98°05'E.), which dries 0.6m, lies on the W side of the fairway about 6.8 miles SSW of Christmas Island. The Bentinck Route track passes midway between this rock and Bidly Rock.

**Whale Rock** (11°52'N., 98°05'E.), 9.1m high, lies 1.8 miles S of Warning Rock. A shallow patch lies close SE of Whale Rock.

**Zahora Rock** (11°52'N., 98°01'E.), awash and steep-to, lies 1.3 miles N of the N end of Bentinck Island.

**8.67 Marian Island** (11°51'N., 98°12'E.), sparsely wooded, lies about 5 miles S of Amie Island. A high conspicuous peak lies at the W end of the island. Two fairly high summits lie in the E part of the island. The saddle in between is prominent from the S.

A group of islands and rocks, including Rosie Island and Bidly Island, lies between Marian Island and Amie Island. A prominent summit lies on the NW side of Rosie Island. Bidly Island consists of two parts connected by a causeway. A foul channel separates this group from Trotter Island to the E.

A pinnacle rock, with a least depth of 3.4m, lies about 1.8 miles S of Marian Island. Several islets and rocks lie between this island and the rock.

**Elephant Island** (11°50'N., 98°10'E.), which appears flat-topped from the offing, is 58m high and wooded. It lies about 1.8 miles SW of Marian Island and marks the E side of the channel abreast West Passage Island.

**Cap and Feathers** (11°50'N., 98°09'E.), a single rock 13.7m high, lies 0.8 mile NW of Elephant Island. A drying rock lies about 91m W of this rock. A 5.5m shoal lies about 0.5 mile N of the same rock.

**Peterson Rock** (11°50'N., 98°06'E.), which dries 1.8m, lies on the W side of the fairway about 3.5 miles W of Elephant Island.

**Crown Island** (11°50'N., 98°05'E.), 61m high and steep-to on its N side, lies 1.5 miles W of Peterson Rock.

**West Passage Island** (11°49'N., 98°07'E.) lies 2.5 miles WSW of Elephant Island and is bold and wooded. The island is steep-to on its E side.

**Dennis Rock** (11°49'N., 98°06'E.), 4m high, lies 1 mile WSW of West Passage Island.

### Bentinck Island—Off-lying Islets and Rocks

**8.68 Bentinck Island** (11°45'N., 98°02'E.), with a very irregular indented coast, is separated from Courts Island by a deep channel about 0.3 mile wide. The island is densely wooded and hilly. A bold flat-topped hill, 294m high, lies 2 miles off the N end of the island. A prominent higher peak rises about 2.5 miles SSE of this hill and appears as a horn when viewed from the NE or SW. Another prominent hill lies about 10 miles SSW of this peak.

The island is surrounded by fairly deep water on all but its E side, which is fringed by a shoal which extends up to 2 miles offshore.

The W coast of Bentinck Island is rugged, wooded, irregular, and fronted by several islets which lie up to 2 miles offshore.

The N inlet of three, which indent the W coast, lies about 9 miles NNW of Bluff Point and provides anchorage, in a depth of 9.1m, in a bay indenting its N shore.

The middle inlet, which lies 7 miles NNW of Bluff Point, provides anchorage in a cove along the N shore, in a depth of 9.1m. Only small vessels with local knowledge can be accommodated.

The S inlet, which lies 4.3 miles NW of Bluff Point, provides anchorage to small vessels with local knowledge, in depths of 11 to 27.4m.

The E coast of Bentinck Island is indented by North Bay and two other inlets. Thompson Island, 305m high, is separated from the NE coast of Bentinck Island by a narrow shoal channel. North Bay lies on the W side of Thompson Island and provides anchorage, in depths of 11 to 27.4m.

**South Passage Island** (11°46'N., 98°07'E.), bold and wooded, lies about 3.3 miles S of West Passage Island. A drying reef lies about 0.3 mile NE of the N point of South Passage Island, with shoal depths in between. During the Southwest Monsoon, anchorage can be taken between these two islands about 2 miles E of the S end of Thompson Island.

**Doris Rock** (11°43'N., 98°06'E.), which dries, and Daphne Rock, awash, lie 6 miles N and 4.5 miles N, respectively, of Bluff Point.

The S part of the E coast of Bentinck Island is indented by two inlets about 2.8 and 4 miles N of Bluff Point. Small vessels with local knowledge can anchor in the N arm of the S inlet.

Several rocks lie off the S end of Bentinck Island. Perforated Rock, 24m high and bare, lies 1.5 miles WSW of Bluff Point. Fish Rock, 3m high, lies 1 mile SSW of Perforated Rock.

Perforated Rock has been reported to be a good radar target up to 22 miles.

**Domel Island** (11°39'N., 98°15'E.), one of the largest islands of the Mergui Archipelago, lies roughly parallel with and 7 to 13 miles E of Bentinck Island. Several densely wooded conspicuous peaks lie on the island and range from 488m to 683m high. Sanderson Hill rises to a bare summit, 539m high, 9.5 miles SSW of the N end of the island. The W coast is indented by many bays with sandy beaches at their heads.

**Livock Bay** (11°28'N., 98°14'E.), on the S coast of the island, contains numerous dangers, but small vessels with local knowledge can anchor, in a depth of 7.3m, in the N arm of the bay. Protection is provided during the Southwest Monsoon.

**Pigeon Island** (11°47'N., 98°13'E.), 119m high near its N end and wooded, lies 3 miles W of the NW point of Domel Island. A shoal spit extends almost 0.5 mile N from the island.

## Bentinck Island to Forrest Strait

**8.69 West side of the Bentinck Route.**—Tree Island (11°32'N., 97°58'E.) lies about 9 miles SW of the S end of Bentinck Island. Northwest Islet lies 3 miles farther WSW and Flat Islet lies 1.8 miles SW of Tree Island.

**Five Sisters** (11°23'N., 98°00'E.) consist of a group of islands and rocks which lie between 10 and 20 miles SSW of the S end of Bentinck Island. Maria, Eliza, Jane, Anne, and Charlotte are the principal islands of the group. These wooded islands are rocky and precipitous on their W sides, and marked by sandy beaches on their E sides.

**Maria Island** (11°27'N., 98°00'E.), irregularly-shaped and fairly high, is marked by four distinct peaks. Two small islets lie within 0.5 mile N of the N end of the island. A fairly high rock lies close off the NE end of the island. Violet Island, wooded and having a grassy summit, lies 0.5 mile SE of Maria Island. Several above-water rocks lie in between the two islands. Maria Rock, 13.7m high, lies almost 1 mile E of Violet Island. A rock, 6.1m high, lies 183m NW of the rock.

Small vessels with local knowledge can anchor in a small bay on the N coast of Maria Island, in a depth of 12.8m, sand,

0.5 mile SSE of the NW end of the island. Protection is provided during the Southwest Monsoon.

**Eliza Island** (11°24'N., 98°00'E.), 204.2m high, lies about 1.3 miles SW of Violet Island. Northeast Quoin Island lies 1 mile E of the SE end of Eliza Island. Eliza Rock, 10.7m high and bare, lies 2 miles SE of the N end of the same island. Umbrella Rock, 22.9m high with a drying rock 137m S of it, lies 0.6 mile SSE of Northeast Quoin Island.

**Jane Island** (11°21'N., 98°01'E.) lies 1 mile S of Eliza Island and is 207m high. Jane Rock, 12.2m high and bare, lies about 2 miles ENE of the N end of Jane Island. A rock, 3m high, lies about 0.2 mile SSE of Jane Rock. A smaller rock lies 91m NW of Jane Rock.

**Janet Island** (11°21'N., 98°01'E.), densely wooded and 88m high, lies 0.4 mile SE of Jane Island. Two rocky ledges lie in between.

**Anne Island** (11°20'N., 98°00'E.), the next island to the S, rises to a height of 204m. Two isolated rocks lie about 3.3 miles W of the N end of Anne Island. Small vessels with local knowledge can anchor, in a depth of 14.6m, sand, in a bay about 0.5 mile SSE of the N end of Anne Island.

**Charlotte Island** (11°19'N., 98°01'E.), separated from Anne Island by a narrow channel, is 157m high. Charlotte Rock, 21m high and bare, lies about 0.3 mile ENE of the island of the same name. May Island, 41m high and densely wooded, lies 137m E of Charlotte Island. Pin Island, steep-to and densely wooded, is 62m high and lies about 0.2 mile ESE of South Quoin Islet. This latter islet is 78m high and lies 183m S of May Island.

**Celia Rock** (11°19'N., 98°04'E.), awash, lies 2 miles ENE of May Island. Depths of 14.6m exist about 0.5 mile SE of this rock.

**Black Rock** (11°23'N., 97°40'E.) lies isolated about 18.5 miles WSW of Maria Island and can be seen for a distance of 8 miles.

**8.70 Coopers Driver Island** (11°27'N., 97°55'E.), rugged and partly wooded, lies 5 miles SW of Charlotte Island. A small islet lies close off the SW end of the island, but it is steep-to on its E and W sides. A bare islet, connected by a chain of rocks to a similar islet about 1 mile to the E, lies close off the N end of the island. Strong eddies prevail during the strength of the tidal currents.

Hen and Chickens, a group of six rocks, lies 2.5 miles S of Charlotte Island. The S rock of the group rises to a height of 15.2m and is the largest of the group.

**Son Island** (11°12'N., 98°05'E.) and Father Island, both bare, lie close together about 5.5 miles SE of Hen and Chickens. The S and W sides of Father Island are marked by red streaked cliffs. A rock, 0.9m high, lies 0.6 mile N of Son Island. Two other rocks, which dry 2.4m, lie almost 0.3 mile N of this rock.

**High Peaked Island** (11°27'N., 98°08'E.), 1 mile W of the SW extremity of Domel Island, rises to a prominent, densely-wooded summit 302m high. Second Observation Island, 70m high, cliffy and wooded, lies 0.4 mile N of the N end of High Peaked Island. Fly Islet and Mosquito Islet lie within 0.5 mile NE of Second Observation Island. A drying rock lies close SW of Mosquito Islet. A similar rock lies 1.5 miles ESE of Second Observation Island. Fly Rock, a small, steep-to pinnacle

awash, lies 2.3 miles NW of Fly Islet and is difficult to distinguish.

**Bushby Island** (11°24'N., 98°08'E.), bold and topped by many high wooded peaks, lies 2 miles SW of the SW extremity of Domel Island.

**Cone Islet** (11°23'N., 98°06'E.), 65m high, conical and heavily wooded, lies 1.5 miles S of the W end of Bushby Island.

**Constitution Bank** (11°24'N., 98°04'E.), with a least depth of 12.5m, lies between Bushby Island and the Five Sisters.

Vessels with local knowledge can anchor, in a depth of 14.6m, close outside a line joining the entrance points of a small sandy cove near the NW point of Bushby Island.

**Dorothy Island** (11°24'N., 98°11'E.), 85.3m high, lies 2 miles ESE of the NE point of Bushby Island. Within about 6 miles E and ESE of Dorothy Island, there are a group of densely-wooded islands and rocks. These include Carew Island, North Park Island, South Park Island, Ravenshaw Island, and Wendy Island. Alligator Rock, 4.6m high, lies 1.5 miles E of Ravenshaw Island.

**Jubilee Channel** (11°19'N., 98°15'E.), a fairly-wide deep passage, branches off from the Bentinck Route in an ENE direction between Ravenshaw Island and Alligator Rock. The currents are strong in this passage.

**Katherine Island** (11°18'N., 98°13'E.), 75m high and wooded, lies in the SW entrance of Jubilee Channel. Vessels can pass N of it, or between it and Barbara Island, about 1.5 miles to the S. The latter island is 79m high and densely wooded.

**Sir J. Malcom Island** (11°18'N., 98°15'E.) has two prominent summits. Both summits rise to elevations of over 366m.

A drying rock lies about 0.6 mile WSW of Barbara Island.

Three islets lie S of Barbara Island and close off the SW extremity of Sir J. Malcom Island. An islet lies in the middle of an inlet on the E side of the latter island.

**8.71 Paines Reef** (11°18'N., 98°18'E.), composed of drying coral, lies 1 mile E of the NE side of Sir J. Malcom Island. A rocky patch, with a least depth of less than 1.8m, lies 1.3 miles S of Paines Reef. Haldane Island, 41m high and heavily wooded, lies 4.8 miles SE of the N end of Sir J. Malcom Island.

A navigable passage, 0.3 mile wide, separates the last-named island from Owen Island to the S. Jubilee Channel is considered to be the safer of the two.

**Owen Island** (11°14'N., 98°15'E.) has three distinct summits; the S summit is 381m high and the other two are each 472m high. Sinclair Bay indents the W side of the island and has a sandy beach about 1 mile long. Small vessels with local knowledge can anchor, in a depth of 14.6m, sand, about 0.5 mile W of a small bluff in the middle of the bay head. Protection is provided during the Northeast Monsoon.

June Bay, bordered by rocky ledges around its shores, lies S of Sinclair Bay. Small vessels with local knowledge can anchor, in a depth of 16.5m, in the entrance of the bay.

**Joan Island** (11°15'N., 98°18'E.), 59m high, lies about 0.8 mile E of the NE end of Owen Island. Doris Island, 85m high, lies 1.5 miles E of the N summit of the same island. Both islands are densely wooded. A drying reef lies almost 1 mile E of the E end of Owen Island.

Maxwell Island, Milne Island, and Bain Island, all small, lie close S of Owen Island.

**Bernard Island** (11°11'N., 98°16'E.), 190m high and densely wooded, lies 0.5 mile S of Owen Island. A deep channel separates the two islands. A shoal bank, with a least depth of 11.3m, extends about 3.5 miles W from the W side of Owen Island. A bank, with a least depth of 14.3m, lies 1.5 miles W of the S end of Bernard Island.

## Morrison Bay

**8.72 Morrison Bay** (12°00'N., 98°21'E.) is entered between the Pickwick Group and Saunggyi Kyun, about 10 miles to the NE. The bay extends about 15 miles SSE of Julian Island, Kennedy Island, and Tucker Island near its head. Parker Island, Trotter Island, and Money Island form the W side of the bay and Sellore Island forms its E side. The N side of Kiss-raing Island forms the S side of the bay.

Morrison Bay can also be entered from the S by a narrow channel which is approached between Domel and Kisseraing Island. This channel leads between flats which extend from the N parts of these islands into the SW corner of the bay.

The N entrance of Celerity Passage lies in the SW part of the bay.

**Parker Island** (11°57'N., 98°15'E.), 189m high near its SE end, is densely wooded. Numerous islets lie off the E side of the island. Edmund Island and Wilmot Island lie close together about 0.5 mile off its NE coast. Pirie Island, densely wooded and conical in shape, lies 1 mile NE of the E end of Parker Island. Tree Island, having shoal ground extending 0.5 mile N from it, lies 0.5 mile NW of Pirie Island.

Star Island, densely wooded and 113m high, lies 1 mile SSW of Pirie Island. This island is the northernmost and easternmost of a group of five islands lying off the SE point of Parker Island. Reef Island, the southernmost, is 50m high and lies 0.5 mile off the NE end of Trotter Island. A small islet lies 0.3 mile E of Trotter Island.

**Trotter Island** (11°53'N., 98°16'E.), the next island S of Parker Island, is 326m high and densely wooded. Whaleback Reef, which dries 1.5m, lies about 1 mile N of the E end of Trotter Island. Shoal patches lie NNW and SW of the reef, but to the E there is deep water.

**8.73 Heath Rock** (11°55'N., 98°19'E.), which has a least depth of 1.5m, lies about 1.8 miles NNE of the E end of Trotter Island. Eddies usually mark this rock. Forfar Rock, 1.2m high, lies on a rocky patch about 1.8 miles ENE of the same point.

**Money Island** (11°50'N., 98°17'E.), the next island to the S, is 335m high and heavily wooded. A wooded islet lies in mid-channel between this island and Domel Island.

**Una Island** (11°52'N., 98°18'E.), 23m high and separated from Jack Island by a channel, 0.2 mile wide, lies 1 mile NE of the NE end of Money Island. Jack Island, 68m high and sparsely wooded, lies 0.5 mile off the NE side of Money Island. A village lies on the N side of Jack Island.

The channels between the above islands are not to be used because of the strong, irregular currents.

**Kayo Island** (12°04'N., 98°24'E.), 52m high, lies 2 miles SW of the NW end of Sellore Island.

**Donnelly Reef** (11°55'N., 98°25'E.), which dries 1.2m, lies about 8 miles S of Kayo Island. The intervening area is marked by several shoal patches.

**Donnelly Island** (11°54'N., 98°26'E.), 47m high and well-wooded, lies 2 miles SSE of Donnelly Reef. This island lies on the NE side of a channel which leads between Julian Island and Kennedy Island.

**Lokthama Kyun** (11°54'N., 98°27'E.), which lies between Donnelly Island and the E shore of the bay, is 79m high and well-wooded. The intervening channel is deep but the currents are strong. A 2.4m patch lies in the S entrance of this channel.

**Twin Rocks** (11°53'N., 98°27'E.), 9.1m high, lie 0.8 mile SSE of Donnelly Island. Bird Rocks, white in color and steep-to, lie 0.4 mile S of Twin Rocks.

**8.74 Head of Morrison Bay.**—The N coast of Kisseraing Island is fronted by Julian Island, Kennedy Island, and Tucker Island. Julian Island, 134m high on its W side, lies with its SW point about 3 miles NE of the NW end of Kisseraing Island. A village lies near the S end of the island.

An extensive bank, as defined by the 6m curve, extends 6.5 miles NNW from the NW point of Kisseraing Island. Square Rock, 4.6m high, lies near the end of this bank about 2 miles ESE of the E end of Trotter Island. Quoin Rock, 9.1m high, lies 0.8 mile S of Square Rock. Both rocks are jungle covered.

**Sidney Island** (11°52'N., 98°25'E.), 21m high and heavily wooded, lies 0.5 mile N of Julian Island.

**Kennedy Island** (11°50'N., 98°28'E.), 174m high and heavily wooded, lies 1 mile E of Julian Island. Numerous islets and rocks lie between this island and the S end of Sellore Island. A shoal, having a depth of 7.9m, lies between Julian Island and Kennedy Island.

Tucker Island, separated from Kennedy Island to the E by a narrow shoal channel, is densely wooded and has two high summits.

Kanmaw Village lies at the NE end of Kisseraing Island. A beacon lies on a rock 0.3 mile NE of the village. Regular sea communication is maintained between the village and Mergui.

**Celerity Passage** (11°46'N., 98°20'E.), narrow and tortuous, leads S from the SW corner of Morrison Bay between Domel Island to the W and the extensive flats known as Leslie's Garden to the E. Jubilee Channel joins this channel about 25 miles to the S and then leads S to the N entrance of Forrest Strait, about 22 miles distant.

**Leslie's Garden** (11°47'N., 98°20'E.), an extensive flat which dries in places, extends about 5.5 miles NW from the NW end of Kisseraing Island to within 0.5 mile of Jack Island. The flat also extends W for about 4.5 miles from the same point to within a short distance of the E coast of Domel Island.

### Morrison Bay—South Approach

**8.75** The S approach to Morrison Bay lies between the SE point of Domel Island and Maw-yut Point, the S end of Kisseraing Island about 15 miles ENE.

A bank, with depths of less than 5.5m, extends about 4 miles off the W side of Kisseraing Island, 11 miles WNW of Maw-yut Point.

The Marble Islands, a group of two large and four small islands, lie from 1.5 to 2 miles off the SE side of Domel Island.

The group is almost bare of trees and steep-to. The S island of the group is the highest, attaining an elevation of 317m. Small vessels with local knowledge can anchor, in a depth of 11m, off the W entrance point of a cove on the S end of this island. Vessels can anchor off this group of islands according to the monsoon; the greatest depths being found between them and Domel Island.

**Sydney Island** (11°32'N., 98°27'E.), small, wooded, and brown, lies close off the SW point of Kisseraing Island.

**Lalla Rookh Island** (11°30'N., 98°30'E.), 32m high, well-wooded, and having a prominent dark tree at its N end, lies about 2 miles W of Maw-yut Point and is the furthest S of a small group of islands. All of these islands are densely wooded and lie on an area of foul ground which extends about 2 miles offshore.

Small vessels with local knowledge can use Celerity Passage on the last of the flood; the tidal currents are not strong.

### Whale Bay

**8.76 Whale Bay** (11°35'N., 98°39'E.) lies between the SE side of Kisseraing Island and the mainland to the E. The entrance lies between Maw-yut Point and Wet Kyun, about 9 miles to the E. The bay is approached from the SW, but caution is required because the bay has not been closely examined. Sheltered anchorage can be taken, in depths of 11 to 18.3m, in the S part of the bay.

Pawe Kyun, marked by a prominent tree-covered hill near its S end, lies about 3.3 miles SSW of Maw-yut Point. Firth Rock lies on a reef which extends about 0.5 mile NE from the NE side of the island. Shoal ground, as defined by the curve, extends more than 1 mile farther NE. Shoal ground, with a least depth of 3m, extends 1 mile off the SE side of the island.

**Vera Island** (11°29'N., 98°32'E.), 90m high and wooded, lies 1.5 miles NE of the N end of Pawe Kyun. Vera Shoal, which has a least depth of 11.9m, lies about in mid-channel between Vera Island and Lalla Rookh Island. Tide rips exist in the channel between Vera Island and Maw-yut Point.

**Robert Island** (11°24'N., 98°30'E.), high and heavily wooded, lies close S of the S end of Pawe Kyun.

Fink Island, high and heavily wooded, is the northeasternmost of a group of small islands and rocks that lie up to 5.5 miles SW of Pawe Kyun. The channels between these islands should not be used because of the rips and variable currents.

**Malcom Island** (11°18'N., 98°32'E.), high and densely wooded, lies about 5 miles NE from the outer edge of a shoal tongue which extends 17 miles SW from the mainland. Cheding Flats is that part of the tongue which lies between the island and the mainland.

**8.77 Alice Island** (11°21'N., 98°31'E.) lies on a detached shoal, about 1.3 miles in extent, which lies about 2 miles NNW of the N point of Malcom Island.

Barn Island, 114m high and heavily wooded, lies 4.5 miles W of the S part of Malcom Island.

**Maw-yut Point** (11°31'N., 98°32'E.) the W entrance point of Whale Bay, is steep-to on its S and E sides. Wet Kyun, on the E side of the entrance, is 125m high and well-wooded. There is no navigable channel between the island and the mainland. Kyauk Kalat, a small islet of whitish color, lies 0.5 mile S of the

island and on the N side of the entrance of Yengan Chaung, a creek bordered by drying flats on both sides of the entrance.

From the entrance of Yengan Chaung, the E side of Whale Bay extends N for about 14 miles to the mouth of the Lenya River at the NE corner of the bay. None of the creeks along this section are as large as the Yengan Chaung.

**Campbell Rock** (11°33'N., 98°34'E.), awash, lies about 3 miles NE of Maw-yut Point and is marked by a beacon with a white circle topmark. The rock consists of two pinnacles and is steep-to on its E side.

Mawgaung-don, a point on the E side of Kisseraing Island, lies 6 miles N of Maw-yut Point. Bhadra Reef fronts the shore for about 3 miles S of Mawgaung-don and extends up to 1.5 miles offshore. A vessel, with a draft of 2.4m, struck a rock on the outer part of this reef about 1.8 miles S of Mawgaung-don.

Northward of Mawgaung-don, the depths decrease and the channel along the NE side of Kisseraing Island almost dries.

The **Lenya River** (11°40'N., 98°43'E.) rises close to the Pakchan River and roughly flows from N to S. The small village of Lenya lies 36 miles upstream and can be reached by small light-draft power vessels.

Between **Kabyachaung** (11°27'N., 98°43'E.), a 65.8m high islet which lies on the S side of the entrance of Yengan Chaung and the entrance of the Bokpyin Chaung, about 11 miles to the S, the coast is fringed by mangroves and intersected by creeks.

Sadien Ondawagan, the largest of many villages in this area, lies 4.5 miles S of the S entrance point of Yengan Chaung. Cheding Rocks, 12.2m high, lie close offshore about 1.3 miles NW of this village.

Kho Gyun, 65m high, well-wooded, and prominent, lies 5.5 miles SSW of the same village. A shoal, which dries in places, extends about 0.5 mile NE from the island.

**Boat Rock** (11°18'N., 98°41'E.), about 0.4 mile N of Kho Gyun, is 15.2m high. Bhadra Rock, about 0.5 mile W of Boat Rock, dries 0.9m.

Small vessels can anchor, in a depth of 7.3m, about 1 mile S of Kho Gyun.

A small village lies on the S side of the entrance of Bokpyin Chaung, a creek about 7 miles S of Sadien Ondawagan. A prominent house lies on a hill behind the village.

The coast between Bokpyin Chaung and the islands forming the N side of Karathuri Bay, about 13 miles to the S, is indented by creeks and marked inland by high hills.

**8.78 Nopu Taung Saba** (Elephant Rock) (11°13'N., 98°39'E.), 48m high and prominent, lies 4.5 miles SW of Kho Gyun. This islet is the northwesternmost of a group of islets and rocks which lie on the S side of the approach to Bokpyin Chaung. Numerous rocks and reefs lie between this group and the mainland. Needle Rocks lies 1.3 miles NE of Nopu Taung Saba.

**Pulau Ting-nga** (11°12'N., 98°39'E.), a group of three conical rocks, lies about 1.5 miles S of Nopu Taung Saba. The S rock rises to a height of 21m. Foul ground extends 14 miles NE and 0.8 mile E from these rocks.

**Pulau Ampat** (11°10'N., 98°37'E.), three well-wooded islets, lie 3.5 miles SSW of Nopu Taung Saba. The S islet is 76m high. From a distance, these islets appear as one. Foul ground extends about 1.5 miles ENE from these islets.

North Cone Island, about 2 miles SSW of Pulau Ampat, is 30m high. Pualu Kyin Ngai, 69m high, lies 4 miles WSW of North Cone Island, Pualu Panyam, 73m high, lies 3 miles farther SW.

An islet, 43m high, lies near the S end of the shoal ground that extends 3 miles S from Pulau Panyam.

**Karathuri Bay** (10°58'N., 98°36'E.) lies between Carnac Island and Jenkins Island to the N, and Kyeinni Taung and the Brothers Islands to the S. Carnac Island and Jenkins Island are surrounded by numerous islands, all lying on an extensive mud bank, about 6 miles SSE of North Cone Island. A narrow, shoal channel separates this mud bank from the mainland to the E.

Carnac Channel, which leads into Karathuri Bay from the N between Carnac Island and Kauye Kyun, about 3 miles to the W, is suitable only for small vessels with local knowledge. Some of the reefs and shoals in this channel are marked by beacons.

**Warrington Straits** (10°55'N., 98°30'E.) leads into Karathuri Bay from the W between Collies Island and Kauye Kyun to the N, and Mingyi Sakan, Sir Robert Campbell Island and Kandaw Island on the S. Kyaukmedaung and Tunnel Rock, which is conspicuous, lie close N of Kandaw Island. This latter island is 80m high.

A group of islets and rocks lie within 0.8 mile from the S end of Kauye Kyun. A rock, with a depth of less than 1.8m, lies 1.5 miles S of this group and 0.8 mile ENE of Mingyi Sakan.

**Riou Island** (10°56'N., 98°26'E.), 65m high, lies on an area of shoal ground, about 1.3 miles S of Collies Island. The intervening channel is known as Warrington Passage.

**Kinnears Passage** (10°59'N., 98°28'E.) separates Collies Island from Kauye Kyun, but is suitable only for small vessels with local knowledge.

Anchorage can be taken, in a depth of 11m, about 0.5 mile E of an islet which lies about 2 miles N of Tunnel Rock.

## Forrest Passage and Forrest Strait—West and Southwest Sides

**8.79 Forrest Passage** (11°05'N., 98°04'E.) is 16 miles wide at its entrance between Father Island, previously described in paragraph 8.70, and North Sentinel Islet, and leads ESE for about 15 miles to the N entrance of Forrest Strait.

**North Sentinel Islet** (10°57'N., 97°58'E.), small and steep-to, has a rock close off its W side.

**Clara Island** (10°54'N., 97°55'E.) rises to two summits and lies 1.5 miles SW of North Sentinel Islet. The N summit is 534m high and the S summit is sharp. South Sentinel Islet lies 0.5 mile S of the S point of Clara Island.

Kanzagyi, an island 173m high, lies 2.8 miles E of Clara Island. Wa-ale Kyun (Blunt Island), 314m high, lies 1 mile farther E.

A reef, partly above and below-water, lies within 2 miles SW of Kanzagyi.

**Forrest Strait** (10°50'N., 98°21'E.), entered between the N end of Sullivan Island and Collies Island, about 15 miles to the E, is a deep-water, sheltered passage available to deep-draft vessels. At its N end, Forrest Strait connects with Forrest Passage, the Bentinck Route, and the route from Morrison Bay through Celerity Passage. Investigator Channel leads from the W into the strait.

The strait extends about 70 miles S as far as the entrance of the Pakchan River, and leads between the mainland coast and a chain of islands, islets, and rocks which lie from 10 to 12 miles offshore. A group of islands, about 18 miles S of the N entrance of the strait, lie in the fairway and divide the strait into two channels. Areas of discolored water are found throughout the strait.

**Tides—Currents.**—The tidal currents in Forrest Passage set E with the rising tide and W with the falling tide. The rate is about 2.3 knots at springs.

Overfalls and eddies occur about 2 miles W of High Island. Within the strait, the tidal currents set N with the rising tide and S on the falling tide, with rates at springs of about 1 knot. In the vicinity of the channels between the islands on the W side of the strait, the directions are NE on the rising and SW on the falling tide, with rates of 1.3 to 1.5 knots at springs.

In Investigator Channel, the tidal currents set ENE on the rising tide and WSW on the falling tide, with rates of 0.5 knot at springs.

**Depths—Limitations.**—Forrest Passage and the approaches to Forrest Strait from the N are deep and clear. The W channel leading through Forrest Strait has a least depth of 11.9m; the E channel has a least depth of 8.5m. The outer islands along this coast are fairly steep-to on their seaward sides.

**Directions.**—Vessels without local knowledge should proceed with caution because there are few navigational aids, none of which are lighted. The W channel should be used because of the deep water within 1 mile of the Gregory Islands and the landmarks available for position fixing.

From a position about 2 miles SW of High Island, a course of 152° should be steered until the S end of the S Dolphin Island bears 270°, distant 4 miles. The latter position can also be reached by steering a course of 195° from a position 2.3 miles E of High Island. Course should then be altered to 180° and maintained until **Bold Promontory** (11°44'N., 98°18'E.) bears 270°, distant 1.5 miles. A course of 186° should then be steered until Pulau Tuhan bears 090°, distant 2 miles. Course should then be altered to 165° for a position about 2 miles E of the Five Islands.

Vessels using the E channel should from a position about 2 miles SW of High Island, steer a course of 152° until Shitpwin Kyun bears 045°. Course should then be altered to about 172°, which leads in mid-channel over a least depth of 8.2m. When Karachi Rock Beacon bears 270°, distant 1 mile, course should be altered to 181° which leads to a position about 2 miles E of the Five Islands.

From the junction of the two channels, at a position 2 miles E of the Five Islands, a course of 193° should be steered in order to clear the extensive sand and mudflat which lies off the Pakchan River entrance.

Vessels bound for the Pakchan River entrance from the junction point should steer for a position 4 miles W of Pulo Mah Puteh and then follow the directions for the Pakchan River.

### Forrest Strait—North Entrance

**8.80** The N entrance of Forrest Strait lies between the N end of Sullivan Island and Collies Island, about 15.5 miles to the E. High Island, which lies about in the middle of the N

entrance, rises to a double peak, about 428m high. A drying rocky ledge extends about 0.2 mile from the SE side of the island. A cove lies NW of this ledge.

Anchorage can be taken, in a depth of 22m, close off this cove.

Collies Island is the northernmost island of many which form the E side of the N portion of Forrest Strait.

### North Part of Forrest Strait—West Side

**8.81 Two Hill Island** (10°59'N., 98°12'E.), 143m high, and Pulo Gaban, 120m high, lie close E of the N end of Sullivan Island. The islands are steep-to except for a rock awash, about 0.3 mile NNW of Pulo Gaban.

The E coast of Sullivan Island forms the W side of the N part of Forrest Strait and rises steeply to form a thickly wooded range of hills about 309m high. East Peak, the highest summit, rises to a height of 462m about 12 miles SSE of the N end of the island.

The **Dolphin Islands** (10°55'N., 98°15'E.), a densely-wooded group of three, lie between 3 and 5.5 miles SSE of Pulo Gaban. The S islet is the highest. Small vessels can anchor in the channel between these islets and Sullivan Island.

**Katyang** (10°51'N., 98°16'E.), a small islet 68m high, lies close offshore about 2 miles S of the Dolphin Islands.

**Half Moon Reef** (10°50'N., 98°18'E.), which dries 0.3m, lies 1.5 miles offshore about 2.5 miles SE of Katyang. A similar reef, which also dries 0.3m, lies 1.3 miles NW. The summit of Pulo Gaban, open NE of the N Dolphin Island and bearing about 030°, leads E of Half Moon Reef. Bold Promontory, open E of The Foreland and bearing 190°, also leads E of Half Moon Reef.

**The Foreland** (10°47'N., 98°18'E.), a projecting headland 13.6m high, is the E extremity of Sullivan Island and is more prominent than Bold Promontory, about 2.3 miles farther S.

**Marble Island** (10°45'N., 98°18'E.), 8.3m high with an islet off its W side, lies 1 mile SSW of The Foreland.

**Ransom Shoal** (10°42'N., 98°19'E.), a coral patch with a least depth of 7.3m, lies about 2.5 miles S of Bold Promontory.

Pulo Nalo, 235m high, and Pulo Kugyi, 34m high, lie within 4.5 miles S of the S end of Sullivan Island. Several islets lie between them.

**Steep Shoal** (10°38'N., 98°17'E.), a rocky patch with a least depth of 1.5m, lies about 1.3 miles E of the N end of Pulo Kugyi. The Foreland, open E of Bold Promontory and bearing about 360°, leads E of Steep Shoal.

### North Part of Forrest Strait—East Side

**8.82 Collies Island** (10°59'N., 98°27'E.), Riou Island, Mingyi Sakan, and Sir Campbell Island, together with the mainland coast to the S, form the E side of Forrest Strait.

**Shitpwin Kyun** (10°49'N., 98°26'E.), 27m high, lies 7.5 miles E of Half Moon Reef and is the N islet of several which lie on the coastal bank on the E side of Forrest Strait. A 4.3m beacon, with a white ball topmark, marks a rock awash about 0.3 mile N of Shitpwin Kyun.

**Campbell Reef** (10°47'N., 98°26'E.), flat and rocky, dries about 24m and is marked at its SW end by a beacon which stands 3.5 miles S of Shitpwin Kyun.

**Pinwun Maw** (10°45'N., 98°28'E.), which lies about 3 miles ESE of the beacon on Campbell Reef, is the NW point of the mainland which forms the E side of Forrest Strait. The coast then extends 7.5 miles S to Tutthabo Maw. These two points and Kyakyke Maw, about midway between them, are the only prominent features along this low stretch of coast which rises some distance inland to high peaks about 670m high.

**Kala Taung** (10°40'N., 98°29'E.), 1.3 miles SE of Kyakyke Maw, rises to a height of 235m and is the highest hill near the coast. A smaller hill lies 1.5 miles S of Kala Taung.

### Forrest Strait—Mid-channel Dangers

**8.83 Jefford Shoal** (10°48'N., 98°21'E.), a steep-to detached 9.1m patch, lies in mid-channel about 4.5 miles WSW of Shitpwin Kyun.

A shoal, with a depth of 13.7m, lies about 3.5 miles E of The Foreland.

**Gregory Group** (10°40'N., 98°21'E.) consists of five low wooded islands, which lie in mid-channel, abreast the S end of Sullivan Island.

Leik-u Kyun, small, wooded, and 33m high, is the N island of the group. Shoals extend 1.5 miles N from the island and terminate in Marble Patch, which has a least depth of 1.8m, sand and shells.

Wa Kyun, Pulo Myang, and Pulo Myang Basa lie within 3.5 miles S of the above island. Extensive reefs fringe these islands.

**Myang Shoal** (10°39'N., 98°20'E.), with a least depth of 11m, lies 1.3 miles WSW of Pulo Myang.

**Karachi Rock** (10°37'N., 98°23'E.), which dries, lies 1.5 miles SE of Pulo Myang Basa. A beacon, with a white ball topmark, marks this danger.

Pulo Tuhan, the S island of the group, lies 2 miles S of Pulo Myang Basa. The intervening channel has a least depth of 14.6m. A shoal ridge extends about 0.5 mile SW from Pulo Tuhan.

### South Part of Forrest Strait—West Side

**8.84 Pulo Hayat** (10°35'N., 98°14'E.) and Saucer Island lie close together about 2 miles SSW of Pulo Kugyi. Pulo Balu, a high island, lies 1 mile farther SSW. A drying reef extends about 0.3 mile N from Pulo Hayat.

**Pulo Bada** (10°30'N., 98°13'E.), 250m high near its S end, lies 1 mile SSW of Pulo Balu. A shoal, with a least depth of 7m, lies about 3.5 miles E of the NE point of Pulo Bada.

Pocock Island and five islets lie on an unexamined area which extends up to 4.5 miles S and SW from the S side of Pulo Bada. Foul ground extends S from S islet.

**Bowen Shoal** (10°29'N., 98°15'E.), a sand and coral patch which dries 0.6m, lies about 1 mile E of the SE end of Pulo Bada. A shoal ridge, with a least depth of 0.3m, lies between 1 and 2 miles N of Bowen Shoal.

A chain of islands and islets lies between Pulo Bada and Pine Tree Island, about 9.5 miles SSE. These include Potter Island, Saddle Island, Naked Islet, Bare Islet, the Ninepins Islands, and Cat and Kitten Island; Northwest Hump Island lies 4 miles W of the latter island. These islands should be ap-

proached with caution, because of the irregular depths and rocky bottom.

A reef, marked by several drying rocks, extends 1.3 miles N from the N coast of Pine Tree Island.

**Southeast Hump Island** (10°16'N., 98°19'E.), 97m high, lies 4.5 miles SSE of Pine Tree Island. A dangerous rock, awash, lies 0.8 mile SSE of the summit of this island.

The **Five Islands** (10°17'N., 98°22'E.), a small group of rocky islets, extend about 1.5 miles N from a position 2 miles E of Southeast Hump Island. The N islet rises to a height of 49m and is the most prominent. A rock that dries 1.5m lies almost 0.3 mile NW of the N islet.

**8.85 Russell Island** (10°15'N., 98°15'E.), tree covered, lies 5 miles SSW of Pine Tree Island and has a well-defined summit, 267m high. Two detached rocks lie 0.5 mile W and NW, respectively, of the S end of Russell Island.

**Two Tree Island** (10°16'N., 98°14'E.), grass covered and 67m high, lies close N of the NW point of Russell Island. The SW point of the island is reef fringed.

**Little Russell Island** (10°13'N., 98°15'E.), tree covered and 76m high, lies close S of Russell Island. A rocky islet lies close off the SW side of Little Russell Island. The passage between the two islands is 0.5 mile, wide and deep.

Currents in the vicinity of Little Russell Island are variable in strength and direction and numerous eddies exist. Vessels should give the rocky islet close SW of this island a wide berth.

**North Phipps Island** (10°10'N., 98°17'E.), topped by a prominent summit, 110m high, lies 3.3 miles SSE of Little Russell Island.

**South Hump Island** (10°11'N., 98°20'E.), of moderate elevation and grass covered, lies 5.5 miles ESE of Little Russell Island. Helmet Island, also moderately high and tree covered, lies 7 miles ESE of the same island. Foul ground extends up to 183m offshore around this latter island.

**St. Lukes Island** (10°09'N., 98°12'E.) rises to a prominent summit 484m high and lies 2 miles W of North Phipps Island. The 2-mile wide channel, between Little Russell Island and the W end of St. Lukes Island, is clear of dangers in the fairway.

Care should be taken to avoid a 9.8m rocky patch about 1.3 miles ENE of the NW extremity of St. Lukes Island.

South Phipps Island, 155m high, Barwell Island, and Horse-shoe Island, lie between 2 and 4 miles SSW of Helmet Island and close off the NE and E coasts of Hastings Island. A channel, about 183m wide with a depth of 5.2m, leads between South Phipps Island and Barwell Island.

Most of the islands mentioned above, with the exception of South Hump Island and those forming Hastings Harbor, are tree-covered. They usually have well-defined peaks, especially South Hump Island and the N summit of Hastings Island, which is 267m high.

### East Side of Forrest Strait—South Part

**8.86** Between **Tutthabo Maw** (10°37'N., 98°27'E.) and an unnamed point about 26 miles S, the E side of the strait is indented by a number of shallow creeks. Pulo Mah Puteh, 81m high, lies close off the unnamed point.

The **Turrets Islands** (10°31'N., 98°27'E.) lie close together about 6 miles S of Tutthabo Maw and about 2.5 miles offshore.

Pulau Salangin, the middle and largest island of the group, is a bold, precipitous rock, 104m high. In clear weather it resembles a square block of marble. Pulo Beba lies close N and Pulo Prewang lies about 0.5 mile S of Pulau Salangin. A 4.9m shoal lies almost 0.8 mile SSW of Pulo Prewang.

An islet, 17m high, lies about 1.8 miles SSE of Pulo Prewang.

**Whaleback Rock** (10°28'N., 98°27'E.), 0.9m high, lies about 2.5 miles S of Pulo Prewang and 4 miles offshore.

Canister Island, 87m high, lies 8.5 miles S of Pulo Prewang and 4 miles offshore.

Between Pulo Mah Puteh and Victoria Point, the N entrance point of the Pakchan River, about 14 miles SSE, the coast is fronted by an extensive shoal bank as defined by the 6m curve. This bank extends in a general SSW direction from Pulo Mah Puteh to a position about 11 miles W of Victoria Point. Numerous patches, with depths of 1.8m and less, lie on this bank.

**Anchorage.**—Vessels can anchor, in depths of 12.8 to 14.6m, E of **Pulo Gaban** (10°58'N., 98°13'E.) and SSW of High Island in the positions indicated on the chart.

Anchorage can be taken, in a depth of 18.3m, off the NE side of Pine Tree Island with the summit of that island bearing 231°, distant 0.6 mile. Care should be taken to avoid the reef extending 1.3 miles N from the N coast of the island.

Anchorage can be taken on the E side of the strait between High Island and the Turrets Islands, in depths of 9.1 to 11m, soft mud.

## Outer Islands and Banks West of Forrest Strait

**8.87 North Twin Island** (10°38'N., 97°42'E.), 137m high, lies about 16 miles SW of Clara Island. The W side of North Twin Island is bare to a height of 30m; its N and E sides are densely wooded.

**South Twin Island** (10°28'N., 98°41'E.), 82m high, lies 9.3 miles S of North Twin Island. Its W side is almost bare and its summit consists of bare rock. The N and S sides of the island are indented by open bays. Two rocks lie close off the NW point of the island. A sunken rock lies close NE of the E end of the island.

A number of isolated shoals and banks have been reported to exist in the W approach to **Investigator Channel** (10°15'N., 97°56'E.), between the 185m curve and a position about 90 miles WSW of Cavern Island. They have reported depths of 9.1 to 87.8m, but these depths have not been closely examined.

**Heckford Bank** (10°20'N., 97°10'E.), the NE bank, has a depth of 12.8m and lies about 48 miles W of Cavern Island. Coral Bank, about 49 miles WSW of the same island, has a least depth of 20m.

A 9.1m patch was reported to exist in position 10°03'N, 97°03'E. Depths of less than 11m were reported to exist in position 10°08'N, 96°48'E.

**Roe Bank** (10°08'N., 96°38'E.), of sand and coral with a least depth of 11.6m, is about 0.4 mile wide between the 20m curves. A depth of 18.3 was reported to lie E of Roe Bank in position 10°08'N, 96°50'E. A shoal, with a depth of 14m, lies about 8 miles S of Roe Bank.

## Forrest Strait—Islands and Dangers West and Southwest

**8.88 The Great Swinton Islands** (10°34'N., 98°03'E.) lie about 15 miles ESE of North Twin Island. Numerous small islets lie between Wa-ale Kyun and the W end of Kyun Pila, about 18 miles SSW. Pulau Tika, 91.1m high, lies about 3 miles SSW of the S end of Wa-ale Kyun.

**Brown Island** (10°45'N., 98°03'E.), 30m high, and Pulau Tajam, 47m high, lie 2 and 5.8 miles SSW, respectively, of Pulau Tika. An unnamed islet, with a sunken rock close W of it, lies 5.5 miles SW of Pulau Tajam.

**Kyun Pila** (10°34'N., 98°00'E.), the largest island of the group, lies with its N point about 3 miles SE of the unnamed island. A group of white rocks, 3m high, lie about 0.8 mile SSE of the E end of Kyun Pila.

**Pulo Set** (10°34'N., 98°06'E.), 207m high and the E of the group, lies 3.5 miles E of Kyun Pila. A rocky islet, surrounded by sunken rocks, lies 1.5 miles SW of Pulo Set. A rocky islet, surrounded by sunken rocks, lies 3.3 miles SSE of the same island.

**Lord Loughborough Island** (10°27'N., 97°55'E.) lies about 3.8 miles SW of Kyun Pila. The Paps, which rise to a height of 439m, are the most prominent of several peaks on the island. The W coast of the island is bold, steep-to, and densely wooded.

**Loughborough Passage** (10°30'N., 97°57'E.) lies between Kyun Pila and Lord Loughborough Island. A rock, with a depth of 3.7m, lies in the middle of the passage about 1.5 miles SSW of the W end of Kyun Pila. Pollock Reef, with a rock 15.2m high near its SW end, and another rock 3.7m high near its NE end, lies at the E end of the passage. An islet, 24m high, lies near the middle of the reef.

Vessels are advised not to use Loughborough Passage.

**Hayward Island** (10°27'N., 97°57'E.), with sunken rocks extending 0.5 mile NE from it, lies 0.5 mile NE of the E end of Lord Loughborough Island. Richards Island lies 0.8 mile SE of the same point. Anchorage can be taken, in depths of 14.6 to 27.4m, between Richards Island and Lord Loughborough Island. An unnamed island, with several unexamined dangers S of it, lies in the S entrance of this anchorage.

O'Connor Island, Saul Island, and Skinner Island lie close together between 1 and 2 miles NE of Richards Island. Off-lying rocks are reported to lie in their vicinity. Vessels should keep closer to Richards Island in passing between that island and the above islands.

**8.89 Investigator Channel** (10°15'N., 97°56'E.) lies between McCarthy Island, Steward Island, and Cavern Island to the N and the St. Andrew's Group to the S. The channel is about 6 miles wide and has depths in excess of 36.6m. Vessels from the W bound for Hastings Harbor or the Pakchan River use this channel.

**Cavern Island** (10°20'N., 98°00'E.), which lies about 5 miles SE of Lord Loughborough Island, is the largest of several islands which lie to SE of that island. McCarthy Island, 213m high, and Steward Island, 154m high, lie between the above islands. Prominent Rocks lie off the S ends of all three of these islands.

**Quoin Island** (10°21'N., 98°04'E.), 114m high, lies 4 miles E of Cavern Island. High Rock, 20m high, lies close S of Quoin Island.

The **St. Andrew's Group** (10°10'N., 97°55'E.), on the S side of Investigator Channel, consists of a number of densely wooded islands and rocks.

**Horsburgh Island** (10°12'N., 97°53'E.), the W of the group, lies 9.5 miles SW of Cavern Island and rises to a height of 76m. Horsburgh Islet, 71m high, lies close SSE of Horsburgh Island. Boulder Rock, 7.6m high, lies 0.8 mile SW of the same island.

The **Cockburn Islands** (10°12'N., 97°59'E.), four in number, lie 5 miles E of Horsburgh Island. The highest island rises to an elevation of 163m. Mackay Island, 3.8 miles SE, and Macleod Island lie 5.8 miles SSE of Horsburgh Island.

Parsons Island, 277m high, lies 3 miles E of the Cockburn Islands. Several islets and rocks lie close S and E of this island. Parsons Rock, a compact group of pinnacles which dry about 1.8m, lies 1.8 miles NNW of the N end of Parsons Island.

**Mackenzie Island** (10°04'N., 97°59'E.), MacIan Island, and MacNab Island, lie between 3 and 6 miles S of the main body of the St. Andrew's Group.

**St. Pauls Island** (10°09'N., 98°09'E.), about 5.5 miles E of Parsons Island and close W of the N part of St. Lukes Island, has a prominent horn-shaped peak, 224m high. The channel separating the two islands has a depth of 6.4m over the bar at its N end.

St. Pauls Island has been reported to be a good radar target up to 20 miles.

The W side of St. Pauls Island is foul. Several rocks and islets lie off this side and off the N side of the island.

Anchorage can be taken, in a depth of 7.3m, near the head of a bay on the N side of the island. Protection is provided during the Southwest Monsoon.

## Za Det Gyi Island and Hastings Harbor

**8.90 Za Det Gyi Island** (Big Top Island) (9°58'N., 98°13'E.) lies S of Za Det Nge Island (Small Top Island) and is hilly and densely wooded. Its N side forms the S shore of Hastings Harbor. Highest Peak, 864m high, lies near the middle of the island; South Peak, 585m high, lies near the S end of the island; both peaks are well-defined. Middle Peak, 744m high and prominent, lies between the above peaks.

The N and NE coasts of the island are indented by a number of foul coves. Fish Harbor, near the NE extremity, provides anchorage for small vessels with local knowledge and a draft of 2.7m or less. White Rock, 9.1m high and prominent, lies 0.5 mile E of the harbor entrance. A 4m shoal lies close SE of the rock.

A rock, which dries 1.5m, lies about 1.3 miles SSW of the NE end of the island.

The SE coast of Za Det Gyi Island is densely wooded. Foul ground extends up to 1 mile offshore in places.

**Tongue Island** (9°55'N., 98°14'E.), 113m high, steep-to and densely wooded, lies 2.5 miles SE of Highest Peak. A bare grassy mound lies near its S end.

South Bay, a bight in the S end of Za Det Gyi Island, provides sheltered anchorage, in a depth of 18.3m, sand and

shells. A 7.9m shoal lies in the E part of the entrance and on the E side of the bay.

**8.91 Hastings Harbor** (10°06'N., 98°18'E.) is bordered by St. Lukes Island to the W, Za Det Nge Island to the E, and Za Det Gyi Island to the S. There are two navigable entrances.

The N entrance lies between the NE end of St. Lukes Island and the NW end of Za Det Nge Island about 2.3 miles SE. Haycock Island, 100m high and jungle-covered, lies 0.5 mile SE of Bengal Point, the NE end of St. Lukes Island. The main channel passes between Haycock Island and Minto Point, about 1.5 miles SE. The main fairway has depths of 20.1 to 27.4m. Thomas Shoal, with a least depth of 2.1m, lies about in mid-channel 0.6 mile NW of Minto Point. Elsewhere the channel is clear of dangers. This shoal can be passed on either side, but there is a submerged rock off Minto Point.

The E entrance lies between Cornwallis Point, the S end of Za Det Nge Island, and Dufferin Point, the N end of Za Det Gyi Island, about 1.3 miles SSW. This entrance has depths of 11 to 18.3m in the fairway.

**Chaves Shoal** (10°04'N., 98°17'E.), a detached patch with a least depth of 5.2m, lies on the S side of the entrance about 0.8 mile SSW of Cornwallis Point. Depths of 12.8m surround this shoal.

**James Patch** (10°05'N., 98°19'E.), with a least depth of 0.6m, lies on the N side of the entrance almost 1 mile ESE of the above point.

The W entrance lies between St. Lukes Island and Za Det Gyi Island, but is not navigable except by small craft and boats.

**8.92 St. Marks Islet** (10°03'N., 98°13'E.), 175m high, lies in a shallow bight in the SW part of the harbor.

**Ryland Patch** (10°04'N., 98°13'E.), a small coral rock that dries 0.3m, lies about 1 mile N of St. Marks Islet.

St. Johns Islet, 122m high, lies off the NE side of Hindustan Bay, about 3 miles S of Bengal Point.

The reefs which fringe the shores of the harbor are quite distinct and rise sharply from depths of 5.5 to 9.1m.

**Tides—Currents.**—Between **South Hump Island** (10°11'N., 98°20'E.) and Za Det Nge Island, the tidal current sets E on the flood and W on the ebb at a rate of 1.5 knots at springs. The currents are weak within Hastings Harbor.

**Anchorage.**—Hastings Harbor provides excellent protected anchorage for all classes of vessels, in depths ranging from 11 to 22m, mud. A lee is always obtainable and no sea or current of any consequence is experienced. Anchorage can be anywhere according to draft, with very good holding ground.

**Caution.**—Patches of discolored water frequently appear in the harbor, but examination has proven that they do not indicate dangers. The W entrance channel is often muddy, making it difficult to make out any dangers.

## The Aladdin Islands to Birds Nest Rock

**8.93 The Aladdin Islands** (9°43'N., 98°03'E.), a well-scattered group of islands, some of which are high and bold, extend about 15 miles W and 18 miles SSW of the S end of Za Det Gyi Island.

**Western Rocky Island** (9°51'N., 97°52'E.), the westernmost of the group, is 21m high. A 10.7m rock lies close NE of this island.

**North Rocky Island** (9°53'N., 97°58'E.), 15m high and scrub-covered, lies 5.8 miles ENE of the above island and is surrounded by off-lying rocks.

**Davis Island** (9°49'N., 98°02'E.), the largest and highest of the group, lies 4 miles WSW of the S end of Za Det Gyi Island. This densely-wooded island has two main peaks each about 454m high with the W peak being slightly higher. A rock, 5.5m high and surrounded by a reef, lies close off the E end of Davis Island.

**Chimney Island** (9°51'N., 98°03'E.), 43m high, lies 1.3 miles NNW of the NE end of Davis Island. Several rocks lie between the two islands. The N rock dries 0.9m.

**Drake Island** (9°46'N., 98°01'E.), 143m high, lies 0.8 mile S of Davis Island. The channel between islands is deep.

**Glasshouse Island** (9°45'N., 97°59'E.), 137m high, bold, and rocky, lies 1.8 miles WSW of Drake Island. A 52m high rock lies close off the W end of Glasshouse Island.

**Slave Island** (9°43'N., 98°00'E.), 64m high, lies 2 miles S of Glasshouse Island. A chain of rocks extends 1.5 miles NNE from Slave Island. Pat Rock, the S rock, is 38m high, and Sheila Rock, the N rock of the chain, is 61m high. A rocky reef, about 0.6m high, lies 1 mile S of Slave Island.

**Lamp Island** (9°43'N., 98°01'E.), about 2.5 miles S of Drake Island, is 97m high. Honor Rock, with a depth of 0.6m, lies about midway between the two islands. North Brother and South Brother, two large rocks, 46 and 59m high, respectively, lie about 0.5 mile S of Lamp Island. Kai Koh, a rock which dries 0.9m, lies 0.2 mile S of South Brother.

**Haycock Rock** (9°41'N., 97°55'E.), high and steep-to, lies 5.5 miles WSW of Slave Island.

**Christie Island** (9°38'N., 97°58'E.), the furthest S of the main Aladdin Islands, lies 4 miles SE of Haycock Rock and has several wooded peaks. The highest peak rises to an elevation of 325m at the NW end of the island.

**Sanders Island** (9°37'N., 97°59'E.), 106.7m high, lies 0.8 mile E of the S end of Christie Island. Murray Island, 71m high, lies 0.5 mile SSW of the same point. Both islands are rocky. A rock, 5.5m high, lies close off the N point of Murray Island. The passage between this island and Christie Island is foul.

**8.94 Cash Island** (9°49'N., 98°07'E.), 113m high, lies 0.8 mile S of the SW end of Za Det Gyi Island. Mawken Passage, the channel between the two islands, has considerable depths and provides a short cut for vessels proceeding W from the Pakchan River. Rocks lie in the passage within 0.3 mile of the SW end of Za Det Gyi Island. The S rock is 6.1m high. A rocky islet, 36m high, lies 0.3 mile E of Cash Island; a similar islet, 43m high, lies about 0.5 mile S of Cash Island. There are strong rips in the passage at springs. The passage should only be used during daylight hours and then only under favorable conditions.

**Dunkin Island** (9°47'N., 98°07'E.) rises to a height of 238m near its N end. The Sisters, two small rocks of almost equal height, lie 0.5 mile S of Dunkin Island. Bruer Island, 292m high and densely wooded near its SE end, lies 3 miles S of the same island. A rock, having a depth of less than 1.8m, the

position of which is approximate, lies about 1 mile SSW of the S end of Bruer Island.

Auriol Island, densely wooded and 183m high at its W end, lies about 2.5 miles S of Bruer Island. A low rock lies close off the NW side of Auriol Island. Swallow Island, about 0.5 mile N of Auriol Island, rises to a height of 88m. The intervening channel is shoal.

**Graham Island** (9°39'N., 98°02'E.), 164m high, lies 2 miles W of Auriol Island. Two prominent high rocks lie close N of the N end of Graham Island. Ninepin Rock, 24m high, lies about 0.5 mile SSE of the S end of Graham Island.

A 5.5m shoal, the position of which is doubtful, lies about 5.5 miles SE of Auriol Island.

**Birds Nest Rocks** (9°47'N., 98°11'E.) consist of two groups of rocks which lie within 5 miles SSE and 4.5 miles E of the SE end of Za Det Gyi Island. The principal rocks in the N group are Horse Shoe Island, 119m high, Cupola Island, 212m high, Tower Rock, 143m high, and Square Rock, 82m high, and Sloap Rock, 88m high. The latter rock is the furthest N of this group.

The principal rocks in the S group are Spur Rock, 149m high, about 2.3 miles SW of Horse Shoe Island, and Cocks Comb Island, about 0.5 mile farther SW. This latter island rises to a height of 76m. An islet, 76m high, lies close S of Cocks Comb Island.

## Ko Chan (Koh Sindarar) and Adjacent Islands

**8.95 Ko Chan** (9°25'N., 97°52'E.), consisting of Koh Sindarar Nua and Koh Sindarar Tal, lies about 10 miles SW of Christie Island. A winding channel, which nearly dries, separates the two islands. From a distance, both islands appear as one high and densely wooded island. A high prominent summit lies near the N end of the S island and rises to a height of 366m.

**Torilla Island** (9°22'N., 97°52'E.), 117m high, lies off the S side of the S island. Pachumba Island, 163m high, lies off the W side of the same island. Stork Island, 97m high, lies about 1.8 miles NE of the N island.

A rocky islet, 13m high, lies about 1 mile NE of the SE end of the S island. Some 0.6m rocks lie close W of the islet. The group is separated from the S island by a 0.5 mile wide deep channel.

A rocky islet, 14m high and steep-to, lies 0.8 mile NW of the N end of the N island. A 9.1m islet lies about the same distance N of the same point.

A 14.6m bank was reported to lie about 1 mile N of Pachumba Island.

**Marshall Rock** (9°23'N., 97°49'E.), a pinnacle with a depth of 4.5m surrounded by depths of 36.6m, lies about 2.8 miles W of the S point of the S island.

**Richelieu Rock** (9°21'N., 98°02'E.), a small, coral pinnacle which dries 1.2m, lies about 10 miles E of Torilla Island. The drying part of the rock is about 9.1m wide. The sea does not always break over this danger at HW, even with a considerable swell.

A depth of 40.2m, rock, was reported to lie about 6 miles WSW of Richelieu Rock.

Anchorage can be taken in the bay formed by the E sides of the two islands, well protected from W winds.

## Pulo Mah Puteh to Casuarina Point—The Pakchan River and Approaches

**8.96 Victoria Point** (9°58'N., 98°33'E.), the N point of the entrance of the Pakchan River, forms the S end of a range of hills. The point is high, bold, and steep-to. An iron flagstaff, 23m high and with an elevation of 57m, lies on the point. Two radio masts, with elevations of 117m, stand near the coast about 0.9 mile N of the flagstaff. A triangular wooden daymark is secured to the NW radio mast.

The land N of Victoria Point is very hilly and partly cleared. The summits of the hills in the vicinity are flat-topped and not easily identified.

The coast between Victoria Point and Pulo Mah Puteh, about 14 miles NNW, is mostly low and bordered in places by mangroves. Tanjong Padah, a bluff headland lies about 7.5 miles N of Victoria Point and a similar headland, lies about 5 miles N of the same point.

The Pakchan River rises in about position 10°50'N, 99°00'E. and is about 80 miles long; it forms the boundary between Burma and Thailand. Both of its banks are densely wooded and numerous streams discharge into it. Access is provided to the river outlets of many of the tin mines in the S part of Burma and the N part of Thailand.

The coast S of the river entrance, between Seaward Peak and Casuarina Point, about 38 miles SSW, is generally low, densely wooded, and intersected by numerous creeks and rivers. **Seaward Peak** (9°49'N., 98°32'E.) rises to a prominent summit 401m high, about 9 miles S of Victoria Point. Double Peak, 945m high and prominent when visible, lies 6 miles ESE of Seaward Peak.

A range of mountains backs this section of coast about 10 miles inland. **Round Mountain** (9°41'N., 98°37'E.) rises to a conspicuous 970m high peak, about 9.3 miles SSE of Seaward Peak. This mountain has a very distinct conical summit, with a peak of almost perpendicular appearance. **Kao Phrami** (9°18'N., 98°28'E.), about 5.8 miles ENE of Casuarina Point, is topped by three peaks each about 1,097m high.

The coast between the S entrance of the Pakchan River and the mouth of the Banlin River, about 9.5 miles SSW, is fronted by mangroves and bordered by extensive banks of sand and mud.

**Tides—Currents.**—The tidal currents near the coast, S of Pulo Mah Puteh, set S on the rising tide and N on the falling tide. In the N approach channel, the tidal currents set in a direction parallel with the channel at a rate of 2 knots at springs.

Between Ko Chan and Koh Chang, the tidal currents set NE on the rising tide and SW during the falling tide. The rate is 0.8 knot at springs. Between the latter island and the mainland, the tidal currents set N on the rising tide and S on the falling tide.

In the S approach channel, the tidal currents set parallel with the channel, toward the Pakchan River entrance on the rising tide and in the opposite direction on the falling tide. Strong rips are found between the N end of Koh Chang and Ko Kan. Both the flood and ebb currents set strongly towards Ko Kan. The flood current sets E past the N coast of Pulo Ru, and then turns NE towards the entrance of the river. The ebb current from the Pakchan River divides at the NE point of Pulo Ru, one part setting W and the other setting S. Tide rips are found in the channel N of Pulo Ru.

**Depths—Limitations.**—The 11m curve lies about 2.5 miles W of Pulo Mah Puteh and up to 12.5 miles W and WSW of Victoria Point. Farther S, this curve is not clearly defined off Casuarina Point.

The least depths in the N, W, and S approach channels to the Pakchan River entrance are 3.4m, 5.8m, and 7.3m, respectively. The depths at the anchorage in Victoria Point Harbor, close N of that point, are 12.8 to 14.6m. Depths of about 4.6m exist off the entrance of Ranong Creek at the recommended anchorage.

Vessels, with a draft of 3.7 to 4m, can proceed about 14 miles upriver to the entrance of the Klong Maliwun River and then 3 miles up that river.

## The Pakchan River—Islands and Dangers in the North Approach

**8.97** Several islands lie on the extensive bank which fronts the coast between Pulo Mah Puteh and Victoria Point.

**Pulo Remiah** (10°05'N., 98°30'E.), the furthest north of these islands, is 18.3m high and lies 0.8 mile S of Tanjong Padeh. A group of islands, islets, and reefs lie between 10 miles NW and 12 miles W of Victoria Point.

**Sims Reef** (10°02'N., 98°29'E.), which dries 2.7m, lies about 5.3 miles NW of Victoria Point. A beacon with a ball topmark marks this danger.

**Thane Island** (10°02'N., 98°30'E.), small and 30m high, lies about 0.3 mile E of Sims Reef. A small drying reef lies close S of the island.

**Pulo Tonton** (10°01'N., 98°30'E.), 123m high and partially cleared, lies 4 miles NW of Victoria Point. Some villages lie on its E and W coasts. A drying bank extends E to the mainland and SE almost to Victoria Point.

**Pulo Besin** (9°59'N., 98°29'E.), 106m high, lies about 1 mile SSW of the S end of Pulo Tonton. Several drying reefs lie close off the E side of Pulo Besin. A beacon, with a globe topmark, stands on one of these reefs. A 4m patch lies N of the NE end of the island.

Akha Barit, 65m high and steep-to, lies about 0.5 mile N of the above point.

**Pulo Jungis** (10°00'N., 98°29'E.), 183m high, lies 0.4 mile N of Pulo Besin. The narrow channel between the islands dries.

A shoal, with depths of less than 1.8m, lies between 2 and 5 miles WNW of Pulo Jungis.

**Pulo Perlin** (9°58'N., 98°30'E.) 137m high, lies about 0.4 mile S of the SE end of Pulo Besin. Two small drying reefs lie within 1 mile S of Pulo Perlin. A white beacon marks the N reef of the two. A light shows from the SE point of Pulau Perlin.

A drying reef lies at the E end of a shoal about 0.9 mile S of Pulo Perlin. The shoal extends about 4 miles to the WSW. A rock, with a depth of 0.6m, lies in the middle of the shoal.

A white beacon stands close off the SE side of Pulo Perlin.

## The Pakchan River—Islands and Dangers in the South Approach

**8.98** Shoal ground, as defined by the 6m curve, extends up to 6 miles offshore between a 183m high headland about 10.5 miles NNE of Casuarina Point, and a point about 15 miles

NNE. A tongue of this shoal extends as far as the E side of Ko Kam Yai.

Ko Nui, a small islet 60m high, lies about 0.5 mile W of the above headland. Shoal ground extends about 4 miles WSW.

**Ko Kam Yai** (9°29'N., 98°21'E.), 314m high, lies about 13 miles N of Casuarina Point. Shoal ground, as defined by the 11m curve, extends about 2 miles off the W side of the island. An extensive sandbank lies about 0.5 mile E of the S end of the island. Ko Kam Tok, 105m high, lies close N of Ko Kam Yai. Ko Kam Nui, 288m high, lies 1 mile E of the same island. The depths between the islands are very irregular and no attempt should be made to pass between them.

**Double Islet** (9°27'N., 98°20'E.), located about 1 mile S of Ko Kam Yai, rises to two peaks joined by a low, narrow strip of sand. The N peak is 83m high and the S peak is 44.5m high. A rock, with a depth of less than 1.8m, lies about 0.2 mile NE of the N peak. South Rock, 12m high, lies 0.5 mile SW of Double Islet.

**Metcalf Island** (9°26'N., 98°21'E.), 22m high and wooded, lies miles SSE of Ko Kam Yai. A sandy spit extends about 1.3 miles ENE from Metcalf Island.

**Hayes Island** (9°20'N., 98°20'E.), circular in shape, high, and wooded, lies 6 miles SSW of Metcalf Island.

**Umbrella Island** (9°20'N., 98°19'E.), located about 0.8 mile NW of Hayes Island, is rocky and shows up well when not in range with the latter island. A high, umbrella-shaped tree lies on the island. These islands are surrounded by large sand banks and rocks which are marked by breakers at LW.

**Koh Chong Pianam** (9°34'N., 98°23'E.), about 4 miles NNE of Ko Kam Yai, is 157m high and wooded. The E side of the island is fringed by rocks which extend up to 183m off-shore.

Hin Sawai, 6.4m high and topped by a white summit, lies 0.5 mile N of Koh Chong Pianam.

**Koh Piam** (9°44'N., 98°25'E.), densely wooded and topped by a prominent peak, lies about 15 miles SW of Victoria Point. The reef-fringed W side of the island is indented by two open bays. A rocky islet 15.2m high, lies about 0.3 mile off the SW point of Koh Piam. A drying rock lies about 0.5 mile SW of the island. Extensive sandbanks lie between the island and the mainland.

**Koh Chang** (9°50'N., 98°27'E.), densely wooded and 390m high, lies 2 miles NNE of Koh Piam. Some wooded islets lie off the S end of Koh Chang. Large sand banks lie between the island and the mainland.

A sand bank, having depths of less than 5.5m, extends 1.3 miles SW from the SW side of Koh Chang toward the N end of Koh Piam. Depths of 7.9 to 11m lie between this bank and the N end of Koh Piam. A 3.7m patch lies about 0.3 mile E of the N point of the latter island.

**Harry Head** (9°52'N., 98°27'E.), the N end of Koh Chang, is a high, tree-covered bluff. Tree Island, 13.7m high and wooded, lies 1.5 miles SW of Harry Head. A 0.6m high rock lies close off the W coast of Koh Chang about 1 mile S of Tree Island.

**Ko Khan** (9°52'N., 98°26'E.), a rocky islet lying about 0.5 mile NW of Harry Head, is steep-to on its E and S sides. The light structure on the islet is not easily distinguished by day because of the trees which obscure all but the top.

Several shoal patches, having a least depth of 0.9m, extend up to 2.5 miles WSW from Ko Khan.

## The Pakchan River—Islands and Shoals

**8.99** A group of islands and islets, surrounded by shoals and foul ground, lie between Koh Kan and Victoria Point.

**Pulo Pingngwe** (9°54'N., 98°29'E.), 184m high lies 1.8 miles NE of Koh Kan. A large drying shoal extends up to 1 mile ESE from the island. A shoal, with a least depth of 1.5m, lies 0.6 mile S of the S end of the island. Other shoal patches lie W of the island.

**Pulo Saung Kharang** (9°55'N., 98°31'E.), 132m high, lies 2 miles ENE of Pulo Pingngwe. Foul ground extends about 0.8 mile W from Pulo Saung Kharang.

Dyke Island lies 0.5 mile S of Pulo Saung Kharang.

**Pulo Ganga** (9°56'N., 98°29'E.), 123m high, lies 1.5 miles N of Pulo Pingngwe, with Pulo Gattai about 2 miles E of it. A narrow drying spit lies between Pulo Ganga and Pulo Gattai and almost joins the two. A shoal, with a least depth of 1.2m, extends about 2.3 miles W from Pulo Ganga.

**Pulo Ru** (9°57'N., 98°32'E.), 186m high near its NW end, lies with its S end about 0.3 mile E of Pulo Gattai and its NE point about 1 mile S of Victoria Point. A shoal, as defined by the 5.5m curve, fronts the W side of Pulo Ru and extends 4.5 miles W from it. The inner part of this shoal dries.

Narrow channels separate the above islands.

**Round Island** (9°55'N., 98°3'E.), 88m high and steep-to, lies 0.8 mile SE of the S end of Pulo Ru. The intervening channel is fairly deep.

A shoal, with a least depth of 3.4m, lies on the S side of the entrance channel between the NE extremity of Pulo Ru and the S side of the river entrance.

## The Pakchan River Entrance—Approach Channels

**8.100** There are three approach channels leading to the Pakchan River entrance. The N channel leads between the shoal ground extending N from Pulo Jungis and Pulo Remiah. The least depth of 3.4m found in this channel lies SW of Pulo Remiah. The channel leads between Sims Reef and Thane Island and then between Akha Barit and the NE end of Pulo Besin.

The W channel leads between Pulo Perlin and the reef lying about 0.8 mile S of that island. The least depth of 5.8m to be found in this channel lies 4.5 miles WSW of the SW end of Pulo Besin.

Bell Passage, the S channel, leads between Koh Kan and the N end of Koh Chang and then E between the N coast of the latter island and the shoals extending S from Pulo Pingngwe. The channel then leads SE of the drying bank that extends SE from the latter island and then SE of Round Island. The least depth of 7.3m found in this channel lies about 0.8 mile SW of Koh Kan.

The Pakchan River entrance lies between Victoria Point and the entrance of Ranong Creek, about 2.5 miles to the ESE. The small Victoria Point Harbor, with the village of Kawsong at its head, lies on the E side of the point, between it and Browning Island, about 0.3 mile to the E.

Koh Phi, a small islet, lies on the E side of the Pakchan River entrance, about 2.3 miles ESE of Victoria Point. A sand bank,

with depths of 0.9 to 3.4m, extends about 0.3 mile SSW from the islet.

Shoal ground, as defined by the 6m curve, extends about 0.2 mile WSW from the S end of Browning Island. Depths of 4 to 5.5m exist between the outer edge of this bank and Victoria Point.

**Anchorage.**—Vessels with local knowledge can anchor, in a depth of 10m, sand and mud, off a sandy beach in the bay that indents the SW coast of Koh Piam.

Vessels with local knowledge can anchor, in depths of 9.1 to 11m, off the NE side of Koh Piam. Protection is provided during the Southwest Monsoon.

Sheltered anchorage can be taken in the N approach channel between Pulo Jungis and Pulo Tonton.

Vessels with local knowledge can anchor in the S approach channel S of Pulo Pingngwe. Light-draft vessels can anchor E of Pulo Ru.

Small vessels with local knowledge frequently anchor, in a depth of 4.6m, off the entrance of Ranong Creek, about 0.3 mile S of Koh Phi.

Vessels can anchor 0.5 mile S of Victoria Point, in depths of 9.1 to 18.3m.

Vessels can anchor, in 12.8 to 14.6m, in Victoria Point Harbor. The anchorage area is about 0.3 mile long and 137m wide and lies E of the pier. Vessels using this anchorage pass over a shoal, having depths of 4 to 5.5m, that lies across the harbor entrance.

**Directions.**—Directions for each channel are, as follows:

1. **North Approach Channel.**—From a position 4 miles W of Pulo Mah Puteh, steer toward Thane Islet on a course of 149°. Double Peak, in line with the E tangent of Thane Islet, makes an excellent mark for this course. Double Peak is seldom visible before noon.

When the beacon marking Sims Reef bears 185°, alter course to 172° so as to pass between that reef and Thane Islet. When the N point of Akha Barit bears 090°, alter course to 148° to avoid the 4m patch which lies SW of Akha Barit and the reefs off the E coast of Pulo Besin. Vessels can pass close off the steep-to SW coast of Akha Barit.

When the SE and SW points of Pulo Besin are in line bearing 261°, alter course to 128°. Maintain this course until Koh Phi Light bears 095°, and then steer that course which leads through the river entrance. When Victoria Point bears 045°, course may be altered for the selected anchorage.

Vessels bound for the anchorage off Koh Phi should, after passing Victoria Point, approach that island from a more N direction in order to avoid the 3.4m shoal in mid-channel, SE of Victoria Point.

2. **West Approach Channel.**—From a position about 9 miles W of Pulo Ganga, steer 090° for that island until the SE end of Pulo Besin bears 061°. Then steer 061° until the SE end of Pulo Perlin bears 090°. A least depth of 5.8m exists about 2 miles along this latter course.

When the SE point of Pulo Perlin bears 090°, steer 095° for Koh Phi Light which leads between Pulo Perlin and the beacon marking the reef S of it. The SE point of this island can be passed at a distance of 183m. Continue on course 095° and then proceed as directed for the North Approach Channel.

3. **South Approach Channel.**—From a position about 4.3 miles W of Kho Piam, steer 048° for the summit of Pulo Pingngwe which leads between the N end of Koh Chang and Koh Kan after passing Tree Island at a distance of 0.4 mile abeam. A least depth of 7.3m is found 4.5 mile SW of Koh Kan.

Vessels approaching this channel from the N should keep W of the shoals in the approach until the summit of Koh Chang bears 120°. Then bring the summit of Pulo Pingngwe to bear 048° and proceed as directed above.

When the N tangent of Koh Kan bears 270° and is in range with South Peak on Za Det Gyi Island, steer 090°, keeping that range astern.

When the summit of Pulo Pingngwe bears 335°, alter course gradually to 045° and steer for Koh Phi Light on that bearing.

Vessels bound for the anchorage off Koh Phi should maintain a course of 045° and anchor as convenient. The least depth on this track is 9.1m, but a shoal with a depth of 4.6m lies in mid-channel about 1.8 miles SW of Kho Phi Light.

Vessels bound for the anchorage off Victoria Point should continue on the 045° course until the summit of Round Island bears 270°. Then alter course to the N and steer 013° for Browning Island. The least depth on this track, 7.3m, is located about 1 mile NE of Round Island. When the NE end of Pulo Ru has been passed, steer for the anchorage which lies about 0.5 mile S of Victoria Point.

**Caution.**—Caution is required because of the lack of navigational aids.

**8.101 Victoria Point Harbor** (Kawsong Harbor) (9°59'N., 98°33'E.) (World Port Index No. 49700), the S settlement of Burma, consists of a small government station and a native village. A police station lies on the summit of the hill forming Victoria Point; some government buildings lie on a ridge to the N. Ocean-going vessels work cargo from lighters at the anchorages.

Ranong, a village which lies about 2 miles above the entrance of Ranong Creek, is the site of a Thailand Government Station. Several tin mines are situated in this area.

The customs house stands at the inner end of a 137.2m pier which extends from the shore on the W side of Victoria Point Harbor.

A pontoon jetty, with reported depths of 5.5 to 6.1m alongside, extends from the shore of the harbor.

Above Victoria Point, the Pakchan River extends in a general NNE direction. During the Southwest Monsoon, or rainy season, small power vessels can reach the Thailand town of Kraburi, about 28 miles above Victoria Point where the river is about 76.2m wide; above Kraburi the river becomes tortuous.

Glong Maliwun flows into the Pakchan River, on the Burmese side, about 14 miles above Victoria Point. The river is available to vessels, with a draft of 3.7 to 4m, for about 3 miles above the entrance. Higher up, the river becomes narrow and winding, but it can be navigated by power launches as far as Maliwun, a small settlement, about 5 miles farther upriver.

**Khlong Bangben** (9°39'N., 98°29'E.), an extensive shallow inlet, is entered about 7 miles SE of the S end of Koh Piam. The 2m curve lies over 1 mile offshore, S and W of the N

entrance point. The channel, which lies on the S side of the entrance, has depths of 1.8 to 3.7m.

**Shong Pianam** (9°34'N., 98°28'E.), or the "Entrance of the Three Big Rivers," an extensive inlet, is entered between Koh Pianam and Laem Tashin, about 0.8 mile S. Koh Pianam, wooded and 228m high, lies about 9 miles SSE of the S end of Kho Piam. Laem Tashin, a high wooded point, lies about 0.4 mile SE of its extremity.

The outer edge of a bar, which has depths of 1.8 to 3.7m, lies 3.5 miles W of the entrance. The bottom is sand and mud.

Within the bar the depths in the entrance range from 18.3 to 29.3m.

The tidal currents attain a rate of 2 to 3 knots at springs in the narrow part of the entrance. In the offing and over the bar, the rate is much less. The N current on the flood is stronger than the S current on the ebb.

Small vessels with local knowledge can anchor, in depths of 9.1 to 16.5m, mud, about 0.5 mile inside the entrance.

**Directions.**—From a position about 0.5 mile N of Hin Sawai, a vessel should steer 089° for a 91m hill on the N end of Koh Pianam. When the summit of **Laem Tashin** (9°33'N., 98°28'E.) bears 132°, course should be altered to that bearing. When the 212m conical hill at the head of the inlet bears 095°, it should be steered for on that bearing which leads through the entrance to the anchorage.

### Casuarina Point to Laem Pak Phra

**8.102 Casuarina Point** (9°14'N., 98°21'E.), the E entrance point of Pak Kura, is low and densely wooded. Takuapa, the W entrance point of Pak Kura, forms the N point of Koh Rah, a high, densely-wooded island. This island, which is steep-to on its W side, is high in its N part and 344m high in its S part.

Takuapa Inlet is the estuary of a large river which discharges through four channels which intersect the W coast of Thailand between the parallels of 9°15'N and 8°52'N.

Laem Krangnoi, a low sandy point, lies 3.5 miles S of the S entrance point of Takuapa Inlet. Laem Krangyai, about 4.5 miles SSW of Laem Krangnor, is low, sandy, and backed by tall trees.

From Laem Krangyai, the coast extends S for about 7 miles to Laem Lachan, a wooded bluff, 93m high. This stretch of coast is low in the N part and backed by high hills. These hills gradually approach the coast, reaching it at Laem Lacham and then receding inland S of this point.

Laem Ao Kham, about 2 miles SSW of Laem Lachan, forms the W entrance point of a common estuary of several rivers. A hill, 84m high, lies on the point which is the N extremity of a bold peninsula. Kao Tamchok, a hill which lies about 2 miles S of the point, is 166m high. Laem Tamchok, about 0.2 mile SW of the hill, forms the W extremity of the peninsula. This peninsula is isolated from and considerably W of any other high land in this vicinity. It is the only readily-identifiable land between Koh Ra and Ko Phuket.

Between Laem Tamchok and Laem Pak Phra, about 22 miles SSE, the coast consists of sandy beaches backed by high wooded hills. Trees grow down to the water's edge in places. The latter point forms the N entrance of Chong Pak Phra, the strait which separates Ko Phuket from the mainland.

Laem Pak Phra is marked by a group of tall trees. A 61m high hill lies just within the point. Koh Pilai, a small hill near the coast about 2.5 miles N of the point, is the only coastal hill between Laem Tamchok and Laem Sai, about 7.5 miles S of Laem Pak Phra. Ko Pilai is hard to identify.

**Tides—Currents.**—During the Northeast Monsoon, the current off the coast between Koh Ra and Laem Tamchok sets either N or S. It sets in one direction for a considerable period and then without any apparent reason, changes its direction.

The direction does not seem to be related to the wind, as the current often sets N during and after periods of moderate N winds.

Even when opposed by the tidal current, this offshore current maintains its direction. When the current and tidal current are confluent, the resultant current may attain a rate of nearly 2 knots; when in opposition, the rate is usually not more than 1 knot.

**Depths—Limitations.**—The 40m curve lies about 15.5 miles W of Casuarina Point and about 5 miles W of Laem Tamchok. The inlets and estuaries that intersect the coast N of the latter point are shoal. The coast between Laem Tamchok and Chong Pak Phra is fairly steep-to, with the 20m curve lying up to 2 miles offshore.

### Middle Island, Perforated Island, and Similan Island

**8.103 Middle Island** (Koh Tasai) (9°04'N., 97°50'E.), densely wooded and 226m high at its S end, lies about 18 miles S of Koh Sindarar Tai. A 91m high peak lies near the N end of the island, with another peak, slightly lower, between it and the 226m peak. The island is steep-to on all except its E side, where depths of 7m are found about 0.3 off a sandy beach about 0.5 mile from the N point of the island.

A rocky shoal, with a depth of 4.2m, lies 0.4 mile S of the island.

Middle Island has been reported to be a good radar target up to 11 miles.

**Perforated Island** (Koh Born) (8°51'N., 97°48'E.), wooded and topped by two distinct peaks, lies 14 miles S of Middle Island. The E peak is the highest. The island derives its name from a hole near the water's edge in the dips between the two peaks. The island is steep-to, except N of its W end, where a depth of 6.4m is found about 0.2 mile offshore.

The **Similan Islands** (8°35'N., 97°39'E.), a group of six islands, extend about 12 miles S from Ko Bangu, the N island, which lies 12.5 miles SW of Perforated Island. Ko Bangu is 96m high and wooded. Several large prominent boulders lie close off its SE end; a drying rock lies N of its W end. The remainder of the island is steep-to.

The Similan Islands have been reported to be good radar targets up to 19 miles.

**Great Sayer Island** (Ko Similan) (8°39'N., 97°39'E.), wooded and flat-topped, is separated from Ko Bangu by a channel about 0.3 mile wide, with a depth of about 25.6m. The island is 261m high in its N part. Two well-defined peaks, 157 and 164m high, lie near the S end of the island. A small cove, with a depth of 9.1m, indents the NW end of the island. Some small sandy coves indent the E side of the island.

Survey vessels engaged in offshore exploration may be encountered S and W of the Similan Islands, usually in depths greater than 200m and up to 80 miles from the Thai mainland.

**Hin Pusar** (8°37'N., 97°39'E.), a group of three above-water detached rocks, lies about 0.5 mile SW of the SW end of Great Sayer Island. A rock, with a depth of 15.5m, lies about 0.2 mile S of Hin Pusar.

**8.104 The Center Islands** (8°35'N., 97°38'E.) lie between 2 and 4 miles S of Great Sayer Island. Ko Pabu, the N island, is 119m high, conical, wooded, and steep-to, except on its NE side, which is fringed by depths of 3.7m. Ko Miang, the S island, is 128m high, flat-topped, and wooded. A drying rock lies close off the N end of the island. A small sandy cove, with a depth of 7.3m, indents the NE side of the island.

Two islets lie on a reef about 0.2 mile off the NE end of Ko Miang. The intervening channel has a depth of 11.3m. The W islet is 48m high and wooded. The E islet is 20m high and rocky.

**Ko Payan** (8°31'N., 97°39'E.), a small, steep-to, bare conical rock 42m high, lies 3 miles SSE of Ko Miang. Scrub covers the summit of the rock.

Ko Payan has been reported to be a good radar target up to 12 miles.

**Hin Payan** (8°30'N., 97°40'E.), a group of steep-to rocks, some drying and others above-water, lie about 0.6 mile ESE of Ko Payan. A detached drying rock lies about 0.2 mile ESE of the main group.

**Ko Payang** (8°30'N., 97°38'E.), 126m high and wooded, lies 1 mile SW of Ko Payan. The intervening channel has depths of 7.3 to 11m.

**Ko Huyong** (South Island) (8°29'N., 97°39'E.), wooded and topped by two rounded peaks, lies 0.5 mile S of Ko Payang. The island is steep-to except on its NE side which is reef-fringed.

Ko Huyong has been reported to be a good radar target up to 25 miles.

### Takua Pa Inlet and Approaches

**8.105 Takua Pa Inlet** (9°02'N., 98°18'E.) is the estuary of a large river which flows into the sea through four channels between the parallels of 9°15'N and 8°52'N.

No recent surveys have been made of Takua Pa and its approaches. Entry should only be attempted by small vessels having local knowledge.

**Pak Kura** (9°16'N., 98°20'E.), the N entrance of the inlet, lies between the NE end of Koh Ra and Casuarina Point, about 2 miles SE. Depths of 11 to 3.7m are found in the channel, with the greater depths being found on the W side. This narrow, intricate, steep-to channel is the only safe entrance during the Southwest Monsoon.

**Pak Chik** (9°09'N., 98°16'E.), the entrance between the S end of Koh Ra and the N end of Ko Phra Thong, is foul and can only be used by small craft with local knowledge.

**Pak Kruen** (9°01'N., 98°15'E.) is entered between the S end of Ko Phra Thong and the N end of an unnamed island about 1 mile to the S. Extensive sandbanks, parts of which dry, extend about 1 to 2 miles seaward of the entrance. The entrance bar, which lies between 2.5 and 3.5 miles W of the entrance, has a

reported depth of 3m. During the Southwest Monsoon, a heavy swell is raised over the bar.

Depths of 9.1 to 12.8m are found along the N side of the channel between the entrance points.

**Pak Koh** (8°52'N., 98°15'E.), the S entrance of the inlet, lies 9 miles S of Pak Kruen. The land in the vicinity of the entrance is densely wooded. The entrance channel leads between sand banks which are reported to be stationary. Depths of 4.6 to 5.5m are found for about 2 miles within the entrance. Small vessels with local knowledge can use this entrance only under the most favorable conditions.

The town of Takua Pa lies about 4 miles above the mouth of a creek which flows into the E side of Pak Koh about 2 miles within the entrance.

**Elbow Point** (9°02'N., 98°20'E.) lies on the E side of the inlet abreast Macauley Point, the SE end of Ko Phra Thong. A black beacon off the latter point marks an area of foul ground with a depth of 2.7m

Small vessels with local knowledge and drawing up to 3.7m can anchor about 0.5 mile N of Feather Tree, which lies on the N side of Elbow Point. Vessels drawing less than 3.7m can anchor on the S side of the inlet about 2 miles S of Elbow Point.

### Pak Ko to Laem Pak Phra

**8.106 Laem Krangnoi** (8°50'N., 98°15'E.) is a low, sandy point about 3.5 miles S of Pak Ko. A drying reef extends about 0.8 mile W from the point.

**Laem Krangyai** (8°44'N., 98°14'E.), about 4.5 miles SSW of Laem Krangnoi and backed by high trees, is another low, sandy point. A drying coral reef surrounds the point and extends about 0.8 mile N and S, and 2 miles W from it.

**Klong Kokak** (8°41'N., 98°15'E.), small river, intersects the coast about 3.8 miles SSE of Laem Krangyai. A village with some tin mines in the vicinity is so close within the entrance that the lights in the village are sometimes visible from seaward.

Krung Nork, a detached drying reef, lies about 1 mile off the entrance of the Klong Kokak. The coast close inshore between this reef and Laem Lachan, about 3 miles to the S, is foul.

**Ao Kaulak** (8°36'N., 98°15'E.), an open bay, indents the coast between Laem Lachan and a point about 3 miles to the S. Laem Ao Kham forms the S entrance point of this bay. A reef, which dries in places, extends about 0.5 mile W from a sandy point about 1 mile SSE of Laem Lachan and divides the bay into two parts. A rock, 3.7m high, lies near the outer part of this reef. Foul ground extends 1 mile offshore in the bight N of the reef and 0.8 mile offshore S of the reef.

**8.107 Klong Bagatae** (8°35'N., 98°14'E.) flows into the S part of Ao Kaulak and serves as the common estuary of several small rivers. Laem Ao Kham is the N extremity of the peninsula which forms the W side of the estuary. The entrance is about 0.5 mile wide, but narrows to a width of 0.2 mile between the 6m curve.

Ban Tablamu Light is shown from a white three-legged structure, 10.1m high, situated at the N end of Laem Ao Kham.

A middle ground, with a least depth of 3.7m, lies on a bar about 0.8 mile within the entrance. A channel extends along

the NE side of the peninsula for about 1 mile; from there the bar can be crossed in a depth of 5.2m. Depths of 5.5 to 8.2m are then found in mid-channel up to a position about 3 miles above the entrance, where the river bifurcates.

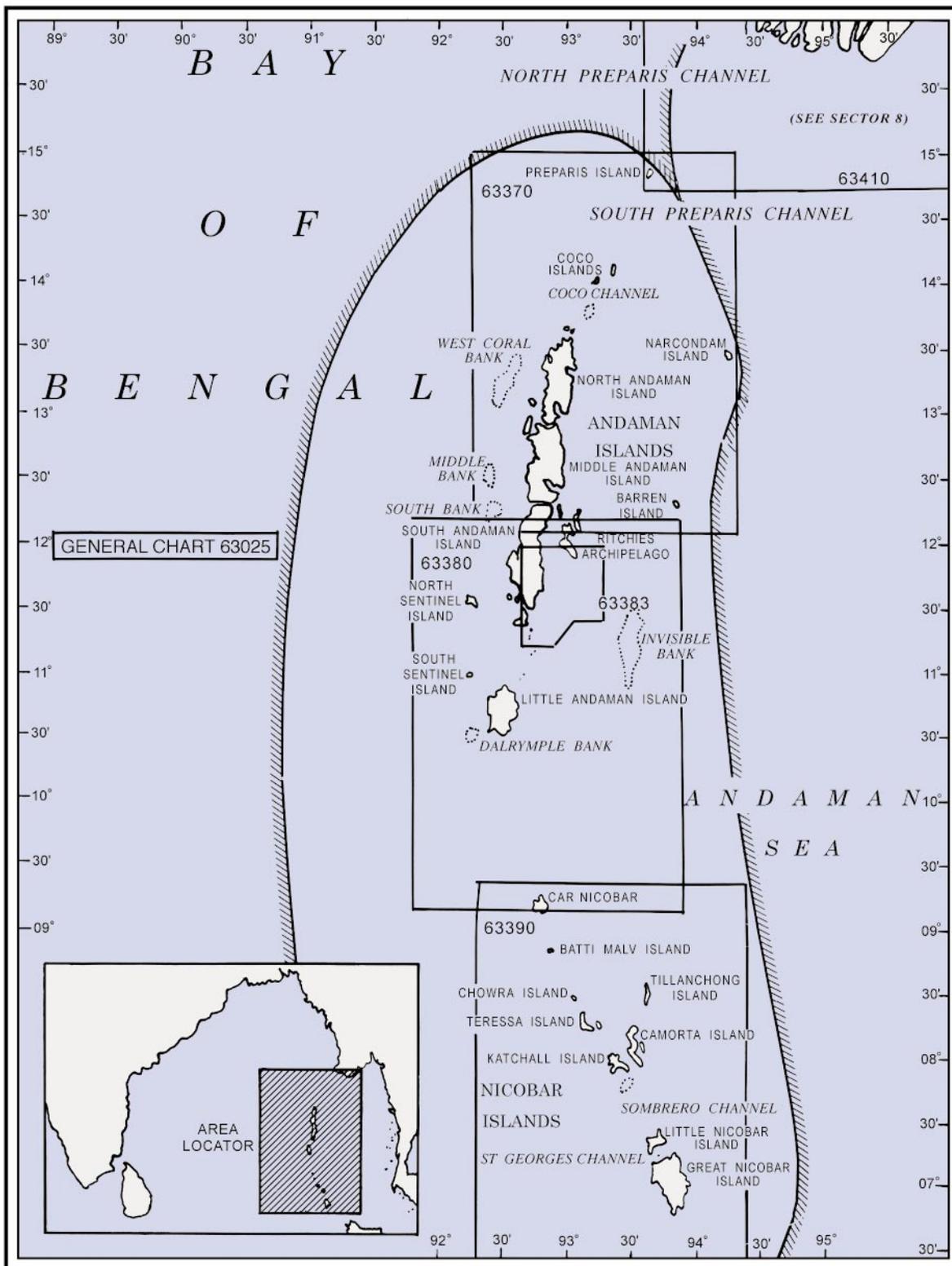
Small vessels with local knowledge can anchor, in a depth of 11m, mud, about 0.5 mile inside the entrance.

The entrance should be approached on a course of 135° in order to pass S of the previously-mentioned 3.7m rock. A course of 190° should then be steered so as to pass not more than

183m off the E extremity of the peninsula forming the W side of the entrance.

Between Laem Tamchok and Laem Pak Phra, about 22 miles SSE, the depths gradually decrease from seaward to depths of 11 to 14.6m about 0.5 mile offshore. This coast should be given a berth of at least 3 miles as it has not been closely examined.

**Ko Lumphuk** (8°19'N., 98°16'E.), a group of rocks about 1.8m high, lies about 0.5 mile offshore 7.5 miles N of Laem Pak Phra. Two smaller rocks lie about 0.5 mile N of the group.



Additional chart coverage may be found in NGA/DLIS Catalog of Maps, Charts, and Related Products (Unlimited Distribution).

**SECTOR 9 — CHART INFORMATION**

## SECTOR 9

### THE ANDAMAN ISLANDS AND THE NICOBAR ISLANDS

**Plan.**—This sector describes Preparis Island, the Coco Islands, the Andaman Islands, and the Nicobar Islands. The descriptive sequence is from N to S, and from W to E.

#### General Remarks

**9.1** A chain of islands, divided into four groups by well-defined channels, stretches in a vast ellipse between **Pagoda Point** (15°57'N., 94°15'E.) and the N end of Sumatra, about 630 miles to the S. The principal channels leading through the groups consist of Preparis North Channel, between Preparis Island and Alguada Reef; Preparis South Channel, between Preparis Island and the furthest N of the Coco Islands; Coco Channel, between the S island of the Andaman Islands; and Ten Degree Channel, between the furthest S of the Andaman Islands and the furthest N of the Nicobar Islands.

Vessels bound from Calcutta or Madras to Rangoon usually pass through Preparis North Channel.

The track from Calcutta to Singapore leads through Preparis South Channel, well N of Table Island. Vessels often use this channel during the Southwest Monsoon in order to pass E of and to the leeward of the Andaman Islands. Vessels should keep well N of Table Island because of the irregularity of the soundings in the vicinity of that island and the strong tidal currents. Vessels passing E of Table Island should keep in depths of more than 91.1m.

Vessels passing through Coco Channel should pass at least 5 miles S of Little Coco Island and at least 4 miles N of Landfall Island.

During the Northeast Monsoon, the banks off the W side of the Andaman Islands may be passed over by vessels of light draft. Vessels of deep draft should not cross the shallower parts. Navigation inside the banks to within 3 miles of the land is safe, except on the W side of North Andaman Island, to which a berth of 6 miles should be given.

**Winds—Weather.**—The Southwest Monsoon commences in the Nicobar Islands about mid-May and rapidly extends over the Andaman Islands. From June through September the wind blows from the W through SW at Force 4 to 6. During the months of October and November, the winds are variable with Force 1 to 3. The Northeast Monsoon prevails from December through March, the prevailing wind is between N and E at Force 2 to 4. During the months of April and early May the winds are variable with Force 1 to 3.

During the months immediately preceding and following the Southwest Monsoon, these island groups lie athwart or close to the tracks of the tropical disturbances of the Bay of Bengal.

The temperatures are relatively high, with little variation from one place to another or between one month and the next. The humidity is high at all times. The mean daily temperature is 27°C; the mean daily minimum temperature is 21°C.

Heavy rains, with a yearly average of 3,200mm, occur in these island groups. Rains occur on the W slopes from mid-May through September, and on the east slopes from October

through mid-December. The rainfall is variable both as to seasons and to geographical positions. In the N part of the Andaman Islands, heavy rainfall (over 250mm per month) falls from June through September. More moderate amounts (125 to 225mm per month) occur in May, October, and November. The months of December through April are relatively dry. In the S part of the Andaman Islands, the heaviest rainfall occurs from May through early November. More moderate amounts fall from early November through December, and relatively small amounts from January through April.

In the Nicobar Islands, heavy rains occur from May through November. More moderate amounts occur from December through mid-January, and relatively small amounts from January through April.

As a rule, the islands with the higher elevation receive the greatest amount of rain.

Thunderstorm frequency varies from island to island. The greatest activity occurs during those months immediately preceding and the first few weeks immediately following the onset of the Southwest Monsoon. Thunderstorms occur most frequently during May and June at Port Blair, when about 4 to 6 days per month have them. In November, thunderstorms occur on the average of 3 days per month at this port.

The cloud cover is more uniform, with cloud amounts increasing from N to S. During the Southwest Monsoon, there is little diurnal variation in cloud cover. During the remainder of the year the cloud cover is more extensive in the afternoons. The cloudiest months are June through September. During these months the cloud coverage amounts to 70 to 80 per cent, with few clear days. February and March are the months with least cloud coverage. During these months there is 30 to 40 per cent coverage in the N and 50 to 60 per cent coverage in the S.

The visibility is good except during heavy rains.

**Tides—Currents.**—The currents in the vicinity of Alguada Reefs are greatly influenced by the winds, especially at neaps. The tidal currents set SE on the rising tide and NW on the falling tide. During the Northeast Monsoon, the ebb current at springs begins about 2 hours after HW, and runs until LW, at a rate of 1 knot to 2 knots. The period of slack water is very short.

Tide rips have been reported in a position about 19 miles W of Alguada Reefs.

The tidal currents in Preparis North Channel appear to set SE on the rising tide and NW on the falling tide. During the Northeast Monsoon, there is a strong S current of 1 to 1.5 knots, which at neaps entirely overcomes the NW tidal currents. A N current of 0.5 to 0.8 knot has been experienced. The S current has a rate of about 2 knots.

The tidal currents in South Preparis Channel in the vicinity of Table Island are strong and often set toward the rocks.

The tidal currents set very strongly through Marshall Channel and heavy tide races occur. The rate is upwards of 5 knots in the fairway and about 2 knots past the N and S ends of Little Coco Island.

The tidal currents in the vicinity of the Coco Islands set E on the rising tide and W on the falling tide. In settled weather, the tidal currents appear to turn at HW and LW. Heavy tide races are found off all salient points.

The tidal currents in Coco Channel, during settled weather, are regular, the current setting E on the rising tide and W on the falling tide, at rates of 1 knot to 2 knots at springs. Strong winds influence the tidal currents at times, even reducing them. During the Northeast Monsoon, the current frequently sets NW through Coco Channel, but during the Southwest Monsoon the set is mostly to the E. Tide rips occur in the vicinity of all shoal water in Coco Channel.

The tidal currents during the Northeast Monsoon set SW and S along both the E and W coasts of the Andaman Islands. During the Southwest Monsoon the set is N to E.

In light breezes and fine weather, the tidal currents set E and W into Duncan Passage, but sometimes a current caused by the prevailing winds sets through it.

Within a few miles of the Nicobar Islands, the tidal currents usually set NE on the rising tide and SW on the falling tide. The tidal currents attain a rate of 3 to 4 knots in the channels between the islands. Well offshore of these islands, the currents usually set with the prevailing wind. The rate, at times about 2 knots, and direction are variable. Heavy overfalls were reported in a position about 110 miles WSW of the S end of Great Nicobar Island.

The currents in the vicinity of Car Nicobar Island flow rapidly enough to cause tide races, particularly N of the island. During the month of February, usually a calm month, from a position about 6 to 8 miles E of the island, a current setting SW at a rate of 7 knots has been experienced about 1.5 hours after HW.

The tidal currents in the vicinity of Chowra Island set NE during the rising tide and SW during the falling tide.

The tidal currents in Sombrero Channel set NW on the rising tide and SE on the falling tide. These currents are reported to attain a rate of 5 knots at springs.

The tidal currents in St. Georges Channel are strong and set NE through the channel on the rising tide, and SW through the channel on the falling tide.

**Caution.**—Although the shoals off the N end of the Andaman Islands have been examined, there is a possibility that depths less than those charted may exist. Vessels are advised not to pass over them because these shoals are not always visible from aloft.

The Andaman Islands lie on fault line, but no earthquakes have been reported in recent years.

## Preparis Island

**9.2 Preparis Island** (14°53'N., 93°42'E.), 81m high, narrow, and wooded, slopes gradually to the sea. A shoal spit extends about 3.5 miles S from the S end of this island. Preparis Island has been reported to be a good radar target up to 24 miles and has been reported to be identifiable with charted features by radar up to 22 miles.

**Cow and Calf Islets** (14°57'N., 93°43'E.), flat-topped, three in number, and about 23m high, lie close together about 1.8 miles N of Preparis Island.

Some islets lie on a reef about 1.3 miles W of Preparis Island.

A 12.2m high pinnacle rock lies on a reef about 4 miles SW of the S end of Preparis Island. A 1.8m high rock lies on a reef about 0.5 mile S of this reef.

Several coral heads, with depths of 3.7m and less, lie within 1.3 miles of the SE side of Preparis Island. A rock, awash, lies about 0.8 mile S of the N end of the island and 0.3 mile offshore. A pinnacle rock, with a least depth of 2.7m, lies 1.8 miles E of the N end of the island.

During the Southwest Monsoon, anchorage can be taken off the E side of Preparis Island, in depths of 21.9 to 25.6m. During the Northeast Monsoon, anchorage can be taken on the opposite side of the island.

**Preparis North Channel** (15°22'N., 93°48'E.), deep and clear in its central part, lies between Preparis Island and Alguada Reef, about 55 miles to the NNE. **Thalia Shoal** (15°15'N., 93°48'E.), with a least depth of 18.3m, lies about 21.5 miles NNE of the N end of Preparis Island. Irregular depths surround this shoal.

Alguada Reef, Hugh Rose Rock, and the dangers which lie between Hugh Rose Rock and the Bassein River Entrance to the NE have been previously described in paragraph 8.4.

**Preparis South Channel** (14°28'N., 93°33'E.), which lies between Preparis Islands and the Coco Islands to the S, has depths of 200 to 275m and a width of 34 miles between the dangers on either side.

A radar conspicuous wreck, stranded in 1980, lies at the W side of the islet 2.5 miles W of the S end of Preparis Island.

**Caution.**—Less water than charted has been reported to lie Preparis Island has been reported to lie about 3.5 miles W of its charted position. All of the Andaman Islands have been reported to lie 1.3 miles of their charted positions.

Preparis South Channel is dangerous to diving submarines, because sunken mines may still exist in this area.

## The Coco Islands—Coco Channel

**9.3** The Coco Islands consist of Table Island, Great Coco Island, and Little Coco Island.

**Table Island** (14°11'N., 93°23'E.), which is densely wooded on all except its SW side, appears as a flat, level surface with steep-to sides on all bearings. The island has been reported to be a good radar target up to 16 miles.

**Slipper Island** (14°11'N., 93°22'E.), 34m high and grass covered, lies about 0.2 mile NW of the NW end of Table Island. The two islands are connected by a drying reef with a stepping-stone causeway on it. A few trees lie near the summit of the island; a remarkable pillar rock lies near its W extremity. Foul ground extends 0.3 mile W and N from Slipper Island, and depths of 9.1m extend 0.8 mile NW from the island with depths of 3.7 and 5.5m over the outer end.

Numerous rocks and shoals, the positions of which may best be seen on the chart, lie off Table Island in depths of less than 18.3m. A detached 11.9m patch lies about 1.3 miles NE of the island, and irregular depths, which cause tide rips, extend about 4.5 miles NE from the island.

During the Northeast Monsoon, anchorage can be taken about 0.3 mile offshore in Table Bay, on the SW side of Table Island, in a depth of 18.3m, rock, with the lighthouse bearing 012°. When anchoring, care is necessary neither to be too close to the reef, nor to far out where the currents are strong.

During the Southwest Monsoon, anchorage can be taken about 0.4 mile off the N side of the island, in depths of 16.5 to 21.9m, sand and rock, with the lighthouse bearing 180°. This anchorage is exposed.

In Table Bay, a small, short jetty extends from the shore close S of the lighthouse. The channel approach to this jetty is marked by a white square board in line with the E white-washed gate of the lighthouse fence.

The landing place on the N side of the island is approached through a channel, about 91.5m wide at its outer end, and 46m at its inner end. Iron stakes mark the reefs on either side.

**Marshall Channel** (14°10'N., 93°22'E.), which lies between Table Island and Great Coco Island to the S, has depths of 9.1 to 18.3m in the fairway seaward of the fringing reefs. Strong currents set through this channel.

## The Coco Islands—Table Island

**9.4 Great Coco Island** (14°06'N., 93°23'E.), densely wooded and steep on its W side, slopes gradually to the sea on its E side. There are no off-lying dangers, but rocky foul ground extends 0.3 mile from its N end and 0.4 mile from its NW end.

Great Coco Island has been reported to be a good radar target up to 23 miles.

**Pollock Bay** (14°09'N., 93°23'E.) lies between the N point of the island and Pechee Point, about 1 mile to the SE. This latter point consists of a 46m high bluff topped by a few trees. The outer part of the bay has depths of 7.3 to 9.1m, whereas its inner part is fouled by rocky reefs. Binnacle Rock, 4m high, lies on the outer edge of this reef.

**Ford Bay** (14°08'N., 93°23'E.), entered S of Pechee Point, has depths of 9.1 to 18.3m in its outer part, but shoals rapidly in its inner part. Rat Islet, 38m high and wooded, lies in the S part of the bay about 1 mile S of Pechee Point.

Anchorage can be taken in the outer part of Ford Bay, in depths of 12.8 to 18.3m, about 0.7 mile N of Rat Islet. Shelter is provided against strong W winds.

**Jerry Island** (14°03'N., 93°22'E.), 30m high, is connected to the S end of Great Coco Island by a reef. Rocky ground, with uneven depths, extends about 2 miles S from Jerry Island.

**Little Coco Island** (14°00'N., 93°14'E.), densely wooded and fairly high, is separated from Great Coco Island and Jerry Island by Alexander Channel. This channel is free of dangers in the fairway, but strong currents and tide rips are encountered. Vessels using this channel should give the S end of Jerry Island a berth of at least 3 miles.

Irregular depths extend about 1.8 miles N, and foul, uneven ground extends about 4 miles S from Little Coco Island.

**Investigator Patch** (13°57'N., 93°16'E.), an area of shoal rocky ground with a least depth of 2.7m, lies about 2 miles ESE of the S end of the island. Rocks, some of which are awash, lie on the foul ground which extends 4 miles S from the end of the island. Middle Rock, with a depth of less than 1.8m, lies 2 miles S of the above end of the island. Daphne Rock, with a least depth of 5m or less, lies 0.5 mile farther S. South Patch, with a least depth of 12.8m or less, lies 1.5 miles SSE of Daphne Rock.

During E winds, sheltered anchorage can be taken, in depths of 16.5 to 21.9m, sand and mud, in Lambert Bay on the W side

of the island. The bottom on the E side of the island is rocky and foul.

**Coco Channel** (13°47'N., 93°12'E.), which separates Little Coco Island from the Andaman Islands to the S, is wide and deep. The S side of the channel has irregular depths over a coral bottom. A 18.3m patch, which is marked by a heavy sea during strong winds, lies 13 miles SSW of Little Coco Island.

## The Andaman Islands

**9.5 Landfall Island** (13°39'N., 93°02'E.), 79m high in its N part, is fringed by a reef which extends up to 0.5 mile offshore in places. Landfall Rocks, 12.8m high, lie on the reef fringing the S end of the island.

East Island lies 0.8 mile E of Landfall Island. The intervening channel has a least depth 5.5m and provides anchorage to small craft. The anchorage is approached from the S. East Island Light is shown from a white, round metal tower with red bands standing on the S summit of East Island; a racon is situated at the light.

Channel Islet, a 29m high rock, lies 0.3 mile off the E side of Landfall Island near the edge of the reef which fringes that island.

**Hickman Shoal** (13°42'N., 93°59'E.), which consists of two small patches, lies about 2 miles N of the NW end of Landfall Island. The patches have a least depth of 8.2m. Several patches, with depths of 5 to 10.1m, lie between Hickman Shoal and Landfall Island. Shoals, with depths of less than 9.1m, lie within 2 miles NW of the N end of the island.

**Ranger Reef** (13°39'N., 93°07'E.), with a least depth of 1.8m, lies 2 miles E of the N end of East Island. Two 9.1m patches lie within 0.8 mile N of Ranger Reef. In heavy weather, the reef is marked by breakers, but at other times it is difficult to identify.

**9.6 Jackson Ledge** (13°39'N., 93°08'E.), with a least depth of 3.2m, lies about 3.3 miles E of the NE end of East Island and is marked by tide rips. An 11m detached patch lies 3 miles ESE of the ledge. An 8.4m patch lies 2.5 miles NE of the ledge.

The Andaman Islands, a group of 204 islands, islets and rocks, lie between the parallels of 10°30'N and 13°40'N and the meridians of 92°11'E and 94°13'E. The principal islands consist of North Andaman Island, South Andaman Island, Middle Andaman Island, Baratang Island, and Rutland Island. Little Andaman Island lies about 30 miles farther S. These islands are known as the Great Andamans. North Andaman Island and Little Andaman Island have been reported to be good radar targets at distances up to 18 miles. South Andaman Island has been reported to be a good radar target at distances up to 17 miles.

The principal groups of small islands consist of the Richies Archipelago, off the E side of Baratang Island, and the Labyrinth Islands, off the SW coast of South Andaman Island. The principal off-lying islands are North Sentinel Island, Baren Island, and Narcondam Island. The latter island is an extinct volcano which lies 70 miles E of the main group.

The Andaman Islands consist of a mass of very high hills enclosing very narrow valleys. Most of the islands are covered with dense tropical growth.

The shores of the islands are deeply indented, forming a number of harbors, some of which are very spacious. The principal ports or harbors on the W coasts of the islands consist of Temple Sound, Port Anson, Port Campbell, Port Mouat, and Macpherson Strait. Those which indent the E coasts consist of Port Cornwallis, Stewart Sound, Elphinstone Harbor, Colebrook Passage, Port Meadows, and Port Blair. The latter port is the administrative center for the whole group.

**9.7** The reefs and dangers off the W coasts of the Andaman Islands are more extensive than those off the E coast and extend in places up to 21 miles offshore.

The surf breaks a considerable distance offshore on the E coast of the Andaman Islands because of the rocky ledges and foul ground which fringe these shores.

West Coral Bank, Middle Bank, and South Bank, composed of coral and sand, lie off the W side of the Andaman Islands. The water over them is very clear and judging from the appearance of the bottom, it seems probable that rollers break on Middle Bank during the Southwest Monsoon but not on the others. The 183m curve passes close W of these banks, and the increase of swell usually indicates their general location.

**West Coral Bank** (13°13'N., 93°31'E.), the N of these banks, lies between 15 and 23 miles W of North Andaman Island. A least depth of 11m lies on the N part of the bank about 14 miles NW of **North Reef Island** (13°05'N., 92°43'E.).

**Middle Bank** (12°32'N., 92°25'E.) has a least depth of 6.9m, which lies about 38 miles SSW of North Reef Island.

**South Bank** (12°16'N., 92°26'E.), about 8 miles in extent, lies about 18 miles SW of **Flat Island** (12°32'N., 92°41'E.). The central part of the bank has a least depth of 11m.

**Dalrymple Bank** (10°31'N., 92°14'E.), about 7 miles in extent and almost circular in shape, lies centered about 9 miles W of the SW end of Little Andaman Island. The depths near the center range from 10.1 to 16.5m, but elsewhere they range from 20.1 to 36.6m. Heavy rollers mark this bank during the Southwest Monsoon.

In 1951, an 11m patch was reported to lie about 23 miles WSW of the SW end of Little Andaman Island.

**Invisible Bank** (11°10'N., 93°31'E.), about 37 miles long and 9 miles wide, lies centered about 46 miles E of the **Cinque Islands** (11°17'N., 92°43'E.). Flat Rock, 27m in diameter and awash, lies near the center which is the shallowest part of the bank.

**9.8 North Sentinel Island** (11°33'N., 92°14'E.), separated from the Labyrinth Islands by a wide, deep channel, is 122m high, densely wooded, and has a level ridge which slopes to the low NW point. Depths of 42.1 to 95.1m are found in this channel.

North Sentinel Island has been reported to be a good radar target up to 13 miles.

No dangers, except those S of the anchorage, exist outside the reef which extends between 0.5 and 0.8 mile from the shore around the island. A dangerous wreck lies about 2.5 miles W of the S part of the island. Constance Islet, 12m high, is the largest of four islets which lie on this reef off the SE point of the island.

Anchorage can be taken, in a depth of 18.3m, 0.5 mile off the E side of the North Sentinel Island with its NE point bearing 283°. Sunken dangers exist S of this fair weather anchorage.

In fair weather, small vessels with local knowledge can anchor, in a depth of 21.9m, about 0.5 mile off an entrance through the reef which lies close E of a small islet on the S side of the island. This anchorage lies about 0.8 mile W of Constance Islet.

**South Sentinel Island** (10°58'N., 92°14'E.), 44m high to the tops of the trees and level topped, lies 15 miles NW of Little Andaman Island. Its appearance is much the same on all bearings. A bank, as defined by the 36m curve, surrounds the island and extends about 6 miles NW from it. Considerable depths exist in the channel between this island and Little Andaman Island.

Anchorage can be taken off the W side of South Sentinel Island with its center bearing 101°, distant 0.9 mile. Anchorage can also be taken off the E side of the island, with its center bearing 281°, distant 0.9 mile.

**Narcondam Island** (13°26'N., 94°17'E.), an extinct volcano 710m high, lies about 74 miles E of the N end of North Andaman Island. Its summit is shaped like a truncated cone. Barata Bay on the E side of the island can be identified by a grove of palm trees. A light is shown from a white framework tower on the NW side of the island; the visible sector bears between 058° and 179°.

Narcondam Island has been reported to be a good radar target up to 27 miles.

In 1946, and subsequently through 1984, the island has been reported to lie 2.3 miles farther W than charted.

**9.9 Barren Island** (12°16'N., 93°51'E.), 353m high with densely-wooded cliffs rising sheer from the sea, lies about 72 miles SSW of Narcondam Island. The outer slopes of the crater, which lies in the center of the island, is covered with foliage. The interior of the crater is visible through a gap on its W side. A thin column of steam rises from a sulphur bed on the crater side and near the summit. No known dangers exist within 0.5 mile of the island. A light is shown from a white metal tower on the NW end of the island.

Barren Island has been reported to be a good radar target up to 24 miles.

Anchorage can be taken, in a depth of 27.4m, about 0.2 mile off a beach on the SW side of the island. The currents were reported to set SE at a rate of 2.5 knots at half tide at this anchorage.

The tidal currents in Cleugh Passage, between Landfall Island and North Andaman Island, set about ESE on the rising tide and WNW on the falling tide. The rate at springs is about 1.5 knots. Tide rips occur throughout the passage.

The current off the seaward side of the Labyrinth Islands, which are located off the SW side of South Andaman Island, sets S, but it occasionally reverses its direction for periods of about 24 hours.

The tidal currents in Macpherson Strait, between Little Andaman Island and Rutland Island, set E on the rising tide, and W on the falling tide, turning at about the times of high and LW. The tidal currents are strong only in the narrows NE of Rifleman Island.

The tidal currents in Diligent Strait, between the Ritchies Archipelago and Baratang Island, are weak, but with strong S winds there is probably a considerable N set in the narrowest part of the strait between Wilson Island and Strait Island.

## Cleugh Passage

**9.10 Cape Price** (13°35'N., 93°02'E.), the N end of North Andaman Island, is densely wooded and slopes gradually to the sea. The S shore of Cleugh Passage, between Cape Price and Cape Thornhill, about 7 miles WSW, is indented, densely wooded, and fringed by mangroves in places.

**Cleugh Passage** (13°36'N., 93°02'E.), which separates Landfall Island and East Island from North Andaman Island, is available to vessels with local knowledge. Passage through it is not recommended because of the strong currents and lack of navigational aids. Depths in the fairway range from 20.1 to 56.7m, but patches of less than 18.3m are numerous. Patches, with depths of 9.1 and 10.5m, lie 1 and 2 miles ESE of Passage Rock.

**Cleugh Rocks** (13°37'N., 92°58'E.), about 1.5 miles SSW of the SW end of Landfall Island, lie on a reef, the W part of which dries 1.8m.

**Passage Rock** (13°36'N., 93°00'E.) awash, steep-to and marked by breakers, lies about 0.5 mile SE of Cleugh Rocks and almost in mid-channel.

Wedge Rock, about 1.8m high and fringed by a drying reef, lies 1.5 miles WNW of Cape Price. A shoal, with depths of 4.6 to 8.2m, lies 1 mile W of Wedge Rock. A 0.9m high rock, surrounded by depths of less than 9.1m, lies 0.5 mile S of this shoal about 2.7 miles W of Cape Price.

**One Fathom Patch** (13°36'N., 93°02'E.), which breaks in heavy weather, has a least depth of 1.8m and lies 0.6 mile N of Cape Price. Depths of 6.4 to 11.9m lie between this danger and Cape Price. A 5m patch lies about 0.5 mile W of the Cape.

**West Island** (13°36'N., 93°54'E.), 53m high, reef-fringed, and densely wooded, lies in the W approach to Cleugh Passage, about 3.5 miles NNW of Cape Thornhill. Depths of less than 9.1m lie up to 0.5 mile off the island. Several patches, with depths of 7.3 to 8.7m lie between West Island and Wedge Rock.

## North Andaman Island—West Coast

**9.11** Between **Cape Thornhill** (13°32'N., 92°56'E.) and Shark Islet, about 22 miles SSW, the coast is backed some distance inland by many conspicuous summits.

**Taylor Hill** (13°27'N., 92°54'E.) about 6.3 miles SSE of Cape Thornhill, is a long ill-defined summit, 196m high. D'Oyley Peak, 159m high and pointed, lies 8 miles S of the same cape. Tasou Hill, 240m high and having three summits of nearly equal height with only a slight dip between them, rises 6.5 miles farther SSW. Tradikeli Hill, 335m high, a sharp ridge with its peak at its S end, lies 8 miles S of D'Oyley Hill. Saddle North Peak, 686m high and having a flat top with a sharp peak at its N end, rises about 23 miles S of Cape Price. Saddle Hill, 731m high, lies 2.8 miles S of Saddle North Peak and has a rounded summit. The peak and the hill are covered with vegetation and appear saddle-shaped when viewed from the W or E.

Several conspicuous hills lie near the W coast of the island. Brown's Hill, 91m high, lies 1 mile SE of Cape Thornhill. Jessop Hill, 134m high, lies on a point at the head of Hudson Bay about 15 miles SSW of the same cape. Lewis Hill, 110m high, lies on a peninsula separating the above bay from Casuarina Bay about 1.3 miles S of Jessop Hill. All of the above hills have twin summits.

Between Cape Thornhill and Bluff Point, about 4.5 miles SW, the coast is somewhat indented and lined with mangroves. The latter bold, cliffy point is 70m high, has an irregular summit, and appears as three peaks when viewed from the SSW.

**Thornhill Island** (13°32'N., 92°55'E.), 77m high, is separated from Cape Thornhill by a narrow shallow channel.

**White Cliff Island** (13°32'N., 92°53'E.), 33m high, lies 1.5 miles W of Thornhill Island. Cliffs, 20m high and dark colored, back the N end of the island.

**Reef Island** (13°30'N., 92°53'E.) is 5.5m high to the tops of the trees. Shoal ground, as defined by the 6m curve, extends almost 1 mile WSW from the SW point of the island. Irregular depths of less than 18.3m lie up to 1.3 miles farther WSW.

**Temple Sound** (13°25'N., 92°51'E.) lies between Shearme Island on the E, and Paget Island and Point Island on the N and W. Shearme Island is 57m high and, except in the narrow channel separating it from the mainland to the E, is fringed by a drying reef. Oldham Rocks, 3m high, lie about 0.5 mile NNE of the NW point of Shearme Island; Sugarloaf Island, a prominent conical rock, 20m high, lies about 1.5 miles SSW of the SW end of Shearme Island and on the SE side of the entrance of the sound.

**9.12 Paget Island** (13°26'N., 92°50'E.), about 0.8 mile NW of the NW end of Shearme Island, is 76m high to the tops of the trees and fringed by a drying reef on all except part of its E side. A spit, with depths of less than 5.5m, extends about 0.8 mile N from its NE point. Cliffs, about 30m high, line the SE side of Paget Island.

**Point Island** (13°24'N., 92°50'E.), about 0.5 mile SW of Paget Island, is tree-covered. A drying reef almost surrounds the island and extends about 0.3 mile from its N and SW sides. A least depth of 6.4m exists in the fairway of the channel separating Paget Island and Point Island.

In the N approach to Temple Sound, between Paget Island to the W and the coast between Bluff Point and Shearme Island to the E, there are several rocks, awash and sunken, and some shoals, the positions of which may best be seen on the chart.

In the S approach, Bolton Shoal, which lies almost in mid-channel between the S end of Point Island, and Sugarloaf Island, about 2.5 miles SSE, has a least depth of 9.1m.

A bank, on which the depths are less than 18.3m, extends almost 1 mile SSE from the S end of Point Island and almost joins Bolton Shoal.

Anchorage, sheltered from all except SW winds, can be taken, in depths of 18.3 to 21.9m, mud and sand, in the middle of the sound about midway between Shearme Island and Point Island. Small vessels can anchor, in a depth of 14.6m, about 0.3 mile W of Oldham Rocks.

The depths in Temple Sound are very irregular and caution is advised both when entering and when anchoring.

The coast between **Point Stuart** (13°22'N., 92°51'E.) and the W entrance of Austin Strait, about 29 miles to the S, is very

irregular and fronted by numerous islets, rocks and shoals. Hudson Bay, entered about 5 miles S of Point Stuart and Casuarina Bay, 3 miles farther S, are both shallow and exposed to the W wind and seas.

**Mackey Bank** (13°20'N., 92°46'E.), with a least depth of 7.3m, lies about 6 miles SW of Point Island. Vessels should give this bank a wide berth when passing.

**Shark Island** (13°12'N., 92°46'E.), about 12.3 miles SSW of the same island, is sandy and covered with bushes about 6.1m high. A rocky reef surrounds this island. Vessels should give this island a wide berth when passing.

**9.13 North Reef Island** (13°05'N., 92°43'E.), low, flat, wooded, and marshy, lies 6.5 miles SSW of Shark Island. A reef extends about 2 miles S from the S end of the island.

**Latouche Island** (13°05'N., 92°43'E.) lies close off the NE point of North Reef Island. A spit extends about 0.3 mile S from Latouche Island. A 3.7m patch lies about 1.5 miles SE of the E end of North Reef Island.

**Interview Island** (12°55'N., 92°42'E.) lies 4.5 miles S of the S end of North Reef Island. The island is low at its N end, but rises gradually to a height of 113m. The highest part of the island is a wooded plateau. A rocky pinnacle, 7m high, lies close off a cliff on the S end of the island. Foul ground extends about 2 miles NNE from the island. A light is shown from the W side of the island.

**South Reef Island** (12°47'N., 92°40'E.) lies about 1 mile SW of Interview Island on a stony spit, as defined by the 6m curve, that extends about 3 miles S from that island.

**Anchorage.**—Vessels with local knowledge can anchor, in depths of 11.8 to 16.4m, about 2 miles E of the S end of North Reef Island. Care should be taken to avoid the shoal patches which lie 1.5 and 2 miles ENE of the S end of the island. Vessels approaching from the NW should round Latouche Island about 0.5 mile off in order to avoid a 6.4m shoal which lies 1.5 miles N of that island.

**Austin Strait** (12°53'N., 92°50'E.), which separates North Andaman Island from Middle Andaman Island, is shoal and can only be used by boats. The shallowest parts are over the bars at either entrance. The W entrance, which lies about 8.5 miles SE of the N end of Interview Island, is approached through Interview Sound which lies between the N part of Interview Island and the mainland. Numerous islands, rocks, and shoals lie in the sound.

**White Mountain** (12°51'N., 92°55'E.), 361m high, lies at the N end of the E coastal range of Middle Andaman Island, about 7 miles ESE of the W entrance of Austin Strait. The mountain appears whale-backed when viewed from the SW.

The W coast of the island, between Tuft Island about 6 miles SSE of the S end of Interview Island, and the W entrance of Andaman Strait, is bold and precipitous. Tuft Island is sandy and about 3m high.

**Port Andaman** (12°44'N., 92°42'E.), of little commercial importance, lies between South Reef Island and Anderson Island. This latter island lies close to and parallel with Middle Andaman Island. The water at the entrance is muddy and irregular depths exist over a rocky bottom. Port Andaman leads N to Interview Passage, which lies between Interview Island to the W and Anderson Island and Bennett Island to the E. This area is dangerous and should be avoided.

Buchanan Passage, which lies between Anderson Island and the mainland, is foul.

Rocky Point, the extremity of a promontory, lies about 4.5 miles SSW of Tuft Island. Hump Island lies about 3 miles S of Tuft Island and Flat Island lies about 6 miles farther S.

A shoal, with a least depth of 11m, lies 2.5 miles W of Rocky Point.

## Andaman Strait—West Entrance

**9.14** The W entrance of Andaman Strait, which separates Middle Andaman Island from South Andaman Island, is divided into two channels by Spike Island. Fairly deep water exists in the outer part of the main entrance which lies N of the latter island. The channel is entered between the W entrance point of Foul Bay and Breaker Point, the NW end of Spike Island. The channel abreast Foul Bay is about 0.4 mile wide between the shoals on either side, but narrows to a width of 0.2 mile between the reef extending from Steep Point, the NE end of Spike Island and Brook Point to the N.

Andaman Strait bifurcates about 0.5 mile E of Steep Point. Homfray Strait, the N channel, separates Middle Andaman Island from Bara. The S channel, which separates the latter island from South Andaman Island, retains the name of Andaman Strait. That part of the channel between Spike Island to the W and Stoa Island, Mangrove Island, and Tala Kaicha Island, to the E, is known as Port Anson.

The S part of the W entrance of Andaman Strait, between Spike Island and the N end of South Andaman Island, about 0.3 mile SW, is fairly deep. This narrow, intricate channel is considered to be dangerous.

## Port Anson—Approaches

**9.15 Foul Bay** (12°19'N., 92°42'E.), on the N side of the main entrance of Andaman Strait, is fouled by reefs. The coast between this bay and Brooke Point, about 1.8 miles SSE, is fringed by a reef which extends about 0.3 mile offshore in places. Brooke Point rises to a rounded knoll, 96m high, close N of its extremity.

Foul ground extends almost 1 mile S from the W point of Foul Bay. A rock, with a depth of less than 1.8m, lies near the S end of this reef. Half-tide Rock, which dries 0.9m, lies 0.6 mile S of the same point.

**Spike Island** (12°16'N., 92°43'E.), whose N side forms the S side of the entrance channel, is 136m high at its N end and 94m high at its S end. The N coast of the island between Breaker Point and Steep Point is fringed by a narrow reef. A vessel drawing 4.6m reported grounding about 0.4 mile E of Breaker Point. Braganza Ledge, almost 0.5 mile NW of Breaker Point, has a least depth of 8.2m.

The W side of Spike Island is fringed by a reef which extends up to 0.2 mile offshore in places. Long Rock, 1.2m high, lies 1.5 miles SSW of Breaker Point. Cingue Rocks, two groups of above-water rocks, lie about 0.3 and 0.5 mile S of Long Rock.

**Taylor Patches** (12°16'N., 92°42'E.), which have a least depth of 8.5m, lie about 1.5 miles SW of Breaker Point. A shoal area, with a least depth of 7.3m, lies 0.5 mile W of Long Rock.

**Bluff Island** (12°15'N., 92°42'E.), 30m high to the tops of the trees, lies in the mouth of the S entrance channel, close N of the N end of South Andaman Island. A drying reef extends 0.3 mile W and 0.5 mile N from Bluff Island.

## Port Anson

**9.16 Port Anson** (12°16'N., 92°44'E.) lies between Spike Island to the W, and Stoa Island, Mangrove Island, and Tala Kaicha Island to the E. Depths of 12.8 to 20m exist in the central part of the bay. All of the above islands are reef-fringed.

**Whales Reef** (12°15'N., 92°44'E.) lies about 0.8 mile NW of the S end of Tala Kaicha Island. Two small reefs lie S of this reef.

**Anchorage.**—Anchorage can be taken in the N part of Port Anson, in depths of 16.5 to 18.3m, mud, about midway between Stoa Island and the N part of Spike Island.

**Directions.**—The low mangrove point at the N end of Stoa Island, just open S of Brooke Point, bearing 112°, leads through the channel N of Spike Island. When within about 0.3 mile of Brooke Point, course should be altered to the S passing about midway between Brooke Point and Steep point. After rounding Steep Point, about 0.1 to 0.2 mile distant, course can be shaped for the anchorage.

**9.17 Andaman Strait.**—Vessels drawing 4m have navigated the strait. Small vessels with local knowledge should only attempt the passage during daylight hours, under favorable conditions. Such vessels should follow the directions above and steer S in mid-channel through Port Anson until W of the S end of Mangrove Island. The course should then be altered slightly E until the summit of a conical peak, to the N, is seen bearing 003° and just open E of the nearer hills that form the W side of a large mangrove valley. The course should then be shaped to about 183° and these marks kept on the bearing of 003°, astern. This course leads between the ledge of rocks that dries 2.1m and Whales Reef and other reefs to the S of it.

When the S end of Tala Kaicha Island bears 090°, the course should be altered to about 220° for the S point of Spike Island, giving a berth of about 0.3 mile to the E side of the strait until about 0.6 mile distant from the S point of Spike island. The course should then be altered to pass 0.2 mile E of that point. When the same point bears 000°, the course should be altered to the S to proceed along the W side of the strait, about 0.2 mile off the W shore.

When the W end of **Baby Island** (12°11'N., 92°44'E.), an island with two hillocks, located at the W end of the narrows about 3 miles SSE of the S end of Spike Island, bears about 113°, the course should be altered to pass S of that point and continue in mid-channel through the strait.

Vessels should not attempt to pass through the narrows during the strength of the tidal currents at springs. Slack water occurs at the times of HW and LW at Port Blair. The tidal currents are weak at neaps.

**9.18 Cape Bluff** (12°12'N., 92°40'E.) the NW end of South Andaman Island, is fronted by dangers which extend about 1 mile offshore. The coast between this cape and Petrie Island, about 15.5 miles SSW, is clear of off-lying dangers, except for

South Bank, which has been previously described in paragraph 9.7. The shallowest part of this bank lies 15 miles WNW of Cape Bluff.

**Port Campbell** (11°57'N., 92°35'E.), almost landlocked and sheltered, is entered between Petrie Island and Montgomery Island, about 1.8 miles SSW. The cliffs in the vicinity of the port are yellowish-gray sandstone with clearly defined stratum lines.

**Petrie Island** (11°58'N., 92°37'E.), which lies on the N side of the entrance, is joined to the N extremity of Defence Island by reefs and shoals. This latter island forms part of the E side of the port.

An area of shoal ground extends 0.5 mile S from Petrie Island and a similar shoal, with some rocks awash, extends about 1 mile W from the middle part of Defence Island.

**Montgomery Island** (11°56'N., 92°35'E.), on the S side of the entrance, is joined to the mainland by foul ground. The E side of this island is fringed by foul ground. A detached patch, with depths of 9.1 to 11.9m, lies about 0.8 mile NE of Montgomery Island.

**Anchorage.**—Vessels can anchor in the entrance, in a depth of 21.9m, about 0.8 mile NE of Montgomery Island. Anchorage can be taken, in a depth of 23.8m, a little over 1 mile SE of the same island.

**Directions.**—Vessels can approach the latter anchorage in depths of not less than 18.3m by passing close N of the previously-mentioned 9.1 to 11.9m patch, on a 090° course until the W point of Petrie Island bears 000°. A course of 180° should then be steered until the N end of Montgomery Island bears 305°. A course of 130° should then be steered and anchorage taken when the NW end of Defence Island bears 003°.

**9.19** The coast between Montgomery Island and Palmer Point, about 15 miles to the S, has not been closely examined. A reef fringes this section of coast and an area of shoal ground extends up to 2.5 miles S from Palmer Point. A 5.5m patch lies near the S end of this shoal ground.

**Constance Bay** (11°42'N., 92°36'E.), entered between Palmer Point and Florence Point, about 2 miles to the SE, is foul and has not been closely examined.

**Port Mouat** (11°37'N., 92°38'E.), entered between Perseus Point and Andromeda Point about 0.8 mile S, extends about 1.5 miles E through a narrow channel to a landlocked basin.

The entrance channel between the extending reefs on either side is about 0.3 mile wide, but about 1 mile to the E the channel narrows to a width of only about 91m. Two detached patches, having depths of 4.3 and 4.6m, lie in the middle of the narrowest part of the channel. Depths E and W of these patches range from 12.8 to 20m. Depths in the landlocked basin to the E range from 7.3 to 10m.

Small fishing vessels with local knowledge frequently use the port as an anchorage. It is advisable to buoy the two shoal patches which lie in the narrowest part of the channel prior to entering.

## The Labyrinth Islands

**9.20** The **Labyrinth Islands** (11°35'N., 92°3'E.), consisting of 14 islands and islets, lie off the SW side of South Andaman Island. All of these islands are rocky and fringed by

reefs which extend up to 1 mile offshore along their seaward faces. Large blocks of these extending reefs have been broken off by the sea during the Southwest Monsoon and have been tossed up onto the reefs where they appear as rocky boulders.

**Tarmugli Island** (11°35'N., 92°34'E.), the NW island of the group, is 78m high and lies with Frederick Point, its NW end, about 4.5 miles WSW of Perseus Point. Two rocks, each 4.6m high, lie close off the cliffy S side of the island.

A large area of foul ground extends up to 2.5 miles N from the reef which fringes the N coast of the island. Allen Patches, partly awash, lie on the outer part of this foul ground about 2 miles NE of Frederick Point. A 5.5m patch was reported to lie about 2.5 miles NE of the same point.

**Boat Island** (11°31'N., 92°34'E.), 27m high, lies on an area of foul ground about 1.8 miles SE of the SW end of Tarmugli Island.

**Malay Island** (11°32'N., 92°37'E.), the SE island of the group, lies 2.3 miles E of Boat Island. A rounded summit, 68m high, rises at its N end. A rocky ledge extends 0.3 mile from the S point of the island.

**Hobday Island** (11°32'N., 92°37'E.), which lies close NE of Malay Island, has a rocky ledge extending 0.5 mile S from its SE side. A ridge, with depths of 6.4 to 8.2m, extends 0.5 mile farther S.

**Redskin Island** (11°33'N., 92°36'E.) lies close NW of Malay Island. It has been reported that Elphinstone Passage, which leads between the W side of Redskin Island and Snob Island, 46m high, is used by local fishing craft proceeding to Port Mouat. Snob Island is 75m high and lies W of Redskin Island.

**Pluto Island** (11°33'N., 92°38'E.), small, rounded, and 49m high, lies close E of Hobday Island. A rock, 0.6m high and said to be a useful mark at all stages of the tide, lies 0.5 mile SSE of Pluto Island.

**Jolly Boys Island** (11°30'N., 92°37'E.), 45m high, lies 0.8 mile NW of Rutland Island. A reef, which is usually visible, fringes the island and extends about 0.8 mile SW from it.

**Grub Island** (11°35'N., 92°36'E.), 24m high with a yellow cliff on it, lies 1.5 miles E of Tarmugli Island.

**9.21 Macpherson Strait** (11°30'N., 92°36'E.) separates South Andaman Island and the Labyrinth Islands from Rutland Island. The recommended channel has a least depth of 7.3m and a least navigable width of 0.2 mile.

The W entrance is narrow and obstructed by reefs as are both shores of the strait. The reef edges are visible in places. That part of the strait which lies between the SW end of South Andaman Island and the NE side of Rutland Island, is clear except for a rocky ledge which extends 0.6 mile ENE from the NE end of the latter island.

Several channels are found in the W approach to Macpherson Strait. Those leading between the islands forming the Labyrinth Islands are mostly foul. The channel between Malay Island and Jolly Boys Island, which leads from Macpherson Strait to Elphinstone Passage, is navigable by small vessels with local knowledge under favorable conditions.

**Brooker Rock** (11°30'N., 92°36'E.), a pinnacle with a depth of 1.5m, lies on the NW side of the channel about 0.8 mile NW

of the SW end of Jolly Boys Island. Because of the discoloration of the water this rock is not usually visible.

Beauchamp Patch, a small coral head awash, lies on the SE side of the channel, 0.4 mile NNE of the NE end of Jolly Boys Island. This rock is not usually visible.

**Peck Shoals** (11°32'N., 92°38'E.), a group of coral heads on the N side of the channel, lie 1.3 miles NNE of the NE end of Jolly Boys Island.

**Anchorage.**—Vessels can anchor, in depths of 11 to 18.3m, on the N side of the E part of the strait with the S end of South Andaman Island bearing 125°, distant 1.5 miles. A white rock on the N side of the strait, about 1.3 miles NNW of the above point, bears 058° and is reported to be a good mark.

**Directions.**—Vessels approaching Macpherson Strait from the W, about 5 miles off the entrance, should steer a course of 051° for Jolly Boys Island until the N end of Pluto Island bears 034°. Pluto Island will then be open, 0.3 of its length E of the SE side of Hobday Island. A 034° course will then lead midway between Brooker Rock and the reef extending SW from Jolly Boys Island. This reef is usually visible. When the summit of this island is abeam course should be altered to 052° with 0.6m rock, located about 0.5 mile SSE of Pluto Island, ahead. When the S end of Boat Island is seen just open S of the S end of Malay Island, bearing 265°, course should be altered to 085° with that mark astern. This course leads between Peck Shoals and Beauchamp Patch.

A mid-channel course can be steered through the narrows. When the above 0.6m rock is abeam, course should be altered so as to pass midway between Rifleman Islet and the NE shore of the strait. A mid-channel course can then be steered through the rest of the strait.

**9.22 Rutland Island** (11°25'N., 92°39'E.), the furthest S of the Andaman Islands, consists of two parts joined together by a low neck of land. Mount Ford, 433m high, lies in the N part of the island; Mount Mayo, 227m high, lies in the S part.

**Woodmason Bay** (11°25'N., 92°37'E.), which indents the W coast of the island, lies with its S part abreast the low neck of land. Depths in the central part of the bay, seaward of the fringing reefs, range from 14.6 to 29.3m.

A bank, as defined by the 20m curve, extends about 4 miles W from the SW side of the island. The Twin Islands, flat-topped and wooded, lie on the N side of this bank. East Twin Island is 44m high and West Twin Island is 48m high. A rocky ledge extends 0.8 mile SW from the latter island. Turtle Rock, which dries 1.8m, lies near the extremity of this ledge. A spit extends about 0.8 mile from the rock. A 2.7m patch lies near the extremity of this spit.

**Investigator Rock** (11°20'N., 92°37'E.), with a least depth of 5.5m and marked by rips, lies about 1 mile SSW of the S extremity of Rutland Island. A rocky shoal, with a least depth of 8.2m, lies about 0.3 mile NNE of this rock.

An extensive bank of dead coral, having a least depth of 11m, lies centered about 6.5 miles SW of the SW end of Rutland Island.

The E side of Rutland Island is described in paragraph 9.47. Mariners Strait and the islands and passages to the S are described beginning in paragraph 9.48.

## North Andaman Island—East Side

**9.23** Cape Price, the NE point of North Andaman Island, has been previously described in paragraph 9.10. The coast between the cape and the entrance of Gibb Creek, about 7 miles to the S, is fronted by several rocky patches. Vessels should keep at least 2.5 miles off this coast when passing.

**Union Ledge** (13°32'N., 93°11'E.), almost awash, lies about 6.5 miles ESE of Pocock Island. It lies near the S extremity of an extensive bank on which the irregular depths are less than 36.6m. A patch, with depths of 11 to 14.6m, lies about 0.8 mile E, and a 5.5m patch lies almost 0.5 mile SSW of Union Ledge.

**Pocock Island** (13°34'N., 93°04'E.), 55m high and wooded, lies about 1.8 miles SSE of Cape Price. A rock, awash, lies near the S end of an area of foul ground which extends 0.3 mile S from the island. A drying rock lies 0.3 mile farther S.

A shoal, with a least depth of 5.5m, lies about 4 miles S of Pocock Island.

**Beauchamp Reef** (13°27'N., 93°04'E.), awash, lies almost 1 mile offshore about 6.5 miles S of Pocock Island.

**Cadell Bay** (13°26'N., 93°04'E.), entered between the S entrance point of Gibb Creek and Colvin Point about 2.8 miles SE, provides anchorage during the Southwest Monsoon, in depths of 11 to 12.8m, mud, in the middle of the bay.

Trilby Island lies 0.2 mile ENE of Colvin Point; Tree Islet, 11m high with some vegetation on it, lies 0.3 mile ENE of Trilby Island.

**Bond Harbor** (13°24'N., 93°04'E.), entered about 1 mile SSE of Colvin Point, provides anchorage to small craft, in depths of 12.8 to 14.6m, mud and sand.

The **Table Islands** (13°25'N., 93°07'E.) consist of Excelsior Island and Delgarno Island, both tree-covered, which lie at the N and SW ends, respectively of an extensive shoal on which the depths are less than 5.5m.

Excelsior Island, 29m high, lies about 1.5 miles E of the coast and is fringed by a reef which extends about 0.3 mile from its NE side.

**Delgarno Island** (13°25'N., 93°06'E.), about 61m high, lies 0.8 mile SSW of Excelsior Island and has a clear sandy beach on its NW side and mangroves on its E and S sides. A reef extends about 0.4 mile S from the island.

Both islands are fairly steep-to on their W sides, but foul ground extends about 1 mile SE from Excelsior Island and the same distance E from Delgarno Island. Seaward of the foul ground, irregular depths extend about 1.3 miles E of Excelsior Island and 1.8 miles E of Delgarno Island.

**9.24 North Passage Reef** (13°26'N., 93°06'E.), which dries about 2.4m, lies about 0.5 mile W of Excelsior Island. The passage between this reef and Tree Islet, almost 0.5 mile to the W, is clear of dangers.

Mushroom Reef and Table Reef lie about 0.2 mile apart, 1.8 miles E of the S end of Delgarno Island. Both reefs dry and are usually visible.

South Passage Reef, which dries, lies in the passage between the Table Islands and North Andaman Island. A shoal spit extends about 0.4 mile ESE from the reef. Vessels using this passage should pass W of this reef.

Vessels passing E of the Table Islands should not shoal to depths of less than 36.6m.

From **Tree Point** (13°23'N., 93°05'E.), the coast extends 1.8 miles SW to the entrance of Thoroughfare Creek. This boat channel separates Smith Island from North Andaman Island and leads into Port Cornwallis.

**Smith Island** (13°20'N., 93°05'E.), 131m high, has a conspicuous tree on its summit. Mangrove Point, the E end of the island, is fronted by a drying reef that extends about 0.2 mile offshore. A 10.1m patch lies about 0.8 mile S of the point.

Temple Island, which forms the S entrance point of Thoroughfare Creek, lies 0.5 mile NE of the N end of Smith Island. A shelving reef extends about 0.3 mile from the E side of Temple Island. A drying ledge lies about 0.3 mile E of the same island.

The **Turtle Islands** (13°22'N., 93°05'E.), two wooded islands about 46m high, lie 1.8 miles NNW of Mangrove Point. Turtle Reef, with a 1.2m high sandbank in its middle, lies 0.5 mile N of the islands. A 7.3m shoal lies 0.5 mile ESE of the reef.

The channel between the Turtle Islands and Smith Island is clear with a fairway depth of not less than 20.1m.

Back Bay, an open bight, lies between Mangrove Point and Ross Island, about 2 miles to the S. The shores of the bay are reef-fringed. Back Bay Shoal, with a least depth of 1.8m, lies about 1 mile SE of Mangrove Point and breaks only in heavy weather. Back Bay Reef dries 1.5m and lies about 1 mile S of Mangrove Point. This reef is usually visible at HW, except when the sea is very smooth. Depths of 11 to 16m exist between Back Bay Shoal and Back Bay Reef.

Tree Island, in line bearing 341° with Cape Price, leads E of Back Bay Shoal. Hand Peak, in line bearing 235° with the SE side of Ross Island, leads SE of the same shoal.

## Port Cornwallis

**9.25 Port Cornwallis** (13°17'N., 93°05'E.) is entered between Ross Island and Dundas Point, about 1.8 miles SSW. Ross Island, 82.6m high, is connected to Smith Island by a sandy spit and is almost entirely surrounded by a drying reef. Dundas Point, sharp and rocky, is fronted by a drying reef which extends about 0.2m NNE from its extremity. The point rises to a height of 124m about 0.4 mile S of its extremity. Hand Peak, 219m high, sharp and wooded, lies 2.8 miles WSW of the same point. A 184m peak lies 1 mile SW of Dundas Point.

There are considerable depths in the entrance and within the harbor. The W part of the harbor is very shallow, but a narrow channel leads between Wharf Island and South Island and then SW into Blair Bay, a shallow extensive backwater.

Shoal ground, as defined by the 10m curve, extends almost 0.5 mile E, and a little over 0.3 mile S from Ross Island. North Reef, which dries 2.4m, lies about 0.3 mile SE of the island. A 5m patch lies close SE of the reef.

A shoal, with a least depth of 6.9m, lies 0.8 mile ENE of Dundas Point.

South Reef, which dries 2.4m, lies about 0.4 mile E; Middle Rock, 0.6m high, lies the same distance SSE of Dundas Point.

Depths of 6.4m and 12.3m lie about 1.3 miles and 1.8 miles, respectively, S of Dundas Point. A 1.2m shoal lies about 1 mile S of the same point. Shoals, with depths of 5 to 9.6m, lie between Middle Rock and the 6.4m patch.

**Minerva Bay** (13°19'N., 93°04'E.) is entered between Hood Point and Perseverence Point, about 1.8 miles NW. A bank, as defined by the 20m curve, extends 0.8 mile SE from the latter point, about halfway across the bay entrance. A rocky shoal, with depths of 10.5 to 16.5m, lies near the outer edge of this bank. A 14.1m patch lies almost 0.8 mile NW of Hood Point. A depth of 11.4m lies about 0.3 mile WNW of the same point.

**Brush Islet** (13°17'N., 93°04'E.), a reef-fringed islet about 6.1m high to the tops of the trees, lies almost in mid-channel about 1 mile SW of Hood Point. A spit, with shallow depths, extends 1 mile W from the islet. A lighted beacon lies on the NW side of Brush Islet.

**9.26 Atalanta Bay** (13°16'N., 93°04'E.) is entered between Dundas Point and Barkely Point, about 1.3 miles WNW. A shoal area, with depths of 2.3 to 11m, lies in the middle of the bay. A 9.6m patch lies 0.4 mile E of Barkely Point.

Ariel Bay is shallow and lies about 1.3 miles W of Barkely Point. An L-shaped jetty extends 0.2m N, then NE from Kopi Point, the E entrance point of the bay. In 1983, works were in progress close SW of Kopi Point.

**Chatham Island** (13°19'N., 93°02'E.), 61m high near its S end and 58m high near its N end, lies about 1 mile W of Perseverence Point.

**Jungle Island** (13°20'N., 93°03'E.), small and low, lies in the S entrance of Thoroughfare Creek, about 1 mile N of Perseverence Point. North Island, 93m high to the tops of the trees, lies 1 mile W of Jungle Island. Wharf Island and South Island lie within 0.5 mile W of North Island. Shoal patches, with a least depth of 6.9m, lie between North Island and Chatham Island.

**Anchorage.**—During the Southwest Monsoon, anchorage can be taken in the entrance of Atalanta Bay. The best anchorage lies NE of Chatham Island, in depths of 11 to 14.6m, mud, about midway between the S end of that island and Jungle Island. Anchorage can also be taken, in depths of 21.9 to 23.8m, about 1 mile NW of Brush Islet.

**Directions.**—Vessels entering Port Cornwallis should keep Brush Island bearing 287° and in line with South Point, the S end of Chatham Island. When the NE end of the latter island bears 313° and is in line with the SW end of Wharf Island, course should be altered to that bearing. When abeam of Perseverence Point, course can be altered to the N for the anchorage.

The coast, between Dundas Point and Cadell Point, about 15 miles to the S, is not well charted. Craggy Island, which lies about 3 miles S of Dundas Point, is joined to the mainland by a reef. Small vessels with local knowledge can obtain good anchorage off the S side of this reef.

Saddle North Peak and Saddle Hill, both prominent, lie inland along this section of coast. Both have been previously described in paragraph 9.11.

## Stewart Sound

**9.27 Stewart Sound** (12°54'N., 93°00'E.), which contains several bays and inlets within its limits, lies within Sound Island between Cadell Point and Cape Vestal, about 11 miles SSW. The hills surrounding the sound are covered with dense jungle. White Mountain, 361m high and prominent, lies 2

miles WSW of Cape Vestal at the N end of the E coastal range of Middle Andaman Island. Ray Hill, a conspicuous cone-shaped hill 135m high, lies 5.7 miles SW of Cadell Point. The hill serves as a good mark for vessels approaching the S entrance of the sound. Ridges of high land span Sound Island in all directions and are prolonged in spurs up to the entrance points of the numerous bays that indent the island. The conspicuous summit of Sound Island is 147m high and lies 1 mile WSW of Simpson Point.

Stewart Sound is of great extent and contains the principal part of North Andaman Island. Several lumber camps and settlements are found around the shores of the sound.

**Austin Strait** (12°54'N., 92°53'E.), which separates North Andaman Island and Middle Andaman Island, has its E entrance at the head of a shallow bay on the S side of Stewart Sound.

**Tides—Currents.**—The tidal currents set N on the rising tide and S on the falling tide. They attain a spring rate of 1.5 knots in the narrow parts of the sound. The N current attains a rate of 0.3 knot, and the S current a rate of 2 knots, S of Comp Bay, a small bight on the N side of the N entrance. The tidal currents close N of Takla Oyster Point set SW on the rising tide and NE on the falling tide. During the strength of the Southwest Monsoon, the SW current is very weak, but the NE current attains a rate of 2 knots.

**Sound Island** (12°58'N., 92°59'E.) is an irregular-shaped island lying in the entrance of Stewart Sound. Above and below-water rocks extend about 0.5 mile NE from Simpson Point, the NE end of the island. Mitchell Point, the SE extremity of the island, is fringed by a drying reef that extends 0.3 mile SSW from it. Square Rock, 4.3m high and prominent, lies on the W side of the outer part of the reef. A lighted beacon lies on Square Rock.

Jones Point, the SW extremity of Sound Island, is fringed by a drying reef on which there is a ridge of rocks extending 0.4 mile S to SE. A rock, that dries 2.4m, lies near the end of this ridge.

**9.28 Stewert Sound—North entrance.**—The N entrance of the sound lies between Cadell Point and Simpson Point. Elphin Patch, which lies near the middle of the entrance, has a depth of less than 1.8m near its center. Morland Rock, which dries 2.4m, lies about 0.4 mile SW of Cadell Point. Shoal ground, with a least depth of 4.6m near its outer end, extends about 0.3 mile SSE from the rock.

**Oliver Island** (13°00'N., 93°00'E.), 59m high, lies 1 mile W of Simpson Point. There are considerable depths in the channel between it and Sound Island.

**Sunk Reef** (13°00'N., 92°59'E.), which dries 0.6m and which has a 5.5m patch on its NW side, lies 0.8 mile NW of Oliver Island.

A group of drying rocks lie about 1 mile W of Oliver Island. An area of shoal ground extends about 0.3 mile SW from the group.

**Oyster Island** (12°59'N., 92°59'E.), 1.2m high, lies 0.8 mile WSW of Oliver Island.

**Stewart Island** (13°01'N., 92°56'E.), which lies in a shallow bay on the NW side of the sound, is covered with jungle growth. A drying mudbank joins the NW side of the island with North Andaman Island.

**Marsack Shoals** (12°57'N., 92°57'E.) consist of two small patches that lie close together at the S end of the channel, between Sound Island and North Andaman Island. The E patch has a least depth of 5.9m and the W patch a least depth of 2.7m.

**9.29 Stewert Sound—South entrance.**—The S entrance of the sound lies between Mitchell Point and Cape Vestal, about 5 miles SSW. Five Fathom Patch, a fairly large shoal with depths of 9.1 to 16.5m, lies about in the middle of the S entrance. Convict Patch, with depths of less than 5.5m, lies 1 mile N of Cape Vestal. Some rocks, with depths of less than 1.8m, lie on the shoal. A 11m shoal lies about 2 miles ENE of the same point.

**Aves Island** (12°55'N., 92°57'E.), 63m high and conspicuous, lies about 2 miles SW of Sound Island. A drying reef connects the island to Aves Point to the WSW.

**Takla Oyster Point** (12°55'N., 92°55'E.), about 1.5 miles WNW of Aves Point, is the N end of a promontory which forms the E side of a shallow bay. The E entrance of Austin Strait lies at the head of this bay.

A shoal, with a least depth of 3.2m, lies almost 0.5 mile E of Takla Oyster Point.

**Berkeley Island Group** (12°56'N., 92°54'E.) consists of Orchid Island, Curlew Island, Egg Island, and Dottrel Island, which lie in the approach to Bacon Bay to the W and NW of Takla Oyster Point. All except Dottrel Island are identifiable from abeam of Square Rock. Several prominent trees, some wooden huts, together with a red-roofed bungalow on its NE side, makes Curlew Island identifiable.

A shoal, having a depth of 12.8m, lies almost 0.3 mile S of the S end of Orchid Island. A rock, which uncovers 2.1m, lies 0.3 mile E of Curlew Island. A shoal, with depths of 7.8 to 14.6m, extends about 0.6 mile NW from the NW end of Orchid Island.

**9.30 Bacon Bay** (12°57'N., 92°54'E.) is entered between Brown Point and Orchid Island, about 0.3 mile WSW. The bay is sheltered from all winds and its E part is clear of all dangers up to within 0.2 mile of the shore. A detached 13.2m patch lies about midway between Brown Point and Orchid Point.

**Anchorage.**—Anchorage can be taken in suitable depths in any part of Steward Sound. Anchorage can be taken in Bacon Bay in all seasons.

Anchorage can be taken, in depths of 14.6 to 16.5m, almost 1 mile N of Oliver Island and in the channel between Sound Island and North Andaman Island, about 2 miles N of Jones Point. These anchorages are partially open to the NE.

Vessels calling at Mayabunder Settlement, on the NW side of Takla Oyster Point, can anchor, in a depth of 18.3m, mud, with Egg Island bearing 272°, distant 0.5 mile and the S point of Orchid Island bearing 023°. Ample depths are available for anchoring elsewhere in this vicinity. Small vessels with local knowledge can anchor farther W of Dottrel Island but caution is advised.

Ample depths are available for anchoring at the head of Bacon Bay, or about 0.4 mile off the E shore.

**Directions.**—Vessels coming from the N and intending to enter by the S entrance, should pass about 0.8 mile off Square Rock and then steer for Orchid Island on a course of 284°.

Vessels proceeding to the anchorage off Mayabunder Settlement should proceed as directed above until Egg Island bears 272°, and then alter course to this bearing which will lead to the anchorage. Egg Island should not be brought to bear more than 272°, until well clear of the 3.2m patch E of Takla Oyster Point.

Vessels proceeding to the anchorage in Bacon Bay should pass about 0.8 mile off Square Rock, keeping Orchid Island bearing 284° until the summit of Aves Island bears 135°. Then a course of 315°, with Aves Island astern, leads into Bacon Bay, passing midway between Orchid Island and Brown Point. This course passes over the patch previously-mentioned 13.2m. When the summit of Ray Hill bears 050°, course can be altered for the anchorage at the head of the bay.

Vessels coming from the S should keep Ray Hill bearing 322° until Orchid Island is seen about midway between Aves Island and Jones Point, bearing 287°. The directions given above can then be followed.

**Mayabunder Settlement** (12°56'N., 92°55'E.) lies on the NW side of Takla Oyster Point.

The local district administrator resides in a conspicuous white house with a red roof on the NE side of the point. Two conspicuous high trees lie about 0.3 mile S of the house and the ruins of a sawmill lie on the NW side of the point.

A short wooden jetty, with a depth of 2.4m alongside its head, extends from the NW side of Takla Oyster Point. In 1985, the jetty was extended 57m NE.

### Middle Andaman Island and Baratang Island—East Coasts

**9.31** The coast between Cape Vestal and Cape Strachan, about 9 miles SSE, is high and clear of off-lying dangers. The latter projection forms the N entrance point of Cuthbert Bay. Mount Diavolo, 512m high, lies about 3.5 miles W of the same point. Between Cuthbert Bay and Coxon Point, about 13 miles to the S, the coast continues to be high.

**Rangat Bay** (12°29'N., 92°58'E.) is entered between Coxon Point and Johns Point, about 0.8 mile to the S. Both points are bold and bluff.

A shoal, with a depth of 7.3m near its outer end, extends about 2.3 miles E from Coxon Point. The inner part of this shoal has several detached heads, with depths which range from 3 to 4.9. A rock, which dries 1.2m, lies among these heads about 0.8 mile ENE of Coxon Point.

A drying reef extends about 0.5 mile SE from Johns Point.

Anchorage can be taken, in depths of 6.4 to 9.1m, midway between the entrance points of Rangat Bay. Local knowledge is required because the depths shoal rapidly within the entrance points.

Between Johns Point and a 117m promontory on Baratang Island, about 17 miles SSW, the coast is bordered by numerous islands and dangers and indented by many bays. Between the promontory and North Point, the SE end of Baratang Island, about 9 miles SW, the coast is indented by many reef fringed bays and backed inland by hilly terrain. North Point forms the N side of the S entrance of Andaman Strait.

**Long Island** (12°24'N., 92°57'E.) densely wooded and fringed by shoal ground, lies about 2.5 miles SSW of Johns

Point. Its W coast is joined to Middle Andaman Island by a shallow flat.

Long Island is the N of a chain of islands, reefs, and other dangers which extend S for about 15 miles from a position about 2.5 miles S of Johns Point. The islands are separated from each other, and from Middle Andaman Island and Baratang Island, by fairly narrow shoal channels. Small vessels with local knowledge can find shelter in some of these bays. Elphinstone Harbor, which provides sheltered anchorage, lies close to the E entrance of Homfray Strait, which separates Middle Andaman Island and Bartang Island.

**Guitar Island** (12°21'N., 92°55'E.) lies about 0.8 mile SSW of Long Island and is joined to Middle Andaman Island by a shallow flat. Cape Dalrymple forms the S end of an islet, 75m high, which lies close S of Guitar Island. Round Island lies about 183m W of the SW end of Guitar Island.

A shoal, with a least depth of 2.7m, lies about 0.8 mile SSE of Cape Dalrymple. A detached patch, with a least depth of 7.6m, lies about 1 mile SSE of the same cape.

**Nancowry Ledge** (12°20'N., 92°56'E.), which has depths of less than 1.8m, lies about 1.3 miles E of Cape Dalrymple.

**9.32 Anderson Rock** (12°26'N., 92°59'E.), which dries 0.3m, lies 1 mile E of the N end of Long Island.

**Campbell Shoal** (12°25'N., 93°04'E.) lies about 6 miles ESE of the N end of Long Island and has a least depth of 5.5m, rock. It lies on the E side of an irregular bank about 2.8 miles long and 1.3 miles wide, which has depths which range 16.5 to 36.6m.

**Headlam Patch** (12°24'N., 92°59'E.), with a least depth of 3.7m, lies about 2.5 miles SSE of the N end of Long Island. Depths of 5.5 to 16.5m surround this danger.

An extensive shoal, with a depth of 4.6m near its SW end and a depth of 8.2m near its NE end, lies between 5.3 and 7.8 miles E of Cape Smith, the S end of Long Island. A detached shoal, about 1 mile in extend, lies with its shallowest depth of 3.7m, about 6.3 miles ESE of Cape Smith.

**Ostmaston Shoal** (12°21'N., 92°58'E.), with a least depth of 3m, lies about 1.8 miles E of Cape Smith.

**North Passage Island** (12°16'N., 92°56'E.), irregular in shape, high, and wooded, lies 3 miles S of Long Island. Cape Portman is the NE extremity of the island. The E side of the island is fronted by dangerous foul ground which extends up to 2 miles offshore. Balfour Reef extends about 1 mile N from the NW end of the island. Merk Bay, which lies between Balfour Reef and the promontory to the E, has depths of 18.3 to 27.4m.

**Strait Island** (12°13'N., 92°56'E.) lies about 0.8 mile SSE of North Passage Island. The intervening passage between the two is foul. The N and E sides of Strait Island are fringed by reefs. Shoals and foul ground, with depths of less than 1.6m, extend up to 1.3 miles E of the island. Shoals, with depths of 3 to 4.9m, extend about 0.5 mile SSW from Cross Point, the S end of the island. A 8.7m shoal lies 2.5 miles ENE of the same point.

A light is shown on the W side and at the S end of Strait Island, close N of Cross Point.

**Colebrooke Island** (12°14'N., 92°54'E.), of irregular shape and densely wooded, lies close W of the SW part of North Passage Island.

Tidal currents in the channel between Long Island and Guitar Island, in the approach to Elphinstone Harbor, and at the various anchorages are weak. They become somewhat stronger, however, after consistent E winds. Strong tidal currents and eddies are experienced in Homfray Strait.

A channel, with depths of 6.4 to 36.6m, leads between Long Island and Guitar Island to the jetties on the SW side of the former island. A narrow channel, with depths of 6.4 to 12.8m, leads NNW to the entrance of several shallow creeks that lead into the interior of Middle Andaman Island.

**9.33 Homfray Strait** (12°15'N., 92°52'E.), an intricate rocky channel connecting Elphinstone Harbor with Port Anson, separates Middle Andaman Island from the Baratang Islands. Depths in the fairway are not less than 5m, except near the E entrance where the depths over the bar is very shallow.

The channel between North Passage Island and Strait Island is shallow and foul.

The channel between North Passage Island and Colebrooke Island is about 0.5 mile wide and has depths of 5.5 to 18.3m. Small vessels with local knowledge can use this passage which is obstructed in places by reefs and shoals.

**Colebrooke Passage** (12°13'N., 92°53'E.) is 0.2 mile wide with depths of 7.3 to 18.3m. Its N part is shallow.

**Anchorage.**—Vessels can anchor about 0.3 mile SW of the previously-mentioned jetty, in a depth of 8.2m, but the swinging room is restricted.

Anchorage can be taken, in a depth of 23.8m, good holding ground, about 10.3 miles W of Cross Point.

A sheltered anchorage with good holding ground can be taken, in a depth of 15.5m, near the S end of Colebrooke Passage, with Cape Union in line bearing 065° with the center of Middle Button Island.

**Caution.**—A depth of 3.2m lies a little over 1 mile W of Cape Union; a 5m patch lies about 0.8 mile SW of the same cape.

**9.34 Anchorage** can be taken in **Rogolochang Bay** (12°09'N., 92°50'E.), in depths of 7.3 to 9.1m, about 4 miles SSW of the S entrance of Colebrooke Passage.

A lumber camp, with a sawmill and a small woodshop, lies on the SW side of Long Island about 0.8 mile WNW of Cape Smith. A wooden jetty, with reported depths of 2.4 to 3m alongside, extends from the shore about 0.4 mile N of the camp. A trolley connects the two.

**Elphinstone Harbor** (12°18'N., 92°54'E.), which is formed by the N part of the channel which separates North Passage Island from the E side of Baratang Island, is entered between Cape Dalrymple and Cape Portman, about 1.8 miles SE. The 118m hill, which lies on the N entrance point of Homfray Strait about 2 miles WSW of Cape Dalrymple, is a useful mark. A prominent tree lies on Guitar Island. Depths in the entrance range from 7.9 to 25.6m, decreasing gradually to depths of 6.1 to 18.3m within the harbor. Numerous shoals and reefs obstruct the inner harbor, the positions of which can best be seen on the chart.

**Mills Passage** (12°15'N., 92°55'E.), between the S part of North Passage Island and Colebrooke Island, has a least width of 0.5 mile and depths of 5.5 to 18.3m. Numerous shoals and

reefs obstruct the passage which can only be used by small craft with local knowledge.

Anchorage can be taken, in a depth of 18.3m, good holding ground, about 0.3 mile off the coast of North Passage Island, with the NW point of that island bearing 029°, distant 0.5 mile.

**Diligent Strait** (12°10'N., 92°57'E.) lies between North Button Island, Middle Button Island, and the Strait Islands to the NW, and Outram Island, South Button Island, and the Wilson Islands to the SE.

Depths in the fairway of the strait range from 8.5 to 53m. The shallowest depth of 8.5 lies about 1.8 miles E of the S end of Strait Island and a 9.8m patch lies about 0.5 mile farther E.

**9.35 North Button Island** (12°19'N., 93°05'E.), 48m high and reef-fringed, lies 7.5 miles E of the NE end of North Passage Island. Low, irregular cliffs lie at its E end. The W end of the island descends abruptly to a tree-covered sand spit. Shoals, as defined by the 10m curve, extend about 1 mile E and 0.3 mile W from the island. The N side is clear of dangers, but the bottom is rocky. The E and W ends of the island should be given a wide berth when passing. A light is shown on the NW side of North Button Island.

Anchorage can be taken by small vessels with local knowledge close off the reef on the S side of the island.

**Middle Button Island** (12°17'N., 93°02'E.), 50m high, lies about 3 miles SW of North Button Island. The N end is cliffy, but the SW point terminates in a short sandspit with a few low rocks off it. Shoals, with depths of 8.2m, extend about 1.5 miles NNE from the N end of the island. A rocky ridge and shoal ground extends about the same distance SW from the island. A light is shown on the NE side of Middle Button Island.

Small vessels with local knowledge can anchor S of Middle Button Island clear of the shoals.

Outram Island, 3.5 miles S of North Button Island, will be described under the Ritchies Archipelago in paragraph 9.36.

**South Button Island** (12°13'N., 93°02'E.), about 3 miles S of Middle Button Island, is 36m high and formed of large steep-to rocks on all sides. A rocky head, with a depth of 10.1m, lies about 1 mile E and coral patch, with a depth of 3.2m, lies about 1 mile SE of the island. A light is shown from South Button Island.

**Two Fathoms Rock** (12°10'N., 92°58'E.) lies about 4.8 miles SW of South Button Island.

**Directions.**—Vessels approaching from the N should shape course, from a position about 2 miles E of North Button Island, to pass about 0.5 mile NW of South Button Island. When that island bears about 135°, course should be altered to the S until the S side of the island is in line bearing 055° with the NW extremity of Outram Island. This range should be kept on that bearing astern until the N point of Nicholson Island is seen open W of the W end of Wilson Island, bearing about 192°. Course can then be altered to pass about 1.5 miles W of the latter island.

Vessels approaching from the S side should steer for Strait Island until the S side of South Button Island is in line bearing 055° with the NW extremity of Outram Island. This range should be steered until the E end of Middle Button Island bears 022°. Course should then be altered to pass NW of South

Button Island and midway between Middle Island and North Button Island, and Outram Island.

## The Ritchies Archipelago

**9.36 The Ritchies Archipelago** (12°03'N., 93°02'E.) consists of ten islands lying between the parallels of 12°16'N. and 11°47'N, with the N end of the group being separated from Baratang Island by Diligence Strait. All of the islands are heavily wooded.

**Outram Island** (12°15'N., 93°06'E.), the N island of the group, is reef-fringed on all except its W side and contains Outram Harbor in a deep indentation along its N coast. Some low rocks lie on the reefs which fringe West Point, the W entrance point of the harbor. Shoal ground extends 0.8 mile NE from this point, and 0.6 mile NNE from East Point, the E entrance point of the harbor.

**Outram Harbor** (12°15'N., 93°06'E.) provides good shelter from S winds. Small vessels with local knowledge can anchor, in a depth of 18.3m, near the middle of the harbor, with the N end of Middle Button Island in line bearing 290° with West Point.

Charka Juru, the strait separating Outram Island from Henry Lawrence Island to the S, has considerable depths throughout its length. Shoal ground extends about 0.8 mile S from South Point, the S end of Outram Island. Once this shoal has been cleared, a mid-channel course will lead through the strait.

The W side of Henry Lawrence Island rises steeply to a ridge about 137m high. A narrow reef fringes the island.

**Kwangtung Strait** (12°06'N., 93°04'E.), the channel between Henry Lawrence Island and John Lawrence Island, has considerable depths in the fairway. The drying reefs which fringe both shores are usually visible.

Rocky Heads lie about 0.5 mile N of Briton Point, the N end of John Lawrence Island. Shoals and foul ground extend 1.5 miles NW from the NW coast of the island.

**Wilson Island** (12°08'N., 92°59'E.) lies W of the N part of John Lawrence Island and is separated from it by a narrow channel. Round Hill, which rises about 1 mile within the NW point of Wilson Island, is 216m high. Foul ground, marked by numerous coral heads, extends from the NW point of Wilson Island to Briton Point on John Lawrence Island.

**Nicholson Island** (12°06'N., 92°58'E.), separated from Wilson Island by a channel about 1 mile wide, rises to a height of 97m in its N part. The W side of the island is fringed by prominent steep-to white reefs. A reef extends about 0.3 mile S from the S end of the island. A shoal, with a depth of 3.2m, lies close S of this reef.

**Sir William Peel Island** (12°05'N., 93°00'E.), low and bordered by dense mangroves, lies 0.5 mile E of Nicholson Island. The intervening channel is available only to small craft with local knowledge. The channel between this island and Wilson Island to the N is narrow and foul.

Havelock Island is the largest of the Ritchies Archipelago. There is an L-shaped jetty, with a dolphin close SE of its head, situated at Jetty Point, the NE extremity of the island; there is a depth of 5.2m at its head.

**9.37 Tadmajuru** (12°03'N., 92°59'E.), narrow and deep, separates Sir William Peel Island from Havelock Island to the

S. Both sides of the channel are fringed by shoals which extends up to 0.2 mile offshore in places. A detached patch lies on the S side of the channel, about 0.5 mile E of Stowe Point the N end of Havelock Island. Stowe Point is marked by a beacon. Yulutang, a conspicuous hill 167m high, lies 2.8 miles SE of the point.

**Rosamund Shoal** (12°04'N., 92°58'E.), a narrow coral ledge almost awash, lies about 0.5 mile N of the N end of Havelock Island. The ledge is difficult to make out.

**Directions.**—Vessels approaching Tadmā Juru from the W, should pass S of Rosamund Shoal on a 090° course. When about 0.2 mile from the SW coast of Sir William Peel Island, course should be altered to 123°, maintaining a mid-channel course. When close to the E entrance of the strait, course should be altered to 073° toward the reef fringing the SW coast of John Lawrence Island. This steep-to reef is usually visible. When close to the edge of this reef, course should be altered to 147°, which leads along the W edge of the reef and then E of Pilot Reef, which lies 1 mile S of the S end of John Lawrence Island.

Between Stowe Point and Doone Point, about 3.8 miles SW, the W coast of Havelock Island is slightly indented by an open reef-fringed bight. Anchorage can be taken off Jalebao, about 2.3 miles SSW of Stowe Point.

Between Doone Point and the S end of Havelock Island, about 9.8 miles SE, the coastal reef extends up to 0.5 mile offshore. Havelock, 1.3 miles SE of Doone Point, is a conspicuous hill, 164m high, at the W end of a bay. White cliffs, about 27m high, line the S end of the island. Sail Rock, 6.1m high, lies close off the S end of the island and appears as a sail on some bearings.

The N side of Outram Island and Charka Juru, the channel separating it from Henry Lawrence Island, have been previously described in paragraph 9.36.

The E coast of Outram Island is fringed by a reef which extends up to 0.3 mile offshore. As previously stated, coral heads and foul ground extend about 0.8 mile S from the S end of Outram Island.

The E coast of Henry Lawrence Island is low, irregular, and bordered by dense mangroves. Reefs extend up to 1 mile offshore in places. A densely wooded islet lies on this reef about 4 miles S of the S end of Outram Island.

**9.38 Inglis Island** (12°08'N., 93°07'E.) lies about 0.8 mile E of the wooded islet and is fringed by a drying reef on all except its NW side. This reef extends up to 0.5 mile off the NE coast, where it terminates in two rocks, each about 1.2m high. Small portions of the N and S points of the island have been detached by the action of the sea and appear as islets at high tide.

**Inglis Shoals** (12°06'N., 93°08'E.), two detached coral patches with depths of 6.9m and 8.7m, lie about 0.8 mile S and 1.8 miles SSE of the S end of Inglis Island.

During NE winds, sheltered anchorage can be taken, in a depth of 12.8m, off a sandy bay, close NW of Wreck Point, the S extremity of Henry Lawrence Island.

**Tadmā Bay** (12°03'N., 93°02'E.) lies W of Runnymede Point, the S end of John Lawrence Island, and between it and Sir William Peel Island. It forms the S entrance of Paranga

Juru, a narrow channel separating the two islands. It also forms the E entrance of Tadmā Juru, which has been previously described in paragraph 9.37.

**Pilot Reef** (12°01'N., 93°02'E.), about 1 mile S of Runnymede Point, has a least depth of 2.7m. A narrow coral reef, as defined by the 10m curve, extends about 1 mile S from Pilot Reef.

Havelock Island, S of Sir William Peel Island, is reef-fringed. Foul ground extends up to 1.3 miles E from its NE coast to within a short distance of the ridge which extends S from Pilot Reef.

**Anchorage.**—Anchorage can be taken in Tadmā Bay, sheltered from all except S winds.

**Directions.**—Vessels approaching Tadmā Bay from the S and E can clear Pilot Reef and the foul ground E of Havelock Island by bringing the W extremity of Sir Hugh Rose Island bearing 173°, and just open E of the E extremity of Neill Island. When the extremity of the reef extending S from Runnymede Point is seen, course can be shaped to the NW into Tadmā Bay.

**9.39 Minerva Ledge** (12°04'N., 93°09'E.), a detached rocky ledge with a least depth of 6.9m, lies about 4.5 miles ESE of Wreck Point. It lies near the outer edge of a bank, as defined by the 40m curve, that extends about 5 miles E from the S end of Henry Lawrence Island.

**Vibart Shoal** (11°59'N., 93°08'E.), narrow and steep-to on its E side, lies centered about 6.3 miles SE of Runnymede Point. Depths over this shoal range from 16.4 to 18.3m.

**Nancowry Strait** (11°52'N., 93°03'E.), between Havelock Island and Neill Island to the S, has depths of 18.2m in the fairway. A small coral patch, with a least depth of 12.8m, lies in the W part of the strait about 0.8 mile N of the NW end of Neill Island. Vessels should pass N of this danger.

**Neill Island** (11°50'N., 93°03'E.) rises to a height of 101m at Nipple Hill, the conspicuous NE end of the island. White cliffs border the seaward face of this end of the island. A rock, 10m high, lies about 91m off this point. Some detached patches, with depths of less than 5.5m, lie off the N coast. Neill Island Pier projects NE between drying reefs on the N side of the island and is marked at its root by a flagstaff. Murugan Temple, 13m high and conspicuous, lies 0.1 mile SW of the pier. A reef extends up to 0.5 mile off the S end of the island and is usually marked by heavily breaking seas. The S point of the W coast of Neill Island is formed by dark cliffs about 12.2m high.

**Sir Hugh Rose Island** (11°47'N., 93°05'E.), the S island of the Ritches Archipelago group, lies about 2 miles SE of Neill Island and is densely wooded. The NW side of the island rises to a height of 73m. Some prominent yellow cliffs, about 24m high, border the NE point of the island.

The island has been reported to be a good radar target up to 14 miles.

Several patches, with depths of 5.5 to 11.9m, lie in the channel between Neill Island and Sir Hugh Rose Island. Vessels are advised not to use this channel because the bottom is very uneven.

Deep-draft vessels passing SW of Sir Hugh Rose Island should avoid a bank with depths of 16.5 to 18.3m, which lies between 1.5 and 2.5 miles SW of the island.

**9.40 Andaman Strait** (12°04'N., 92°47'E.), referring to the E entrance of that strait, lies between North Point, a 76m promontory forming the SE extremity of Baratang Island, and South Point, the NE extremity of South Andaman Island, about 2 miles SSW. From the 76m promontory the coast extends about 1.8 miles WSW to Entrance Hill, the N point of the inner entrance of the strait. This 30m high conical hill is conspicuous.

Andaman Strait Light is shown from the summit on North Point.

The general width of the strait ranges from 0.2 to 0.3 mile, but narrows to a width of 73m in places.

The strait has moderate depths, except for two ridges which span the strait, and over which the least depth is 5.5m. A bar, over which there are depths of 3.3 to 3.9m, obstructs the entrance from a position about 0.5 mile NE of Entrance Hill and South Point. The navigable width of the bar is about 183m. A vessel with a draft of 4m has passed through the strait. The bottom throughout is of mud and sand.

A small isolated, rocky ledge topped by a 4m high prominent rock on it, lies about 0.5 mile SE of the 76m promontory. A detached shoal, with a least depth of 2.7m, lies about 0.5 mile S of the promontory.

A coral reef, which dries in places, extends up to 0.5 mile offshore between North Point and Entrance Hill.

A ledge of drying coral extends almost 0.5 mile NE from South Point. The coast between this point, and the S point of the inner entrance of the strait about 1.5 miles W, is bordered by foul ground which extends up to 0.3 mile offshore.

**Oral Kaicha** (12°11'N., 92°46'E.), a small island which lies about midway between the E and W entrance of the strait, can be passed on either side but the E side is preferred.

Anchorage can be taken, in depths of 16.5 to 18.3m, mud, about 1.3 miles NNE of South Point.

The coast between South Point and Wedge Point, about 1.5 miles to the S, is fringed by a drying reef that extends almost 0.3 mile offshore.

**Smythe Rock** (12°03'N., 92°48'E.), the outermost danger off this section of coast, lies about 1 mile E of South Point and has a least depth of 3.2m.

Whitehouse Rock, which has a least depth of 3.7m, lies 1 mile E of Wedge Point. A shoal, with a least depth of 1.2m, lies midway between this rock and the point.

A rock, barely above water, lies 0.5 mile SE of South Point. Rocks, which dry up to 1.2m, lie about 0.4 mile N and 0.3 mile NNE of Wedge Point.

Wedge Rock, 8.5m high and prominent, lies close S of Wedge Point.

**Port Meadows** (12°01'N., 92°46'E.) is entered between Wedge Point and Cape Persain, a little over 1 mile SW. The shores of the port are reef fringed and the low land is covered with mangroves. Cape Persain is the NE extremity of a fairly high hill which lies on a promontory separated from the coast by mangroves.

**9.41 Duncan Island** (12°01'N., 92°47'E.), 90m high and densely wooded, is connected to the shore W of Wedge Point by a drying shoal.

The entrance channel, which lies between Duncan Island and Cape Persain has a least depth of 20.1m.

The E and S sides of Duncan Island are fringed by above-water and sunken rocks which extend up to 183m offshore. A prominent 5.5m high rock lies close off the SW side of the island. A drying rock lies 137m SW of this rock.

The E side of the promontory forming Cape Persain is fronted by a drying reef that extends about 0.4 mile offshore. This reef only extends about 183m offshore, E and N of Cape Persain. Some drying rocks lie on the reef.

A detached 4.5m patch lies about 0.2 mile E of Cape Persain.

A two-pronged pinnacle rock, with a least depth of 5m, lies on the S side of the approach to Port Meadows about 0.7 mile SE of the summit of Duncan Island. A dangerous wreck, marked by a buoy, lies on this rock.

The Patch, a shoal with a least depth of 7.3m, lies about 0.8 mile ESE of Cape Persain.

**Anchorage.**—Anchorage can be taken, in depths of 16.5 to 18.3m, about 0.2 mile W of the W point of Duncan Island. Anchorage can also be taken, in a depth of 14.6m, in the center of the SW part of the harbor, about 0.6 mile W of Cape Persain.

**Directions.**—Vessels should keep Cape Persain bearing 276° until the E end of Duncan Island is in line bearing 012° with Wedge Point. A course of about 292° then leads in mid-channel through the entrance. When Wedge Rock becomes visible, course can be altered to 000° for the E anchorage, or to 260° for the previously-mentioned W anchorage.

A jetty extends from the W side of the promontory, about 0.3 mile W of Cape Persain. A lumber camp lies near the inner end of the jetty.

The coast between Cape Persian and Point Crawley, about 0.8 mile S, and then to Kotara Point, about 1.5 miles farther SW, is fringed by a drying reef which extends about 0.5 mile offshore. Some drying rocks lie on this reef.

**Kotara Anchorage** (11°59'N., 92°45'E.) lies between Kotara Point and the N side of Kyd Island, about 0.8 mile to the S. This island is 237m high and rounded.

A least depth of 6.4m exists in the fairway, with depths of 8.2 to 14.6m being found in the entrance.

Anchorage can be taken, in depths of 6.4 to 7.3m, mud, about 0.5 mile SW of Kotara Point. Small vessels with local knowledge can anchor, in depths of 7.3 to 8.2m, mud, in the outer part of an inlet about 1.5 miles W of Kotara Point.

**Shoal Bay** (11°56'N., 92°47'E.) entered between the SE side of Kyd Island and Cape Masy, about 1.5 miles to the SE, is shoal over most of its area.

Depths of 6.4m are found in the narrow entrance channel decreasing to a depth of 5.5m about 1.5 miles within the entrance and to a depth of 1.8m at the entrance of Shoal Bay Creek.

The coast between Cape Masy and North Point, about 14.5 miles to the S, is bold and free from dangers. The land rises to form a broken ridge which parallels the coast at a distance of about 2 miles. Koyob, a peak which rises to a height of 459m, lies 6.8 miles N of North Point.

### **Port Blair (11°41'N., 92°45'E.)**

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**9.42** Port Blair is entered between North Point and South Point, about 2.3 miles to the S. The port consists of an inlet 4

miles long which is entered through two channels, one on each side of Ross Island. The port is divided into an exposed outer harbor and a landlocked inner harbor. The port is the headquarters of the Chief Commissioner, who is representative of the Indian Government for the Andaman Islands and the Nicobar Islands. The principal administrative offices lie at the village of Aberdeen on the S side of the harbor about 1 mile WNW of South Point. The port officer also resides at Aberdeen. Port Blair is the site of an Indian Naval Base, but has little commercial importance.

Port Blair Port Control may be contacted on VHF channels 10, 12, and 16 for port instructions.

**Winds—Weather.**—Port Blair has a mean temperature of 28°C.

**Tides—Currents.**—The currents in Port Blair are weak and are affected by the prevailing winds. The rates rarely exceed 1 knot. During the Northeast Monsoon, the current sets S and during the Southwest Monsoon it sets between N and E. Heavy seas and swells occur in the outer harbor during the Northeast Monsoon. The inner harbor is sheltered and experiences no sea or swell. The mean range of the tide is 1.4m and the spring range is 2m.

**Depths—Limitations.**—Considerable depths exist in the N entrance channel between North Point and Ross Island. A 5.2m shoal lies in this channel about 0.4 mile ESE of Atalanta Point.

Depths of over 18.3m exist in the outer harbor and depths of 5.5 to 27.4m exist in the inner harbor.

Depths at the anchorages range from 12.8 to 16.5m. Depths alongside the berths range from 2.1 to 5.8m. An examination anchorage area is shown on the chart.

**Pilotage.**—Pilotage is compulsory for vessels over 200 grt. The pilot boards 0.8 mile N of Ross Island.

**Regulations.**—Vessels should send an ETA message 48 hours and 24 hours in advance to the Deputy Conservator of Ports in advance, stating:

1. Vessel name.
2. Port of departure.
3. Destination.
4. ETA.
5. Length, beam, maximum draft, and grt.
6. Speed.
7. Number of people on board suffering from dangerous or contagious diseases, if any.
8. Type and quantity of cargo.
9. Agent's name and requirements, if any.

**Signals.**—Storm signals are displayed at the light station on Ross Island; the Indian General System is used. Further information on these storm signals may be found in Pub. 160, Sailing Directions (Planning Guide) South Atlantic Ocean and Indian Ocean under "India—Signals."

**Caution.**—A submarine exercise area is located 35 miles SSE of Port Blair. A good lookout should be exercised in this vicinity.

**9.43 Ross Island** (11°41'N., 92°46'E.) divides the entrance of Port Blair into a N channel and a S channel. The island is roughly triangular in shape and lies about 0.4 mile NE of South Point. The former residence of the Chief Commissioner lies at an elevation of 45m on the highest part of the island about 1.5

miles SSE of North Point. A dark stone building with battlements, about 17m high, lies on the N end of the island.

A reef fringes the island on all except a small part of its W side. A shoal as defined by the 6m curve, extends about 0.3 mile NW from the NW end of the island.

Storm signals are displayed from the lighthouse on the NE corner of the above-mentioned dark stone building.

The following objects on the S side of the outer part of the harbor are conspicuous:

1. The mast and tower on Atalanta Point.
2. A temple 0.8 mile S of Atalanta Point.
3. Mount Haughton, 155m high, about 1.5 miles S of Atalanta Point.
4. Flagstaff Hill Tree, with an elevation of 122m, a little over 1 mile SSW of Atalanta Point

**9.44 Port Blair—North shore.—North Point** (11°42'N., 92°46'E.) is bordered by shoal ground, as defined by the 10m curve, which extends almost 0.3 mile S from it.

North Bay, entered between North Point and Perseverance Point, almost 1 mile SW, extends about 1 mile inland and is bordered on its W and N side by foul ground. Mount Harriet, about 1.8 miles NW of North Point rises steeply to a height of 364m. Some buildings lie close to its summit.

**Semiramis Bay** (11°42'N., 92°44'E.), small and deep, is entered between Lime Kilns Point and Command Point, almost 1 mile WNW. A pier extends from the head of the bay. Command Point is 4m high; a light is shown from a white concrete tower, 6m high, on the point. A beacon lies 91m N of the light.

Command Bay lies on the W side of Command Point. The settlement of Hope Town lies at the head of the bay.

In 1982, it was reported that plans were made to construct a 180m long wharf at Hope Town to accommodate vessels up to 15,000 grt drawing 9m.

Shore Point, the W entrance point of Bamboo Flat Bay, lies about 1 mile W of Command Point. Some buildings lie at the head of the bay. A small jetty extends from the shore in the NW corner of the bay. The W shore of the bay is fringed by shoal ground which extends about 0.3 mile offshore.

**9.45 Port Blair—South shore.—Sesostris Bay** (11°40'N., 92°46'E.) is entered between South Point and Atalanta Point, about 0.8 mile NW. The bay is almost completely fouled by reefs and shoals. A 3.7m patch lies on a line joining the entrance points, about 0.3 mile SSE of Atalanta Point.

**Sesostris Shoal** (11°39'N., 92°01'E.), which consists of two coral patches with depths of 2.4m, lies about 1 mile S of the S end of Ross Island. A 5.7m patch lies close NE of the E end and a 8.5m patch lies close S of the W end of Sesostris Shoal.

**Atalanta Point** (11°40'N., 92°45'E.) is located 0.8 mile W of Ross Island; the point is fringed by a reef extending 137m offshore.

**Phoenix Bay** (11°40'N., 92°45'E.) is entered between Phoenix Point, about 0.8 mile W of Atalanta Point, and an unnamed point about 0.4 mile to the W. Blair Reef, marked by some drying rocks, extends about 0.4 mile ENE from the latter point. A 5.2m patch lies about 183m ESE of the outer extremity of Blair Reef. A conspicuous building lies on the W shore of Phoenix Bay. There are numerous wrecks in the S part of the bay.

Cholanga Jetty lies close S of Phoenix Point, with its W face 64.9m in length and having alongside depths between 3.5 and 6.1m. Fishery Jetty extends N for 0.2 mile from the S shore of Phoenix Bay with varying depths from 1m at the inner end to 8m at the head. In 1980, works were in progress for new facilities in the SE corner of the bay.

**Blair Point** (11°41'N., 92°44'E.), about 0.4 mile WNW of the W entrance point of Phoenix Bay, is fringed by a reef which extends about 0.1 mile offshore. A prominent 78m hill lies S of the point. A lighted beacon stands 0.2 mile E of the group of islets close E of the drying extremity of Blair Reef.

**Chatham Island** (11°41'N., 92°44'E.), about 0.3 mile N of Blair Point, is connected to it by a conspicuous causeway. Some buildings and a conspicuous chimney lie on the island.

Chatham Jetty lies along the N side of the island, 249m long with varying depths between 4.8m to 7.4m alongside. Wooden Jetty is situated at the SW side of the island with depths of 1.2 to 6m alongside.

**9.46 Port Blair—Inner port.**—From Chatham Island, the coast extends SW to Hood Point, and then S to Navy Point forming the E side of the inner harbor.

A conspicuous radio mast and a house lie about 0.7 mile E of Navy Point. Navy Bay lies between Navy Point and Lewis Point almost 1 mile SSW.

**Mangrove Bay** (11°41'N., 92°43'E.), which is entered between Shore Point and Dundas Point, lies directly opposite Hood Point. This shoal bay dries in its inner part. A conspicuous white tree lies on the W side of the bay, about 0.8 mile W of Shore Point.

**Ranger Flat** (11°41'N., 92°43'E.), having depths of less than 5.5m, extends about 0.5 mile SSE and 0.5 mile E from Shore Point. A 4.3m rocky patch lies almost 0.5 mile S of Shore Point. Black conical buoys are moored 0.5 mile E, 0.4 mile SE, and 0.5 mile SSW of Shore Point and mark the SE side of the flat. The N end of Chatham Island, bearing 087° and in line with Perseverance Point, leads S of Ranger Flat and N of the 3.7m rocky patch.

The head of the bay S and SW of Dundas Point is shoal and obstructed by drying flats.

**Depths—Limitations.**—There is about 348m of berthing space available, with varying depths alongside. Jetties extend from the N and SW sides of Chatham Island. The N jetty has a length of about 85m, with depths of 6.1 to 7.3m alongside. The wharf at Haddo, about 0.3 mile NE of Hood Point, has a length of 182m with depths of 8.2 to 9.4m alongside.

A tanker submarine pipeline discharge berth, marked at its outer end by a mooring buoy and a float, lies about 0.3 mile NW of Hood Point.

The E coast of South Andaman, between South Point and Chiriyā Tapu, about 11.5 miles SSW, is bold and deep, with the 185m curve lying about 2.5 miles offshore. Sesostris Shoal, the only coastal danger, has been previously described in paragraph 9.43.

**Anchorage.**—Sheltered anchorage can be taken, in depths of 11 to 12.8m, mud, about 0.5 mile WSW of Chatham Island, with the NW extremity of that island bearing 068°.

Small vessels can anchor W of Ross Island, in depths of 14.6 to 16.5m, sand, between 0.1 and 0.2 mile SW of the NW end of Ross Island. This is a fair weather anchorage.

Two black mooring buoys are positioned off the N side of Chatham Island.

Anchorage is prohibited in the vicinity of submarine cables which extend from Ross Island to the mainland and between Hood Point and Dundas Point.

**Directions.**—Vessels entering Port Blair by way of the N channel should pass about 0.5 mile N of Ross Island, and then about 0.3 mile S of Perseverance Point. Shore Point, bearing less than 293° and open the E end of Chatham Island, leads N of Blair Reef. A mid-channel course between Chatham Island and Command Point should then be steered. The NW end of Chatham Island should be rounded at a distance of about 183m and course altered to 237° which leads to the anchorage.

Vessels from S using the S entrance channel should keep Atlantic Point bearing about 313°, in line with the light on Command Point, which leads close SW of the 5.2m patch in the fairway, about 0.4 mile SE of Atalanta Point. The rear beacon should not be confused with the beacon situated on the extremity of Command Point. When South Point bears 163°, the course can be altered N to keep the point astern on that bearing. When the N extremity of Ross Island bears 090°, the course can be altered NW to pass midway between Blair Reef and Perseverance Point, and then as directed above.

Vessels bound for the anchorage W of Ross Island should approach the S entrance channel as directed above. When South Point bears 185°, the course should be altered N and the point kept on that bearing astern, which leads to the anchorage.

**Chiriyā Tapu** (11°29'N., 92°43'E.), the S end of South Andaman Island and the NE entrance point of Macpherson Strait, is a prominent bare promontory with some caves at its base. A rock, 0.3m high, lies about 0.5 mile W of the point; vessels should not pass between this rock and the point.

**9.47 Rutland Island—East coast.—Portman Bay** (11°25'N., 92°41'E.), which is open to heavy swells during the Northeast Monsoon, indents the E coast of the island. The head of the bay is shallow.

Rocks, both above and below-water, extend some distance off the S coast of Rutland Island. This coast should be given a berth of 1.5 miles when passing.

Investigator Rock, which lies off the W end of the S coast of Rutland Island, has been previously described in paragraph 9.22.

### Islands, Dangers, and Passages between Rutland Island and Little Andaman Island

**9.48 Manners Strait** (11°20'N., 92°42'E.) lies between the SE coast of Rutland Island and the Cinque Islands, about 3 miles SE. A detached shoal, with a least depth of 16.5m, lies about 4.8 miles W of the N end of North Cinque Island.

A large shoal area, with depths of 11 to 18.3m, lies with its shallowest part about 12.5 miles WSW of the N end of North Cinque Island.

Depths in the strait, seaward of the fringing dangers, range from 22 to 75m.

A shoal with a depth of 5.5m, the existence of which is doubtful, has been reported to lie 6 miles SSW from Rutland Light on the S of the island.

The **Cinque Islands** (11°17'N., 92°43'E.) are two hilly islands which are almost joined by a rocky ledge that dries 2.1m. Two summits, 154 and 145m high, form a saddle near the N end of North Cinque Island. A small, conical, bare hill, 89m high, lies near the S end of the island. A promontory projects WNW from this hill.

North Clique Island Light is shown from its N summit.

South Cinque Island, 166m high, has a 117m high conical hill near its S end.

Anchorage can be taken, in depths of 12.8 to 18.3m, coral and sand, W of the drying ledge which almost joins the two islands, with the W point of North Cinque Island bearing 349°. Small vessels can anchor off the W side of the South Cinque Island, in a depth of 23.8m, with the conical hill at its S end bearing 168°, distant 1 mile.

**Passage Island** (11°11'N., 92°41'E.), 85m high at its N end but low at its S end, lies 3.3 miles SSW of South Cinque Island. A detached rock, 1.8m high, lies about 0.3 mile N of Passage Island. A shoal, with a least depth of 11m, lies 2 miles WSW of the end of Passage Island. During spring tides, overfalls form over this shoal. Small patches, with depths of 14.6 to 18.3m, lie S and NE of this shoal.

The channel between South Cinque Island and Passage Island is deep and clear, although tide rips occur during spring tides.

**The Sisters** (11°09'N., 92°44'E.), two small islets, lie close together about 3.5 miles SE of Passage Island. A ledge connects the islets and a partly drying spit extends about 0.8 mile NW from this ledge. East Sister Island is 76m high and West Sister Island is 70.7m high.

**Duncan Passage** (11°04'N., 92°40'E.) lies between The Sisters and North Brother Island, about 10 miles SSW, and is the main channel between Little Andaman Island and Rutland Island. Depths in the fairway range from 21.9 to 36.6m.

Shoal ground, with depths of 5 to 18.3m, lies between 2 miles WNW and 3 miles NE of the N end of North Brother Island. A 12.3m patch lies about 1.5 miles E of the island.

Patches, having depths of less than 18.3m, lie between 3.3 and 6.5 miles WNW, through 7.3 miles NNW of the N point of North Brother Island.

**9.49 The Brothers** (10°59'N., 92°40'E.), two small flat-topped islands, each 27m high, lie 10 and 14.5 miles SSW of The Sisters. Each island is marked by trees and has a lagoon in the middle part. North Brother Island is fringed by a reef which extends 1.8 miles WNW from it.

Foul, unsurveyed ground lies between the two islands. Leeboard Ledge, a detached shoal, lies about midway between the two islands. Foul ground extends about 5 miles WNW and 1.5 to 2 miles NNW from South Brother Island. In the latter direction, the foul ground terminates in a reef awash which usually breaks. A reef lies SE of the island.

**Little Andaman Island** (10°42'N., 92°31'E.), the S island of the Andaman group, lies almost 28 miles S of Rutland Island. The island appears almost level from a distance, but rises gradually to a 183m summit near its center. The island is well-wooded.

The passage between Little Andaman Island and South Brother Island has not been closely examined and should be avoided.

The low N side of Little Andaman Island is indented by Bumila Creek, which is difficult to make out until close off the entrance. A breaking reef extends almost across the entrance.

Anchorage for small vessels with local knowledge can be taken about 0.4 mile N of the creek entrance, in a depth of 14.6m, coral, with the entrance bearing 158°. This anchorage should be approached from the NW because the depths to the NE are irregular. The tidal currents set E and SE at the anchorage. A strong ebb sometimes flows out of the creek.

**Jackson Creek** (10°48'N., 92°24'E.), which lies about 9 miles SW of Bumila Creek, can be identified by a conspicuous square clump of trees near the bank which falls abruptly to the waters edge. A reef appears to extend 0.8 mile N from the W entrance point of the bay into which the creek discharges.

Anchorage has been reported available, in a depth of 13.7m, about 1 mile NNW of the entrance of the creek. Some prominent, cliffy islands lie in the NE part of the bay.

The coast, between Jackson Creek and Sandy Point, the SW end of Little Andaman Island about 16 miles to the S, appears to be fringed by a reef. The coast close S of the creek is cliffy.

A conspicuous sandy patch lies about 2 miles S of the W entrance point of the creek. A rocky reef extends about 1 mile WSW from Sandy Point.

A light is shown from a round concrete tower 6 miles E of Sandy Point.

**9.50 Api Islet** (10°39'N., 92°23'E.), a good landmark, lies close offshore about 9 miles S of Jackson Creek.

A drying reef extends almost 0.8 mile offshore from the SE extremity of Little Andaman Island.

The NE coast of Little Andaman Island has not been closely examined. Hut Bay indents the SE coast of the island SE of its summit.

**Hut Bay** (10°36'N., 92°35'E.) is an open bight on the E side of Little Andaman Island. Landing can be made through a gap in the reef close S of the village of Kwate-tu-Kwage. Two breakwaters, the one on the E being angular and longer, lie 1.3 miles ESE of the village. A light is shown from the head of E breakwater. South Point, on which a beacon lies 0.3 mile E of the roof of E breakwater.

Anchorage can be taken, in a depth of 12m, about 1.3 miles E of the N beacon or, in depth of 9m, about 1 mile ESE of the S beacon.

**9.51 Ten Degree Channel** (10°22'N., 92°30'E.), which lies between Little Andaman Island and the Car Nicobar, about 77 miles to the S, is deep and clear. A depth of 7.3m was reported (1977) to lie 4 miles S of Sandy Point, the SW point of Little Andaman Island.

South Sentinel Island (paragraph 9.8) lies NW of Little Andaman Island; Dalrymple Bank (paragraph 9.7) lies SW of Little Andaman Island. Both have been previously described.

Invisible Bank (paragraph 9.7), Barren Island (paragraph 9.9), and Narcondam Island (paragraph 9.8), which lie E of the Andaman Islands, have also been previously described.

## The Nicobar Islands

**9.52 Car Nicobar** (9°15'N., 92°46'E.), the N island of the group, lies about 77 miles SSE of Little Andaman Island. The island is densely wooded, mostly coconut trees.

The island has been reported to be a good radar target up to 14 miles.

**Sawi Bay** (9°14'N., 92°45'E.) indents the NW coast, between Keating Point and Hog Point, about 3.5 miles to SW. Foul ground extends 1 mile N from Keating Point and 0.5 mile N from Hog Point. Sawi Village lies 0.5 mile SE of Hog Point. A light is shown from a concrete tower on Hog Point.

The tidal currents off Sawi Bay set NE on the flood tide.

An observation spot lies on a small promontory that extends WNW from the coast about 1 mile S of Keating Point. Keating Point Light is shown from a round metal tower on the point; a racon and a radio beacon transmit from the tower.

A light is shown from a 9m high concrete tower on Observation Point, 1 mile S of Keating Point.

A coral patch, with a least depth of 10.1m, was reported to lie about 0.7 mile NW of the observation spot. A 9.1m patch lies 0.8 mile WNW of the same spot.

Anchorage can be taken, in a depth of 21.9m, rock and coral over a thin layer of sand, about 0.8 mile N of Sawi Village. Anchorage can also be taken in similar depths just over 1 mile W of the observation spot. Small vessels with local knowledge can anchor closer inshore off the observation spot.

**Arong Village** (9°09'N., 92°43'E.) lies 3 miles S of Hog Point. Anchorage can be taken about 0.5 mile W of the village, in depths of 16.5 to 20.1m. Vessels should approach the anchorage with the village bearing 090°.

**9.53 Kemois Bay** (9°07'N., 92°46'E.) is a slight indentation on the S side of the island. Kemois Village, fronted by a beach, lies close W of a well-defined entrance of a creek. A village lies close E of this entrance. A reef is reported to lie about 0.2 mile offshore.

The tidal currents set ESE on the flood at a rate of 3 knots at springs and in the opposite direction on the ebb. Small vessels with local knowledge can anchor, in depths of 18.3 to 21.9m, about midway between the two villages.

**Kakana** (9°07'N., 92°48'E.), a small village, lies about 2 miles SW of the SE end of Car Nicobar.

**Mus** (9°14'N., 92°47'E.), the principal village on the island and the residence of the Assistant Commissioner, lies 0.8 mile SE of Keating Point. The village lies at the head of a small inlet; the village of Lapate lies 1 mile farther SE. A flagstaff lies in the village of Mus.

Anchorage can be taken off Mus, in a depth of 13.7m, about 0.4 mile offshore, with the NE extremity of Car Nicobar bearing 284°. Vessels may drag anchor because of the strong currents at springs.

Vessels can anchor about 0.5 mile NE of Lapate Village, in a depth of 21.9m.

Tamalu and Perka are villages situated 4.8 and 5 miles SSE of Keating Point.

Anchorage can be taken, in a depth of 25.6m, about 0.5 mile offshore of either village.

**Malacca Village** (9°10'N., 92°49'E.) lies on the S side of a small bight, about 6 miles SE of Keating Point. A small mason-

ry jetty, which dries completely at LW, serves as a good landmark. Two groups of beehive-shaped huts stand close N and S of the jetty and lie out clearly in contrast to the jungle. A conspicuous two-storied house, painted white and green with a red roof, stands about 0.3 mile SSE of the jetty. A beacon stands close SE of the two-storied house. Two flagstuffs stand near the jetty; two more stand in the village.

A dangerous reef extends offshore close N of the jetty. Stranded wrecks lie on this reef within 0.3 mile N and S of the jetty head.

**9.54** The Nicobar Islands extend about 160 miles SSE from Car Nicobar, the N island of the group. These islands are a dependency of the Andaman Islands and are administered by the Assistant Commissioner who resides at Mus, Car Nicobar. The islands range from hilly and undulating to mountainous and volcanic. There are few rivers.

The Nicobar Islands are usually divided into three groups. The N group consists of Car Nicobar and Batti Malv Island. The S group consists of Great Nicobar Island and Little Nicobar Island, together with their off-lying islets. The central group includes all the remaining islands of the Nicobar Islands. Nancowry Harbor, between the islands of Camotra, Nancowry, and Trinkat, is perhaps the most important and best sheltered harbor.

The channels between the groups of islands and between the individual islands have irregular depths, but are for the most part deep and clear of dangers.

## The Nicobar Islands—North Group

**9.55** Car Nicobar, the N island of the group, has been previously described in paragraph 9.52.

**Batti Malv Island** (8°50'N., 92°51'E.), which lies about 17 miles SSE of Car Nicobar, appears wedge-shaped from the offing. This very small island rises to a densely wooded peak about 73m high. The NW end of the island is low, but rocky cliffs lie on the other sides. Reefs appear to extend 0.5 mile off the NW, SW, and SE sides of the island. The 40m curve surrounding the island lies up to 5 miles SE and 2.8 miles N of the island. A light is shown from a metal framework tower, 12m high, on the N side of Batti Malv.

Batti Malv Island has been reported to be a good radar target up to 11 miles.

**Chowra Island** (8°27'N., 93°04'E.), which lies about 24 miles SSE of Batti Malv Island, is generally low but rises to a 104.5m high rocky pinnacle at its S end. The island looks like a hat from the offing. Sanenya, the principal village, lies on the NE coast.

Chowra Island has been reported to be a good radar target up to 23 miles.

Reefs extend about 1.5 miles from the NW side of the island. A shoal, with a least depth of 2.4m, lies between 2.5 miles NW and 4 miles NNW of the N point of Chowra Island. Depths of 16.5 to 18.3m are found between the shoal and the island reef.

Anchorage can be taken, in depths of 16.5 to 18.3m, abreast of Sanenya Village.

**Tillanchong Island** (8°31'N., 93°38'E.) lies with Cape Winifred, its S end, about 34 miles E of Chowra Island. Maharani Peak, the highest of several peaks forming a jagged ridge along

the length of the island, lies in the center of the island and attains an elevation of 322m.

Tillanchong Island has been reported to be a good radar target up to 17 miles.

**Païra Rock** (8°35'N., 93°36'E.), 107m high, lies 0.5 mile NNW of Cape Maud, the N extremity of the island. Several detached rocks lie up to 1 mile off the W side of the island.

**Isle of Man** (8°24'N., 93°39'E.), a detached rock 123m high, lies about 2.8 miles SE of Cape Winifred. A chain of needle-like rocks lie between this rock and the cape.

Paria Rock has been reported to be a good radar target up to 19 miles.

An unexamined detached shoal, with a least depth of 20.1m, lies about 9.5 miles SW of Cape Winifred.

**9.56 Castle Bay** (8°27'N., 93°38'E.), which lies on the SE coast of the island about 2 miles N of Cape Winifred, is deep and clear in its central part.

A rock awash lies about 0.3 mile S of Castle Bay Point, the N entrance point of the bay. Foul ground, with depths of less than 9.1m, extends about 0.2 mile S from the rock. A dangerous wreck lies in shoal water about 0.3 mile SSW of Castle Bay Point.

During fair weather, anchorage can be taken, in depths of 25.6 to 27.4m, with Castle Bay Point bearing 062°, distant about 0.5 mile.

**Teressa Island** (8°18'N., 93°07'E.), roughly crescent-shaped and low in its central part, lies 6.5 miles SE of Chowra Island. It appears as two separate islands from the offing. The N end of the island is 27m high. Hinam Village lies 4.5 miles SSE of the N summit and is only visible from seaward on a NE bearing. Laksi Village, which consists of some huts amongst the trees, lies 4 miles SE of Hinam Village. The village is hard to identify from seaward. Bengala Village lies on the E side of the island about 2 miles S of its NE extremity. Karawa Village lies 3.5 miles farther S.

Reefs extend over 1 mile from the N and S ends of the island, but less off the W coast.

Teressa Island has been reported to be a good radar target up to 25 miles.

Anchorage can be taken by small vessels with local knowledge close off Hinam Village, in depths of 11 to 25.6m. Small vessels can also anchor, in a depth of 25.6m, coral and coarse sand, SSW of Laksi Village, about 0.5 mile seaward of the coastal reef.

Small vessels with local knowledge sometimes anchor, in a depth of 45.7m, about 0.5 mile off Bengala Village, with the NE end of the island bearing 006°, the E end bearing 146°, and the N end of Bompoka Island bearing 115°. This is a fair weather anchorage.

**Bompoka Island** (8°14'N., 93°14'E.) lies 1.8 miles NE of the SE tip of Teressa Island and is 208m high. The intervening channel seaward of the fringing dangers is deep. Poahat Village lies on the W side of the island.

Small vessels with local knowledge can anchor about 0.3 mile offshore with the village in range 040° with the N peak of the island. Seaward of this position the depths decrease rapidly and caution is advised.

**9.57 Camorta Island** (8°09'N., 93°29'E.), separated from Tillanchong Island to the NNE by a channel about 12 miles wide, is very irregular in shape and hilly. A 52m hill lies close to the NE end of the island; a 186m high hill lies 1 mile N of the S end of the island. A 132m hill lies at the SE end of a range of hills that extends 4 miles SE from a position 1 mile SE of the NW end of the island. Mount Edgecumbe, a tree-covered hill 109m high, lies about 4.3 miles N of the S end of the island.

Several villages and huts lie along the shores of the island.

The W coast is indented by bays which form Dring Harbor and Expedition Harbor. Nancowry Island lies close S of and overlaps the S end of Camorta Island. Nancowry Harbor, a secure, land-locked inlet, lies between them.

The NE coast of Camorta Island has not been closely examined. The SE side of the island is separated from Trinkat Island by Beresford Channel. The E entrance of Nancowry Harbor lies between the SE end of Camorta Island and the NE end of Nancowry Island. The approach to this entrance leads through Beresford Channel.

A coral bank, with depths of 25.6 to 27.4m, lies about 6 miles ENE of Horace Point, the N extremity of Camorta Island.

**Tides—Currents.**—The tidal currents off the E coast of Camorta Island, between a position about 2 miles WNW of the NW end of that island and a position between the entrances of Expedition and Nancowry Harbors, set S on the flood and N on the ebb. At springs, the N current attains a rate of 3 knots about 2 to 3 miles offshore. The S current attains a rate of 0.8 to 1.3 knots. At neaps, the N current attains a rate of 0.8 to 1.3 knots and the S current a rate of 0.3 to 0.8 knot.

At springs, tide rips frequently occur at various places all along the coast at variable distances offshore.

The W coast of Camorta Island, between Horace Point and Kai-hoa Village, almost 3.8 miles SW, is reef-fringed up to 0.5 mile offshore. From the village the coast extends SW for 1.3 miles and then S for 7.5 miles to Cave Point, the N entrance point of Expedition Harbor. Dring Harbor, which is available only to boats, is entered 2.3 miles N of Cave Point.

A 22m shoal lies about 6.5 miles NW of Cave Point.

The coast, between Satellite Point, the S entrance point of Expedition Harbor, and Reef Point, the S extremity of the island, is fringed by a narrow reef. This latter point is the N entrance point of the W entrance of Nancowry Harbor.

**Perseus Reef** (8°10'N., 93°27'E.) extends about 0.8 mile W from the NW end of the island. A shoal, as defined by the 20m curve, extends about 1.8 miles NW from the same point.

**9.58 Sanderson Rock** (8°07'N., 93°27'E.), which has a least depth of 1.5m, lies about 2.3 miles NW of the entrance of Dring Harbor. The rock lies near the W extremity of a shallow shoal that extends 10.3 miles offshore.

A rocky shoal, with a least depth of 8.2m, lies 0.5 mile offshore about midway between the entrances of Dring Harbor and Expedition Harbor.

Temporary anchorage can be taken almost anywhere off the W coast of Camorta Island, N of Exposition Harbor, in depths of 18.3 to 36.6m, poor holding ground. Vessels anchoring S of the harbor are advised to anchor in depths of 36.6m.

Vessels can anchor off Kai-hoa Village, in depths of 12.8 to 16.5m, about 1 mile offshore. Perseus Reef provides no protection during the Southwest Monsoon.

Anchorage can be taken, in a depth of 17.4m, off the entrance of Dring Harbor, about 0.7 mile W of the S entrance point, with that point bearing 089° and in line with a 64m hill near the head of the harbor. This is considered to be the best anchorage off this coast, because there is little or no current.

From the NE point of Camorta Island, about 1.5 miles E of Horace Point, the E coast of the island curves SSW and then SSE in a wide curve for about 8.5 miles and then S for 3.5 miles to Naval Point. A beacon lies about 0.8 mile N of this point. This point forms the N side of the E entrance of Nancowry Harbor. An L-shaped jetty extends from a position close WNW of Naval Point, and has a depth of about 11m at its seaward end. A reef extends up to 1 mile offshore along this entire stretch of coast except off Moshoit Village, where it lies only 0.3 mile off. The village lies about 4 miles SSW of the NE point of the island. This coastal reef is easily seen under favorable light conditions.

Caution is necessary when approaching this coast between the NE end of Camorta Island and the N entrance of Beresford Channel, because this area has not been closely examined.

**Trinkat Island** (8°05'N., 93°35'E.), which lies between 1.5 and 2.5 miles E of the S part of Camorta Island, is separated from that island to the W and NW by False Bay and Beresford Channel. Trinkat Island is low, level, and covered by coconut trees. An extensive reef surrounds the island. Morrel Point, the S end of the island, is marked by a beacon.

**Beresford Channel** (8°07'N., 93°33'E.) is entered from the S through False Bay. Both shores are fronted by reefs and shoals that extend almost 0.8 mile offshore. A number of shoals, with depths of 5.5 to 11m, lie in the middle of the S part of the channel. The channel on both sides of Middle Reef, which lies about 3.5 miles NNW of Morrel Point, is about 183m wide. The W channel has depths of 7.6 to 25.6m and the E channel has depths of 5.8 to 20.1m. The area N of Trinkat Island has not been closely examined.

## Expedition Harbor and Grand Harbor

**9.59 Expedition Harbor** (8°03'N., 93°30'E.) is landlocked and, together with Grand Harbor, its extension to the NE, is of considerable size. A low, narrow peninsula separates Expedition Harbor from Nancowry Harbor to the S. The entrance of Expedition Harbor lies between Cave Point and Satellite Point, about 0.3 mile SSE.

The S and E sides of the harbor are indented by coves, and are fringed by reefs and mangroves. Hoau Village lies about 0.3 mile ESE of Edgumbe Point. The latter point lies a little over 1 mile NE of Satellite Point. The coast from Edgumbe Point extends E and N to Edye Point, about 0.9 mile NNE, the S entrance point of Grand Harbor.

**Wasp Point** (8°03'N., 93°29'E.) lies about 0.3 mile SE of Cave Point and forms the inner entrance point of the harbor. The coast from Wasp Point extends NNE for 0.7 mile to Devils Point, then N and NE for about 1.3 miles to the N entrance point of Grand Harbor. A conspicuous palm tree lies close N of this point.

Grand Harbor is entered between Edye Point, the N end of the promontory separating Grand Harbor from Expedition Harbor, and a point about 0.3 mile to the N. The harbor is about 2 miles long in a N and S direction. Two creeks indent the E shore. The bay at the N of the harbor is foul.

**Depths—Limitations.**—Coral patches, which dry 1.2m, lie 0.2 mile SSE of Cave Point.

A channel, about 91m wide and having depths of over 18.3m, forms the inner entrance of Expedition Harbor, between the reefs fringing Wasp Point and Satellite Point. The channel passes about 91m N of the latter point.

Middle Reef, an extensive drying shoal, lies in the middle of the fairway, abreast of Devils Point. A channel, about 183m wide and having depths of 12.4m, leads between the SE end of Middle Reef and the reef fringing Edgumbe Point.

A drying reef extends 0.2 mile SE from Foul Point, about 0.5 mile NE of Devils Point. A channel, about 183m wide with a least depth of 23.8m, leads between the SW end of this reef and the N end of Middle Reef.

Grand Harbor has depths of 7.3 to 14.6m in its middle part. Foul ground extends up to 0.3 mile off the salient points.

**Anchorage.**—Vessels can anchor, in 18.3m, mud, with Devils Point bearing 340°, distant 0.3 mile. Vessels intending to stay are advised to use Nancowry Harbor, because of the swarms of mosquitoes which infest this anchorage.

**Directions.**—Vessels wishing to enter Expedition Harbor are advised to wait until the sun is high, and is possible to enter at LW, when all the fringing reefs and dangers are visible. Vessels approaching from the N or S should keep at least 1 mile off the coast until abeam of the entrance. When Hoare Village opens out in the entrance and bears 071°, vessels should alter course to this heading taking care to avoid the fringing dangers on both sides of the channel. When Devils Point bears 000°, course can be altered to the NNE which leads to the recommended anchorage.

Vessels not having local knowledge should not proceed above Devils Point into Grand Harbor until the N end of Middle Reef and the SW end of the drying reef fringing Foul Point are clearly visible.

## Nancowry Harbor (8°01'N., 93°31'E.)

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**9.60 Nancowry Harbor** lies between the S coast of Camorta Island and the N coast of Nancowry Island. This spacious, landlocked harbor is deeply indented by several bays and inlets. The harbor can be entered by deep-draft vessels either through the E or W entrance during either monsoon to take sheltered anchorage. Both entrances are readily identified from the offing. The harbor consists of four bays, Satellite Bay and Fort Bay on the N side, and Wasp Bay and Spiteful Bay on the S side. Cross Harbor lies between Fort Bay to the N and Spiteful Bay to the S.

Nancowry Harbor has been reported to be a good radar target up to 25 miles.

**Tides—Currents.**—The tidal currents set E on the flood and W on the ebb. These currents have considerable strength in the entrances, but are very weak within the harbor. Between Man

Point and Indian Point the currents are very strong on both tides.

**Depths—Limitations.**—The depths in the W entrance are over 18.3m and the depths in the E entrance range from 11 to 42m. A depth of 22m exists in the three recommended anchorage areas.

Although providing excellent shelter for all types of vessels, the harbor has few facilities. The residence of the Government Agent lies about 0.3 mile WNW of Naval Point.

A stone jetty, 119m long, with wooden extension projecting about 100m SW and W from its head, lies about 0.3 mile WNW of Naval Point. There are depths of about 11m at the outer end of the jetty. The approach to the jetty requires much attention as there are shoals and rocks in the vicinity.

A wooden jetty, 72m long and 6.1m wide, extends in a W direction from the shore about 0.2 mile SSW of Mayo Point.

The W entrance of the harbor lies between Reef Point and Man Point on the N side and Burleigh Rock and Indian Point on the S side. The latter point, which forms the NW extremity of Nancowry Island, lies NE of Burleigh Rock. The W entrance can be identified by vessels up to 5 miles offshore by the trend of the coast inland to form its S side. Reef Point can be identified by a white mark on it and would otherwise be very difficult to identify. This mark cannot be relied on. Man Point is also difficult to identify. There is a least depth of 11.9m in the fairway of the entrance which is about 183m between the dangers on each side.

**Northbrook Patch** (7°59'N., 93°29'E.), which has a least depth of 3m, lies about 0.3 mile SSW of Reef Point. Shoal patches lie between this danger and the coast to the W of the point.

Burleigh Rock, 7.3m high and topped by a wooded summit, is joined to the SE by a reef. Foul ground extends about 137m NW and 91m N from the rock. A patch, with a depth of 7.6m, lies 0.2 mile SSW of the rock.

The approach to the E entrance lies between Morrel Point, the S extremity of Trinkat Island to the NE, and Laire and Reid Points to the SW. The latter two points lie on the NE coast of Nancowry Island. Trinkat Island is easily distinguished from Camorta Island, which is higher and more open.

A disc beacon lies on Reid Point and a similar beacon lies about 91m NNW of Morrel Point.

The coast between Laire Point and Reid Point is fronted by an extensive reef which extends up to 0.5 mile offshore. The edge of this reef, except at HW and on very calm days, is marked by breakers.

A shoal, with a least depth of 4.9m lies on the edge of the shore bank, about 0.4 mile ENE of Reid Point. A 9.8m patch lies near the center of the channel about 0.5 mile NE of the same point.

**Eastern Shoals** (8°02'N., 93°34'E.), a large shoal area with depths of less than 11m, extends from 1 mile SSW to 1 mile WSW of Morrel Point. Depths of 7.6 and 8.5m lie close within the outer edge of Eastern Shoals.

The dangers N of an imaginary line joining Naval Point and Marrel Point have been previously described with Beresford Channel in paragraph 9.58.

The E entrance of Nancowry Harbor lies between Naval Point to the N, and between Reid and Mayo Points to the S. A beacon lies on Mayo Point.

Naval Point Light is shown from a structure 0.2 mile S of **Naval Point** (8°02'N., 93°22'E.).

The entrance channel, which is about 0.2 mile wide between the fringing dangers on either side, has a least depth of 11m.

Shoal ground, as defined by the 10m curve, extends up to 0.3 mile ESE and about 0.3 mile S from Naval Point.

The shore bank, as defined by the 10m curve, lies between Reid and Mayo Points and extends up to 0.3 mile offshore about midway between them.

A detached 7.3m shoal lies 0.3 mile NW of Reid Point, close off the above bank.

A white metal beacon with a ball topmark lies about 0.2 mile S of Naval Point near the edge of the reef. A similar beacon lies 1 mile N of the same point on the edge of the shore reef.

**Wasp Bay** (8°00'N., 93°31'E.), which forms the SW part of Nancowry Harbor, lies between the W entrance and an imaginary line drawn between Easter Point and Leda Point to the ENE. Itoe Village, which lies on the E shore of the bay about 0.5 mile S of Leda Point, serves as a good mark.

Wasp Bay has depths of over 18.3m in its central part, but is fouled by some dangers and irregular depths around its shores.

A shoal, with a least depth of 2.4m, lies 0.2 mile offshore about 0.5 mile NNE of Man Point, which lies 0.3 ENE of Reed Point. A shoal, with a least depth of 9.8m, lies about 0.7 mile NE of the same point. Foul ground, with depths of less than 11m, extends 0.3 mile SE and 0.5 mile ENE from Easter Point.

A drying rock lies in the E part of the bay, a little over 1 mile SSW of Leda Point and about 0.3 mile offshore. Shoals, with depths of 4.9 to 12m, lie between this rock and the shore reef.

**Alfrey Shoal** (8°01'N., 93°31'E.), having a depth of 9.7m, lies almost in mid-channel, a little over 0.5 mile SW of Leda Point.

**Satellite Bay** (8°02'N., 93°30'E.), which forms the NW part of Nancowry Harbor, is entered between Easter Point and Alfred Point, about 1.3 miles NE. Alfred Point has been reported to be a good radar target up to 21 miles.

A deep channel, about 0.3 mile wide, leads between the W side of Alfrey Shoal and the E side of the foul ground, which extends 0.5 mile ENE from Easter Point. Depths of 16.5 to 31.1m exist in the outer part of the bay.

**Satellite Patch** (8°01'N., 93°30'E.), which lies about 0.7 mile SW of Alfred Point, has a least depth of 4.1m. A 6.4m patch lies about 183m S of this patch, and shoal patches, with depths of 5.5 to 11m, lie between Satellite Patch and the coast to the N and NW.

Shoal ground, as defined by the 11m curve, extends 0.3 mile SSW from Alfred Point and 0.3 mile NW and N from Leda Point.

**Cross Harbor** (8°02'N., 93°32'E.) is entered from the W between Alfred and Leda Points and from the E between Naval and Mayo Points. Depths in the harbor area range from 21.9 to 53.1m, mud.

**Fort Bay** (8°02'N., 93°31'E.), entered between Alfred Point and Ray Point about 1 mile ENE, recedes about 0.8 mile NNW. The latter point can be identified by two radio masts which lie 0.2 mile to the NE. Battery Point, which lies 0.2 mile NW of Ray Point, can be identified by a conspicuous clump of casuarina trees about the same distance to the N. A flag staff lies close NE of Ray Point.

Depths in the bay range from 14.6 to 23.8m in its central part, shoaling gradually to the coastal reef which fringes its shores. A wreck, with a depth of 14.6m, lies about 0.3 mile W of Ray Point.

**Spiteful Bay** (8°01'N., 93°32'E.), the SE part of Nancowry Harbor, is entered between Mayo Point and Leda Point. A village lies on the E shore of the bay, about 0.3 mile S of Mayo Point.

A 5.5m patch lies about in the middle of the entrance, about 0.3 mile ENE of Leda Point.

Depths of 16.5 to 23.8m are found in the outer part of the bay, shoaling gradually to the drying flats at its head. Shoals on the W side of the bay extend up to 0.3 mile offshore.

**Anchorage.**—There is an outer anchorage about 1 mile E of **Naval Point** (8°02'N., 93°22'E.). The depth is 21.9m and the holding ground is good. A long scope of chain is advisable as the squalls off the land are sometimes heavy. The anchorage is otherwise sheltered.

Excellent anchorage is provided in the outer part of Fort Bay, in a depth of 21.9m, mud, with the previously-mentioned conspicuous clump of trees bearing about 075°, distant 0.3 mile. The previously-mentioned wreck should be given a wide berth. This anchorage is sheltered and little current is experienced.

Anchorage can be taken in the middle of the entrance of Spiteful Bay, in a depth of 21.9m. This anchorage is somewhat exposed to the sea breezes.

Anchorage can be taken in the fairway of the E entrance of Nancowry Harbor, in convenient depths, on a line joining the stone jetty and the village of Mala about 0.2 mile SSW of Mayo Point.

**Directions.—West entrance.**—Vessels should approach the W entrance from the SW in order to avoid the dangers extending SSW from Reef Point and terminating in Northbrook Patch. The conspicuous clump of casuarina trees near Battery Point, midway between Man and Indian points, bearing about 039°, leads SE of Northbrook Patch. When Reef Point bears 000°, steer on that bearing until Burleigh Rock bears 090°. Then gradually alter course to the NE, avoiding the foul ground which extends NW from Burleigh Rock, and course shaped to pass midway between Man Point and Indian Point. In passing between these points, vessels should have good steerage way as the currents are strong and there are many eddies.

After passing Man Point, the course should be altered to about 051°, and when about 0.8 mile off the village, course should be altered N, passing close W of Alfrey Shoal and E of the 4.8m shoal, about 0.3 mile W of Alfrey Shoal.

When Mayo Point bears about 080° and is open N of Leda Point, alter course should be altered E and the radio masts NE of Ray Point should be steered for on a course of 055°. This course leads between the dangers extending from Leda and Alfred Points and into Fort Bay where anchorage can be taken as convenient.

**East entrance.**—Vessels approaching the E entrance should keep Reid Point bearing 281° and in line with Alfred Point. This course leads S of Easter Point. When the right tangent of Trinkat Island bears 034°, the course should be altered N to bring Bay Point Beacon to bear 309° and kept on that bearing which leads NE of the reef fronting the coast between Laire and Reid Points.

When Mayo Point bears 261°, the course should be altered to 268° to pass midway between Naval Point and the N shore of Nancowry Island, about 0.5 mile S. This track passes 183m S of a shoal with 5.8m of water above, located 0.5 mile SE of Naval Point and 0.2 mile N of another shoal with a depth of 6.7m on the S side of the entrance. When clear of Mayo Point, alter course to the N to clear the spit extending NW from Mayo Point. Anchorage can be taken, as convenient, in Fort Bay.

## The Nicobar Islands—Central Group

**9.61 Katchall Island** (7°56'N., 93°22'E.) is separated from Camorta Island and Nancowry Island to the NE by Revello Channel, which is about 3.8 miles wide and apparently free from dangers, except for a detached 12.8m patch which lies about 4.5 miles NE of the SE end of Katchall Island. The island is densely wooded and rises to a height of 254m in its central part.

Katchall Island has been reported to be a good radar target up to 18 miles.

Depths off the W side of the island are very irregular. Some 16.5 to 18.3m patches lie up to 4 miles off this coast.

**West Bay** (7°55'N., 93°20'E.) deeply indents the W side of the island and is foul in its inner reaches. It has been reported that a SW swell occasionally sets into the bay during the Northeast Monsoon and that the tidal currents attain a rate of 2 knots across the entrance. A light is shown from a concrete tower, 11m high, situated on the N entrance point of West Bay.

Vessels with local knowledge can anchor, in a depth of 16.5m, about 1 mile SSW of the NW entrance point.

**South Bay** (7°53'N., 93°24'E.) indents the S coast of the island close W of its S end. The bay should not be entered because of the rocks and foul ground found within its limits. It has been reported that Cape Albany, the S end of the island, had extended 0.2 mile farther S than charted.

**East Bay** (7°59'N., 93°25'E.), backed by steep cliffs and Katchall Peak, indents the NE side of the island. Numerous rocks and foul ground encumber the bay and lie up to 1.5 miles off its shores. The depths in the bay range from less than 1m to more than 36.6m. A light is shown from a square tower, 9m high, situated on the N entrance point of East Bay.

**Hoinipoh Bay** (7°58'N., 93°26'E.), a slight indentation, lies close S of the S entrance point of East Bay. Anchorage can be taken, in depths of 21.9 to 23.8m, with a conspicuous hut in the village bearing 256°, distant 0.5 mile. The bay is often visited by trading vessels.

## Sombrero Channel

**9.62 Sombrero Channel** (7°41'N., 93°36'E.) separates the central and S groups of the Nicobar Islands. The channel is 30 miles wide between Cape Albany and Sombrero Point, the N extremity of Little Nicobar Island. The depths in the channel are irregular, but there is deep water in mid-channel.

Strong tidal currents set through this channel.

A yellow, clay patch, with a depth of 21.9m, lies in the W approach to Sombrero Channel about 12 miles WSW of Cape Albany. Shoal patches may exist in this area.

A detached coral bank, which shoals to a depth of 16.5m at its N end about 3 miles SSE of Cape Albany, is roughly 9 miles long and 5 miles wide. Depths elsewhere on this bank range from 20.1 to 31.1m. This bank has been reported to be extending to the W.

**Miroe Island** (7°31'N., 93°32'E.), low and small, lies 10.5 miles WNW of Sombrero Point. The island has been reported to be a good radar target up to 19 miles.

**Trak Island** (7°28'N., 93°37'E.) lies 5 miles WNW of Sombrero Point; Treis Island lies 1 mile SE of Trak Island. Both islands are small, reef-fringed, and surrounded by sunken rocks. A rock, which has a depth of less than 1.8m, lies about midway between Treis Island and Sombrero Point.

## The Nicobar Islands—South Group

**9.63 Little Nicobar Island** (7°20'N., 93°42'E.) is densely wooded, with Mount Deoban rising to a height of 413m on the central part, and the Empress Peak rising to 401m on the NE part of the island.

Little Nicobar Island has been reported to be a good radar target up to 23 miles.

The NW coast between Sombrero Point and Pahua, about 6 miles SW and then about 7.5 miles S to Cape Edinburg, is fringed by a reef which extends up to 0.5 mile offshore.

**Pulo Milo** (7°24'N., 93°42'E.) lies about midway between Sombrero Point and Pahua, in the bight formed by these two places. Two 5.5m patches lie in the channel between Pulo Milo and the coast of Little Nicobar Island, about 0.8 mile ENE and 0.7 mile ESE of the N end of Pulo Milo. A light is shown from a structure on the NE point of Pulo Milo.

The channel separating Pulo Milo from Little Nicobar Island is about 0.4 mile wide, but is narrower on the S side where the channel has not been closely examined. Depths of less than 11m lie within 0.4 mile of Little Nicobar Island, E of Pulo Milo.

A 18.3m patch lies about 13 miles W of Pulo Milo. Depths of 11.4m and 15.5m lie 2.5 and 5 miles W of Pulo Milo.

Anchorage can be taken in the channel between Pulo Milo and Little Nicobar Island, in depths of 16.5 to 23.8m, sand and coral. This anchorage is sheltered.

**Ileya** (7°25'N., 93°42'E.), a small village, lies on the NE coast about 1.5 miles SSE of Sombrero Point. A small drying patch lies close E of the village.

**Menchal Island** (7°24'N., 93°45'E.), small in extent and reef-fringed, lies 4 miles SE of Sombrero Point and 1.3 miles off the NE coast of Little Nicobar Island. A depth of 11.9m exists in the intervening channel, but less depths may exist.

Anchorage can be taken by vessels with local knowledge, during periods of fair weather, in depths of 11 to 12.8m, about 0.5 mile SW of Menchal Island. The tidal currents have been reported to be strong, especially at springs.

The SE coast of Little Nicobar Island, which forms the NW side of St. Georges Channel, is fairly steep-to.

## Great Nicobar Island

**9.64 Great Nicobar Island** (7°00'N., 93°49'E.), the S and largest of the Nicobar Islands, is well-wooded and fertile. Its NW end lies about 4 miles SSE of Little Nicobar Island.

The island rises to considerable heights throughout its length and is marked by steep-sided mountains covered by dense jungle growth. Mount Thuillier rises to a height of 642m in the NE part of the S end of the island. A second ridge extends W from this peak and a third ridge extends SW from a position near the center of the main ridge.

Great Nicobar Island has been reported to be a good radar target up to 23 miles.

**Caution.**—The coast of the island appears to be reef-fringed on all sides. The edge of the submarine plateau, from which the island rises, has not been clearly defined. It apparently extends a considerable distance W from the coast. The W coast of the island, which is fully exposed to the Southwest Monsoon, has not been closely examined. Vessels are advised to use caution when approaching the island.

A detached 18.3m shoal lies about 19 miles SW of the S end of Great Nicobar Island. A detached 17.7m patch was reported (1975) to lie about 11.8 miles SSW of the same point. The position of this latter depth is approximate.

**9.65** Between the NW point of Great Nicobar Island and the NW entrance point of Ganges Harbor, almost 5 miles ENE, the coast is slightly indented and reef fringed. A 6.4m shoal lies 1.5 miles off the N coast of Great Nicobar Island about 1.8 miles E of the N end of Kondul Island. A 0.9m patch lies about 2 miles farther E.

**Kondul Island** (7°13'N., 93°43'E.), high and rocky on its N side, rises to a height of 122m.

**Caution.**—Caution is advised when approaching Kondul Island and the adjacent coast because uncharted dangers may exist. Less depths than charted have been reported to lie W of this island and may extend for a considerable distance offshore. A rock, with a least depth of 1.8m, lies 0.7 mile W of the S end of the island.

**9.66 Kondul Harbor** (Pryce Channel) (7°12'N., 93°43'E.) is formed by the S side of Kondul Island and a bight in the NW coast of Great Nicobar Island. A radio station is situated in Mayaiya Village, about 0.3 mile N of the S part of Kondul Island.

A 4.6m shoal, which has not been closely examined, lies about 0.8 mile SSE of the SE end of the island.

**Ganges Harbor** (7°13'N., 93°48'E.), which lies in a bight on the N coast of Great Nicobar Island about 5 miles E of Kondul Island, is entered between two points fouled by shoals. A spit, with a depth of 6.4m at its outer end, extends almost 1 mile WSW from the E entrance point; foul ground lies S of the coral head. A reef extends almost 0.5 mile NNE from the W entrance point.

A coral head, with a depth of less than 1.8m, lies 1.5 miles N of the E entrance point. A shoal, which has two rocks with depths of less than 1.8m on them, lies almost midway between this shoal and the dangers extending from both entrance points.

**Kabra Island** (7°18'N., 93°51'E.), 63m high, lies almost 3 miles N of Murray Point, the N end of Great Nicobar Island. A 4.6m patch lies in the intervening channel, about 1.3 miles NE of Murray Point. Its position is doubtful.

**Anchorage.**—Anchorage can be taken off either the E or W side of Kondul Island according to the direction of the wind. The E anchorage has a depth of 12.8m about 0.5 mile offshore.

Depths of 18.3 to 21.9m exist in the W anchorage, but caution is advised in its approach.

Kondul Harbor provides sheltered anchorage, in depths 21.9 to 31.1m, sand and coral, E or NE of the previously-described 4.6m shoal.

Ganges Harbor provides anchorage, in depths of 16.5 to 29.3m, coarse sand and clay, well clear of the previously-described dangers.

**9.67 St. Georges Channel** (7°17'N., 93°46'E.), which lies between Little Island and Great Nicobar Island, has considerable depths in the fairway over an uneven bottom. Its W entrance has a least width of 3.8 miles reduced to a navigable width of 2.8 miles by the shoals extending from both shores.

The N side of the channel is free from off-lying dangers, except in the W entrance, where depths of 14 to 16.8m, about 0.4 mile apart, were reported to lie 1 mile ESE of the S end of Little Nicobar Island. A 32m shoal was reported to lie 0.7 mile S of the same point.

A bank, with a depth of 20.1m, the existence of which is doubtful, was reported to lie about in the middle of the E entrance almost 3 miles NW of Kabra Island.

The tidal currents through this channel are strong.

Between the NW point of Great Nicobar Island and Teesta Point, about 10 miles to the S, the coast is high and rugged. This coast has not been thoroughly examined and lesser depths than charted may lie between 2 and 4.5 miles offshore.

Shoal patches, having depths of 12.8m and 18.3m, lie 6.5 miles W and 4.5 miles WNW of Teesta Point.

A depth of 23m lies about 8 miles NW of Teesta Point; in 1986 it was reported that the area may have lesser depths than charted. A depth of 8.2m lies 2.5 miles SSE and another depth of 6.4m lies 4.5 miles SW of Teesta Point; a report also indicates that lesser depths may exist in the area.

Megapod Islet lies about 12.5 miles SSE of Teesta Point. A depth of 11m lies 2.5 miles WNW of Megapod Islet.

**9.68 Casuarina Bay** (7°01'N., 93°41'E.), of no commercial importance, is entered close E of Teesta Point and recedes about 1 mile to the N.

Between the SE entrance point of Casuarina Bay and Indira Point, about 16.5 miles SSE, the coast is indented by a number of small bays, none of which have been closely examined. The villages of Kopenheat and Tae-angha lie about 3 and 5 miles SSE of Casuarina Bay.

Indira Point (formerly Pygmalion Point) has been reported to be good radar target up to 21 miles; a light is shown from the point and a racon transmits from the light tower.

The coast between Teesta Point and Indira Point is fronted by shoal ground which lies between 4 miles off the former point to 2 miles off Indira Point. Less water than charted has been reported to exist along this section of coast.

**Anchorage.**—Vessels with local knowledge can anchor, in a depth of 20.1m, in Casuarina Bay, about 1 mile S of the NW entrance point. Protection is provided during the Northeast Monsoon.

Vessels with local knowledge can anchor in the entrance of a bight between the villages of Kopenheat and Tae-angha, in a depth of 27.4m, about 1 mile offshore.

Extreme caution is advised when approaching the above anchorages because of the numerous reports of shallow depths.

Two small villages lie at the head of a bight about 8.5 miles NNW of Indira Point. A small island lies close inshore about 6.5 miles NNW of the same point.

The coast between Murray Point, the NE extremity of Great Nicobar Island, and Indira Point about 29 miles to the S, is hilly, wooded to the water's edge, and indented by several bights. Mariners are advised that this coast has not been closely examined.

**9.69 Trinkat Champlong Bay** (7°13'N., 93°52'E.) is entered between Murray Point and Kerr Point, about 1.8 miles SE. The NW shore of the bay is rocky and steep, with some coral heads extending up to 183m offshore. A sandy beach lines the S shore. Two conspicuous rocks lie about 0.5 mile W and 0.8 mile WSW of Kerr Point. The W rock is flat-sided.

A coral reef, partly dry at lower water, extends about 0.2 mile offshore, NE of the W rock. Other dangers lie within the 6m curve. A shoal, as defined by the 20m curve, extends about 2 miles NE from Murray Point. A depth of 4.6m lies near the outer edge of this shoal.

**Anchorage.**—Trinkat Champlong Bay provides good, safe anchorage for large vessels. Protection is provided during the Southwest Monsoon. A vessel anchored, in a depth of 51.2m, coral and shells, with Murray Point bearing 310°, distant almost 0.8 mile.

**9.70 Laful Anchorage** (7°10'N., 93°54'E.), a small coastal indentation, lies about 3.3 miles S of Kerr Point. A ledge, with depths of less than 9.1m and apparently steep-to, extends about 0.2 mile offshore. The coast in the vicinity is fairly steep-to. Protection is provided from W winds.

The anchorage should be approached by steering 270° for the middle of the S half of the sandy beach which is a good mark. Anchorage can be taken when the coast S of the bight is almost shut in by South Point, the S entrance of the bay. Care should be taken because the depth decreases rapidly.

Between South Point and Pigeon Islet, about 5.5 miles to the S, the rocky coast has no pronounced indentations except for a small bay NW of the islet, which has not been closely examined. Good anchorage has been reported available in this bay. Depths of 31.1m have been reported to lie close off the bay shores.

**9.71 Tenlaa Bay** (7°02'N., 93°56'E.), which lies 3 miles S of Pigeon Islet, is narrow and has depths of 33m near its head. The bay is sheltered except from NE winds.

Between Tenlaa Bay and the NE of Koal-ta-pain, a promontory about 2 miles SE, the coast is rugged. The promontory forms the NE side of Campbell Bay, a bight fully exposed to SE winds and seas. The entrance of the bay is difficult because it is fouled by rocks. Cerebus Rock lies 0.4 mile S of the E entrance point of the bay.

A light is shown on the SW side of Campbell Bay, close within its entrance.

There is an L-shaped jetty, with a depth of 5m at its head, situated on the NE side of the bay; it is usually used only in good weather. A breakwater, marked at its head by a light, extends SW from Man Point.

Range lights, situated close together at the head of Campbell Bay and in line bearing 323.75°, lead in from seaward. Between Campbell Bay and Tara Point, about 7.5 miles SSW, the coast forms a small bight which is indented at its head.

**Boat Rock** (6°56'N., 93°58'E.), awash, about 1 mile SE of the N entrance of the bight, has three smaller rocks close SW of it.

Mataita-anla, the S indentation in the above bight, lies about 1 mile WNW of Tara Point. Small vessels with local knowledge can anchor in this indentation protected from SW winds and seas. Rocks and shoals restrict the available space.

**9.72 South Bay** (6°48'N., 93°52'E.), entered between **Hayward Point** (6°47'N., 93°52'E.), also known as Kwangtung Point, about 3 miles SW of Tara Point and Indira Point, about 3.8 miles farther SW, provides shelter during the Northeast

Monsoon. A sand bar blocks the entrance of the Galathea River, which flows into the head of the bay.

Hayward Point has been reported to be a good radar target up to 20 miles.

Walker Island, about 1.5 miles NNE of Indira Point, is flat, small and rocky. Several heaps of stones lie on the island. The island is prominent from the S, but is difficult to make out from the E because of the high land behind it.

A breaking rock, with a depth of less than 1.8m, lies about 0.7 mile SSE of Hayward Point.

A shoal, with a least reported depth of 5m, lies 0.5 mile S of Indira Point Light, which marks the S extremity of Great Nicobar Island.

Vessels can anchor within the bay as convenient, in depths of 16.5 to 18.3m.

**Burmese**

BURMESE	English	BURMESE	English
<b>A</b>			
a-shae .....	east	kyauk taung .....	rocky mountain
a-nauk .....	west	kyauk hteyk .....	rocky top
<b>B</b>			
baamn .....	range/row of hills, mountain	kyauk-cha-kan .....	anchorage area
baanm (pan) .....	range/row of hills, mountain peak	kyun .....	island
<b>C</b>		<b>L</b>	
chaung .....	stream	laan .....	road, path, way
<b>D</b>			
daan .....	rank in file, range	lantaya .....	clear path, fairway
<b>H</b>		<b>M</b>	
hteyk .....	top, peak	mee .....	light, fire
<b>I</b>			
inn .....	lake	mee-pya .....	lighthouse, lightship
<b>K</b>			
kan .....	area, span	myauk .....	south
kaan .....	coast	myit .....	river
kaana .....	coast line, beach, river bank	<b>T</b>	
kyauk .....	rock	taung .....	north
		taung .....	mountain, hill
		taung daan .....	mountain range
		taung gyi .....	large mountain
		<b>Y</b>	
		ye .....	water
		ye-gan (kan) .....	lake, pond
		ye-dagun (dakun) .....	waterfall
		yoma .....	mountain range

## Hindi

HINDI	English	HINDI	English
	<b>A</b>	kot .....	fort
ar .....	stream		<b>M</b>
	<b>B</b>	mala .....	mountain
bandar .....	anchorage	malai .....	mountain
bet .....	island	mudi .....	mountain
betta .....	mountain		<b>N</b>
bil .....	lake, swamp	nadi .....	stream
bum .....	mountain, hill	nala .....	stream
	<b>C</b>	nam .....	stream
cheruvu .....	lake		<b>P</b>
chu .....	stream	pahar .....	mountain
	<b>D</b>	parbat .....	mountain
dhar .....	mountain range	parvat .....	mountain
dongar .....	hill	po .....	mountain
durga .....	hill fort	pulo .....	island
durgam .....	hill fort		<b>R</b>
	<b>E</b>	rann .....	marsh, lake
eri .....	lake	sagar .....	lake
eru .....	stream	sagara .....	lake
	<b>G</b>	suti .....	stream
gad .....	stream		<b>T</b>
ghat .....	pass	tal .....	lake, swamp
giri .....	mountain	tala .....	well
gudda .....	mountain, hill	talab .....	lake
gutta .....	mountain, hill	talao .....	lake
	<b>J</b>	tapu .....	island
jhil .....	lake	tivu .....	island
jhor .....	stream	tlang .....	mountain peak, range
	<b>K</b>		<b>V</b>
kas .....	stream	va .....	stream
kayal .....	inlet	vagu .....	stream
kere .....	lake, tank		
khal .....	stream, creek		

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**Pakistani**

PAKISTANI English

**A**

ab..... water, spring  
 an..... pass

**B**

bandar..... harbor  
 bil..... swamp, lake  
 bundar..... mud dike, embankment

**C**

chah..... spring, well  
 chakul..... spring  
 char..... island  
 chara..... stream  
 chauki..... customhouse

**D**

dar..... stream  
 darya..... river, stream  
 dasht..... desert, plain  
 dhand..... swamp  
 dhar..... mountain range  
 dhor..... stream  
 dimi..... east  
 doab..... plain between rivers

**G**

gang..... stream  
 ghar..... mountain, mountain range  
 goth..... town, village

**H**

hamun..... salt lake, salt waste  
 haor..... lake  
 hor..... swamp, fresh or brackish marsh

**J**

jabal; jebel..... hill, mountain, island  
 jezirat..... island

**K**

kalat..... fort  
 kand; kandao..... pass  
 kaur..... stream, river

PAKISTANI English

khal..... river  
 khand..... pass  
 khari..... stream, creek  
 khor; khor..... stream, river mouth, inlet  
 koh..... mountain, mountain range  
 kot..... port  
 kotal..... pass  
 kuh..... hill, mountain

**L**

lak..... pass  
 lora..... stream

**N**

nadi..... stream  
 nal..... stream  
 nala..... stream  
 narai..... pass  
 nawar; nawar..... lake  
 nullah..... intermittent stream, gully

**P**

padi..... west  
 pahaar..... mountain, hill

**R**

ras..... cape, point  
 rud..... river, stream

**S**

sar (sur)..... peak, summit, well

**T**

tangi..... gorge  
 tar..... well  
 taung..... hill, mountain  
 toba..... well  
 toi..... stream

**W**

wah..... canal, stream

**Z**

zarr..... bay  
 ziarat..... tomb, shrine



THAI	T	English	THAI	English
ta.....		landing place	tong koong .....	river bend
thale.....		sea, lake	trumbu .....	dangerous shoal
thai .....		siamese	tuwak .....	old
thang.....		road, path		
thit-nua .....		north	<b>W</b>	
thit-tai .....		south	wat .....	buddhist temple
thit-tuan-ok.....		east		
thit-tuan-tok .....		west	<b>Y</b>	
thi-thort-samor .....		anchorage	yai-kwa .....	greater
tida angin.....		calm	yord.....	top
toko .....		storehouse	yot .....	peak
tong .....		mountain		

## How to use the Index—Gazetteer

Geographic names of navigational features are generally those used by the nation having sovereignty and are listed alphabetically. Diacritical marks, such as accents, cedillas, and circumflexes, which are related to specific letters in certain foreign languages, are not used in the interest of typographical simplicity.

Geographic names or their spellings do not necessarily reflect recognition of the political status of an area by the United States Government. Positions are approximate and are intended merely as locators to facilitate reference to the charts.

**To use as a Gazetteer** note the position and Sector number of the feature and refer to the Chart Information diagram for the Sector. Plot the approximate position of the feature on this diagram and note the approximate chart number.

**To use as an Index** of features described in the text note the paragraph number at the right. To locate this feature on the best scale chart use the Gazetteer procedure above.

## Index—Gazetteer

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					BARUVA	18	52 N 84 35 E	6.31
ALLIGATOR HEAD	16	36 N	94 19 E	7.57	BASAVRAJDURG ISLAND	14	19 N 74 24 E	3.8
ALPHEE SHOAL	7	25 N	81 52 E	4.39	BASIN ISLAND	11	59 N 98 10 E	8.64
AMAZON POINT	16	29 N	94 41 E	8.8	BASSEIN	16	47 N 94 44 E	8.9
AMBU ISLET	19	08 N	72 47 E	2.25	BASSES DE PEDRO	13	05 N 72 25 E	5.5
AMBWAH BAY	17	16 N	73 13 E	2.37	BASWARAJ DRUG	14	19 N 74 24 E	3.8
AMENI ISLAND	11	07 N	72 44 E	5.7	BATAINA GALA	6	02 N 80 10 E	4.23
AMHERST POINT	16	05 N	97 34 E	8.23	BATTI MALV ISLAND	8	50 N 92 51 E	9.55
AMIE ISLAND	11	56 N	98 13 E	8.66	BATTICALOA LIGHT	7	45 N 81 41 E	4.40
AMINI ISLAND	11	07 N	72 44 E	5.7	BATTICALOA ROADS	7	46 N 81 41 E	4.40
AMNAM	17	57 N	83 29 E	6.28	BEACON ISLAND	18	56 N 93 27 E	7.43
ANDAMAN STRAIT	12	04 N	92 47 E	9.40	BEAUCHAMP REEF	13	27 N 93 04 E	9.23
ANDERSON ROCK	12	26 N	92 59 E	9.32	BEDI	22	31 N 70 02 E	1.24
ANDREWS BAY	18	20 N	94 20 E	7.53	BELEKERI BAY	14	42 N 74 15 E	3.6
ANDROTH ISLAND	10	49 N	73 41 E	5.8	BELEKERI POINT	14	42 N 74 15 E	3.6
ANGEDIVA ISLAND	14	45 N	74 07 E	3.4	BENTINCK ISLAND	11	45 N 98 02 E	8.68
ANJADIP ISLAND	14	45 N	74 07 E	3.4	BENTINCK POINT	15	29 N 97 44 E	8.25
ANJENGO	8	40 N	76 46 E	3.33	BENTINCK SOUND	15	35 N 97 42 E	8.26
ANNE ISLAND	11	20 N	98 00 E	8.69	BENTOTA GANGA	6	26 N 79 59 E	4.21
ANT ISLET	12	42 N	98 19 E	8.50	BERESFORD CHANNEL	8	07 N 93 33 E	9.58
AO KAULAK	8	36 N	98 15 E	8.106	BERKELEY ISLAND GROUP	12	56 N 92 54 E	9.29
APAW-YE KYUN	18	23 N	94 19 E	7.53	BERNARD ISLAND	11	11 N 98 16 E	8.64, 8.71
API ISLET	10	39 N	92 23 E	9.50				
ARGO FLAT	21	44 N	89 57 E	7.16	BERUWALA POINT	6	28 N 79 58 E	4.20
ARI ATOLL	3	55 N	72 50 E	5.42	BETUL POINT	15	08 N 73 57 E	2.51
ARIYADDU CHANNEL	3	25 N	72 53 E	5.46	BEYPORE	11	10 N 75 48 E	3.27
ARMAGON SHOAL	13	54 N	80 18 E	6.14	BHANGADUNI ISLAND	21	33 N 88 52 E	7.12
ARNALA ISLAND	19	28 N	72 44 E	2.22	BHATKAL FORT	13	58 N 74 32 E	3.11
ARONG VILLAGE	9	09 N	92 43 E	9.52	BHAVNAGAR	21	46 N 72 14 E	2.13
ASAR MATA	22	50 N	69 13 E	1.9	BHIMUNIPATNAM	17	54 N 83 29 E	6.28
ASIRGARH SHOAL	20	28 N	92 28 E	7.27	BIG TOP ISLAND	9	58 N 98 13 E	8.90
ATALANTA BAY	13	16 N	93 04 E	9.26	BILADU	3	09 N 72 59 E	5.52
ATALANTA POINT	11	40 N	92 45 E	9.45	BILUGYUN ISLAND	16	23 N 97 31 E	8.21
AUCKLAND BAR	21	45 N	87 59 E	7.5	BILUGYUN SANDS	16	10 N 97 32 E	8.22





	Position			Sec. Para		Position			Sec. Para
	°	'	°			°	'	°	
<b>H</b>									
HADDUMMATI ATOLL	1	55 N	73 25 E	5.58	INVESTIGATOR PASSAGE	12	45 N	97 48 E	8.46
HAING GYI KYUN	16	00 N	94 19 E	8.7	INVESTIGATOR PATCH	13	57 N	93 16 E	9.4
HAING GYI SHOAL	15	57 N	94 17 E	8.6	INVESTIGATOR REEF	22	36 N	69 33 E	1.18
HALDIA	22	01 N	88 05 E	7.7	INVESTIGATOR ROCK	11	20 N	92 37 E	9.22
HALDIA POINT	22	01 N	88 04 E	7.7	INVESTIGATOR ROCK	18	58 N	84 42 E	6.31
HALF MOON REEF	10	50 N	98 18 E	8.81	INVISIBLE BANK	11	10 N	93 31 E	9.7
HAMBANTOTA	6	07 N	81 08 E	4.32	IRNATIVU NORTH	9	17 N	79 59 E	4.58
HAMIDARDIA ISLAND	21	30 N	91 57 E	7.24	IRON ISLAND	12	45 N	98 20 E	8.42
HANIKANDU FARO	5	17 N	72 51 E	5.30	IRON PASSAGE	12	42 N	98 22 E	8.49
HANSTAL CREEK	22	56 N	70 24 E	1.29	IRRAWADDY ROCK	19	25 N	93 23 E	7.29
HANUMAN POINT	22	28 N	69 09 E	1.17	ISDU	2	07 N	73 35 E	5.58
HARINGHATA RIVER	21	50 N	89 57 E	7.15	ISLE OF MAN	8	24 N	93 39 E	9.55
HARRY HEAD	9	52 N	98 27 E	8.98	ISLET POINT	21	00 N	71 41 E	2.8
HASTINGS HARBOR	10	06 N	98 18 E	8.91	<b>J</b>				
HASTINGS SAND	16	44 N	96 13 E	8.13	JACKSON CREEK	10	48 N	92 24 E	9.49
HATRASS PASSAGE	12	11 N	97 44 E	8.60	JACKSON LEDGE	13	39 N	93 08 E	9.6
HAYCOCK	6	20 N	80 18 E	4.2	JAFARABAD	20	52 N	71 23 E	2.6
HAYCOCK ISLAND	12	17 N	98 10 E	8.59	JAFFNA	9	39 N	80 01 E	4.58
HAYCOCK ROCK	9	41 N	97 55 E	8.93	JAIGARH BAY	17	18 N	73 13 E	2.36
HAYES ISLAND	11	52 N	97 40 E	8.61	JAIGARH HEAD	17	18 N	73 11 E	2.36
HAYES ISLAND	12	29 N	98 11 E	8.49	JAMES PATCH	10	05 N	98 19 E	8.91
HAYES ISLAND	9	20 N	98 20 E	8.98	JANE ISLAND	11	21 N	98 01 E	8.69
HAYWARD ISLAND	10	27 N	97 57 E	8.88	JANE ISLAND	11	22 N	98 01 E	8.65
HAYWARD POINT	6	47 N	93 52 E	9.72	JANET ISLAND	11	21 N	98 01 E	8.69
HEADLAM PATCH	12	24 N	92 59 E	9.32	JAWAHAR DWEEP	18	58 N	72 54 E	2.26
HEADLAM PATCH	15	08 N	97 38 E	8.18	JAWAHARLAL NEHRU PORT	18	57 N	72 57 E	2.26
HEATH ROCK	11	55 N	98 19 E	8.73	JEFFORD POINT LIGHT	21	44 N	89 32 E	7.13
HECKFORD BANK	10	20 N	97 10 E	8.87	JEFFORD SHOAL	10	48 N	98 21 E	8.83
HECKFORD PATCH	19	57 N	92 44 E	7.28	JERRY ISLAND	14	03 N	93 22 E	9.4
HEINZE CHAUNG	14	43 N	97 54 E	8.32	JOAN ISLAND	11	15 N	98 18 E	8.71
HELEN PASSAGE	19	24 N	93 27 E	7.37	JODIYA	22	42 N	70 18 E	1.25
HENRY PRINSEP ISLAND	12	03 N	97 38 E	8.60	JOHNNY ISLAND	12	22 N	98 14 E	8.58
HENRY ROCKS	18	52 N	93 27 E	7.46	JOHNSTON POINT	21	49 N	72 13 E	2.17
HEXT ROCK	12	08 N	98 16 E	8.63	JOLLY BOYS ISLAND	11	30 N	92 37 E	9.20
HEYWOOD CHANNEL	18	34 N	93 49 E	7.47	JUANITA SHOALS	16	00 N	93 40 E	7.42
HICKMAN SHOAL	13	42 N	93 59 E	9.5	JUBILEE CHANNEL	11	19 N	98 15 E	8.70
HIGH ISLAND	16	37 N	94 18 E	7.57	JUNGLE ISLAND	13	20 N	93 03 E	9.26
HIGH PEAKED ISLAND	11	27 N	98 08 E	8.70	<b>K</b>				
HIKKADUWA POINT	6	08 N	80 06 E	4.22	KABOSA ISLAND	12	48 N	97 51 E	8.46
HIN PAYAN	8	30 N	97 40 E	8.104	KABRA ISLAND	7	18 N	93 51 E	9.66
HIN PUSAR	8	37 N	97 39 E	8.103	KABYACHAUNG	11	27 N	98 43 E	8.77
HINDELNATTU	6	07 N	80 24 E	4.21	KACHCHAITIVU	9	23 N	79 25 E	4.59
HINDUMA KANDA	6	20 N	80 18 E	4.2,	KACHCHITIVU	9	23 N	79 25 E	4.59
				4.21	KADALUR POINT	11	28 N	75 38 E	3.24
HITADU	1	48 N	73 25 E	5.59	KADAN KYUN	12	40 N	98 21 E	8.43
HMAWUN LUMPS	16	34 N	96 15 E	8.13	KADAN KYUN SOUND	12	37 N	98 26 E	8.43
HNGETPYAW KYUN	15	11 N	97 43 E	8.29	KADDAIKADU	9	34 N	80 29 E	4.51
HNGETTHAIK KYUN	13	32 N	98 08 E	8.34	KADEAWELLA POINT	8	12 N	81 26 E	4.42
HOBDAY ISLAND	11	32 N	92 37 E	9.20	KAHANDAWA ROCKS	6	03 N	80 54 E	4.31
HOINPOH BAY	7	58 N	93 26 E	9.61	KAKANA	9	07 N	92 48 E	9.53
HOLLY ISLAND	12	00 N	98 12 E	8.66	KAKANA TAUNG	15	41 N	97 43 E	8.25
HOMFRAY STRAIT	12	15 N	92 52 E	9.33	KAKINADA BAY	17	00 N	82 19 E	6.24
HONAVAR	14	17 N	74 27 E	3.9	KALA KYUN	12	30 N	98 30 E	8.51
HONDEDU	0	27 N	72 57 E	5.63	KALA TAUNG	10	40 N	98 29 E	8.82
HOPE ISLAND	16	49 N	82 20 E	6.22	KALAMETIYA POINT	6	04 N	80 56 E	4.31
HOPE POINT	15	21 N	97 43 E	8.27	KALEGAUK ISLAND	15	33 N	97 40 E	8.26
HORSBURGH ATOLL	4	52 N	72 55 E	5.31	KALINGAPATAM	18	20 N	84 09 E	6.29
HORSBURGH ISLAND	10	12 N	97 53 E	8.89	KALMUNAI POINT	9	36 N	80 03 E	4.58
HORSESHOE SHOAL	20	05 N	92 51 E	7.33	KALPENI	10	06 N	73 39 E	5.12
HUGLI POINT	22	13 N	88 04 E	7.6	KALUTARA	6	35 N	79 58 E	4.19
HUGLI RIVER ENGRANCE	21	39 N	88 01 E	7.4	KALUWATTE GALA	6	39 N	79 53 E	4.18
HUMANI POINT	22	29 N	69 04 E	1.15	KALWIN POINT	12	29 N	98 36 E	8.44,
HUMANI POINT	22	29 N	69 04 E	1.10					8.51
HUNTERS BAY	19	55 N	93 19 E	7.34	KANDAUNG PROMONTORY	14	40 N	97 53 E	8.32
HUT BAY	10	36 N	92 35 E	9.50	KANDLA	23	00 N	70 13 E	1.28
<b>I</b>									
IHAVANDIFFULU ATOLL	7	02 N	72 54 E	5.17	KANDUDU	5	39 N	73 16 E	5.25
ILEYA	7	25 N	93 42 E	9.63	KANDUFURI	2	32 N	73 00 E	5.56
ILLUKATIYA POINT	6	30 N	81 42 E	4.36	KANIKA SAND	20	47 N	87 00 E	6.39
IMMA	4	18 N	73 34 E	5.36	KANKESANTURAI	9	49 N	80 03 E	4.54
INGLIS ISLAND	12	08 N	93 07 E	9.38	KANS A ROCK	18	50 N	72 54 E	2.26
INGLIS SHOALS	12	06 N	93 08 E	9.38	KANTU ROCKS	13	20 N	98 24 E	8.41
INTERVIEW ISLAND	12	55 N	92 42 E	9.13	KAO PHRAMI	9	18 N	98 28 E	8.96
INVESTIGATOR BANK	8	32 N	73 17 E	5.14	KAP LIGHT	13	13 N	74 44 E	3.15
INVESTIGATOR CHANNEL	10	15 N	97 56 E	8.87,	KARACHI HARBOR	24	47 N	66 59 E	1.3
				8.89	KARACHI ROCK	10	37 N	98 23 E	8.83
INVESTIGATOR LEDGE	18	01 N	94 09 E	7.41					





	Position			Sec. Para		Position			Sec. Para		
	°	'	°	'		°	'	°	'		
NINDAKARA	8	56 N	76	33 E	3.31	PANAJI	15	30 N	73	50 E	2.49
NISHANBOTU	14	42 N	79	56 E	6.17	PANCHPARA RIVER	21	31 N	87	07 E	7.3
NIZAMPATAM BAY	15	42 N	80	33 E	6.19	PANDI ARICHA MUNAI PAAR	8	32 N	81	13 E	4.48
NOPU TAUNG SABA	11	13 N	98	39 E	8.78	PANJU ISLAND	19	20 N	72	51 E	2.24
NORMANS POINT	22	12 N	91	49 E	7.20	PANTAW ROCKS	18	40 N	94	09 E	7.48
NORTH BUTTON ISLAND	12	19 N	93	05 E	9.35	PARADIP	20	16 N	86	41 E	6.36
NORTH DELAY SHOAL	20	30 N	92	15 E	7.27	PARKER ISLAND	11	57 N	98	15 E	8.66, 8.72
NORTH ISLAND	14	28 N	97	47 E	8.19	PARVAT GUDI	14	32 N	74	27 E	3.8
NORTH LEDGE	14	31 N	97	49 E	8.33	PASCOE SHOAL	15	10 N	97	45 E	8.29
NORTH PAP BEACON	18	46 N	72	56 E	2.26	PASSAGE ISLAND	11	11 N	92	41 E	9.48
NORTH PASSAGE ISLAND	12	16 N	92	56 E	9.32	PASSAGE ISLAND	12	17 N	98	21 E	8.57
NORTH PASSAGE REEF	13	26 N	93	06 E	9.24	PASSAGE ROCK	13	36 N	93	00 E	9.10
NORTH PATCHES	21	43 N	91	44 E	7.19	PATAW ISLAND	12	27 N	98	35 E	8.51
NORTH PHIPPS ISLAND	10	10 N	98	17 E	8.85	PATENGA POINT	22	13 N	91	48 E	7.20
NORTH REEF ISLAND	13	05 N	92	43 E	9.13	PATHFINDER INLET	22	28 N	69	40 E	1.20
NORTH ROCKS	15	46 N	97	39 E	8.25	PATHIYANKARA	9	14 N	76	25 E	3.31
NORTH ROCKY ISLAND	9	53 N	97	58 E	8.93	PATIRAJA POINT	6	10 N	81	14 E	4.34
NORTH ROUND ISLAND	12	15 N	98	23 E	8.54	PATTANAMARUDUR	8	55 N	78	11 E	4.7
NORTH SANDS	14	41 N	97	50 E	8.32	PAVANGA SHOAL	21	51 N	89	30 E	7.13
NORTH SENTINEL ISLAND	11	33 N	92	14 E	9.8	PAVANGA POINT	16	54 N	73	17 E	2.39
NORTH SENTINEL ISLET	10	57 N	97	58 E	8.79	PAWDI TAUNG	14	57 N	97	52 E	8.31
NORTH SHOAL	19	28 N	93	30 E	7.36	PAYI KYUN	12	22 N	98	26 E	8.56
NORTH TERRIBLE	19	27 N	93	16 E	7.28	PAZIN KYUN	13	48 N	98	04 E	8.33
NORTH TWIN ISLAND	10	38 N	97	42 E	8.87	PECK SHOALS	11	32 N	92	38 E	9.21
NORTHBROOK PATCH	7	59 N	93	29 E	9.60	PEGU RIVER	16	46 N	96	13 E	8.13
NUMARA	6	26 N	73	03 E	5.24	PEINNECHAUNG KYUN	19	57 N	93	05 E	7.34
NYAWBYIN BAY	13	40 N	98	08 E	8.34	PENNER RIVER ENTRANCE	14	35 N	80	11 E	6.17
						PERFORATED ISLAND	8	51 N	97	48 E	8.103
<b>O</b>						PETERSON ROCK	11	50 N	98	06 E	8.67
OBSERVATION ISLAND	11	59 N	97	55 E	8.60	PETRIE ISLAND	11	58 N	92	37 E	9.18
OKHA	22	28 N	69	05 E	1.16	PHAETON SHOALS	15	47 N	94	14 E	8.6
OKHAMANDEL PENINSULA	22	29 N	69	05 E	1.16	PHAUNGKALA TAUNG	15	35 N	97	50 E	8.25
OLAHALI	4	41 N	73	26 E	5.35	PHITTI CREEK	24	40 N	67	09 E	1.4
OLIVELIFUR	5	17 N	73	36 E	5.32	PHOENIX BAY	11	40 N	92	45 E	9.45
OLIVER ISLAND	13	00 N	93	00 E	9.28	PICKWICK ISLAND	12	01 N	98	16 E	8.66
ONA GALA	7	00 N	79	50 E	4.17	PIGEON INLAND	8	43 N	81	12 E	4.52
ONE FATHOM PATCH	13	36 N	93	02 E	9.10	PIGEON ISLAND	11	47 N	98	13 E	8.68
ORAL KAICHA	12	11 N	92	46 E	9.40	PIGEON ISLAND	14	01 N	74	20 E	3.10
OSPREY ROCKS	18	40 N	94	05 E	7.48	PIGEON ISLET	17	37 N	83	14 E	6.26
OSTMASTON SHOAL	12	21 N	92	58 E	9.32	PILLAR ROCK	17	29 N	83	01 E	6.26
OTTIVAKAM HILL	12	48 N	80	07 E	6.11	PILLINAWA POINT	6	22 N	81	34 E	4.36
OUBLIEE ROCK	12	26 N	97	58 E	8.47	PILOT REEF	12	01 N	93	02 E	9.38
OUTER TUNA LIGHTED BUOY	22	51 N	70	07 E	1.28	PINNACLE ROCK	12	59 N	98	14 E	8.45
OUTRAM HARBOR	12	15 N	93	06 E	9.36	PINWUN MAW	10	45 N	98	28 E	8.82
OUTRAM ISLAND	12	15 N	93	06 E	9.36	PIPAVAV BANDAR	20	54 N	71	31 E	2.7
OWEN ISLAND	11	14 N	98	15 E	8.71	PIROTAN ISLAND	22	36 N	69	57 E	1.23
OYSTER ISLAND	12	59 N	92	59 E	9.28	PITI SAND BANK	10	46 N	72	33 E	5.9
OYSTER ISLAND	20	12 N	92	32 E	7.27	PITTI ISLET	10	46 N	72	33 E	5.9
OYSTER REEF	20	05 N	92	39 E	7.27	PLUTO ISLAND	11	33 N	92	38 E	9.20
OYSTER ROCK	19	00 N	93	59 E	7.50	POCOCK ISLAND	13	34 N	93	04 E	9.23
OYSTER ROCKS	14	49 N	74	04 E	3.3	POINT CALIMERE	10	17 N	79	53 E	4.53
						POINT CALIMERE	10	18 N	79	52 E	6.2
						POINT ISLAND	13	24 N	92	50 E	9.12
						POINT PEDRO	9	50 N	80	15 E	4.52, 4.54
<b>P</b>						POINT PUDI	13	47 N	80	15 E	6.16
PAGE ISLET	12	36 N	98	10 E	8.49	POLLOCK BAY	14	09 N	93	23 E	9.4
PAGET ISLAND	13	26 N	92	50 E	9.12	PONDICHERRI	11	56 N	79	50 E	6.9
PAGODA POINT	15	12 N	97	46 E	8.28	PONDICHERRY	11	56 N	79	50 E	6.9
PAGODA POINT	15	37 N	97	44 E	8.25	PONDICHERRY LIGHT	11	54.9 N	79	49.9 E	6.9
PAGODA POINT	15	57 N	94	15 E	8.3, 9.1	PONNANI	10	47 N	75	55 E	3.28
PAINE KYUN	12	55 N	98	11 E	8.45	PONTAMAU ISLAND	17	19 N	94	30 E	7.56
PAINES REEF	11	18 N	98	18 E	8.71	PORBANDAR	21	38 N	69	36 E	1.32
PAIRA ROCK	8	35 N	93	36 E	9.55	PORT ANDAMAN	12	44 N	92	42 E	9.13
PAK CHIK	9	09 N	98	16 E	8.105	PORT ANSON	12	16 N	92	44 E	9.16
PAK KOH	8	52 N	98	15 E	8.105	PORT BANKOT	17	59 N	73	03 E	2.32
PAK KRUEEN	9	01 N	98	15 E	8.105	PORT BLAIR	11	41 N	92	45 E	9.42
PAK KURA	9	16 N	98	20 E	8.105	PORT CAMPBELL	11	57 N	92	35 E	9.18
PALAR RIVER	12	28 N	80	10 E	6.10	PORT CANNING	22	19 N	88	39 E	7.12
PALATUPANA POINT	6	14 N	81	22 E	4.35	PORT CHAUL	18	33 N	72	55 E	2.29
PALERU RIVER	15	19 N	80	06 E	6.18	PORT CORNWALLIS	13	17 N	93	05 E	9.25
PALK BAY	9	30 N	79	30 E	4.56	PORT DABHOL	17	35 N	73	10 E	2.34
PALK STRAIT	10	00 N	80	00 E	4.53	PORT MARIA	12	23 N	98	03 E	8.48
PALMYRAS POINT	20	46 N	86	59 E	6.39	PORT MEADOWS	12	01 N	92	46 E	9.40
PALMYRAS SHOALS	20	47 N	87	12 E	6.33	PORT MOUAT	11	37 N	92	38 E	9.19
PALURU BLUFF	19	26 N	85	08 E	6.34	PORT MUHAMMAD BIN QASIM	24	46 N	67	20 E	1.5
PAMBAN	9	17 N	79	13 E	4.60	PORT OWEN	13	06 N	98	19 E	8.42
PAMBAN ISLAND	9	11 N	79	25 E	4.1	PORT REDI	15	45 N	73	39 E	2.48
PAMBAN ISLAND	9	17 N	79	18 E	4.11	PORTMAN BAY	11	25 N	92	41 E	9.47
PAMBAN PASS	9	17 N	79	12 E	4.9	PORTO NOVO	11	30 N	79	46 E	6.7
PANADURA	6	43 N	79	54 E	4.17	POSITION ROCK	14	42 N	97	52 E	8.32

	Position				Sec. Para		Position				Sec. Para
	°	'	°	'			°	'	°	'	
POSITRA BAY	22	26 N	69	09 E	1.17	ROSAMUND SHOAL	12	04 N	92	58 E	9.37
POSITRA POINT	22	25 N	69	12 E	1.17	ROSS ISLAND	12	13 N	98	06 E	8.62
POWELL ISLANDS	5	58 N	72	55 E	5.29	ROSS SAND	14	55 N	97	41 E	8.18
PREPARIS ISLAND	14	53 N	93	42 E	9.2	ROUND HILL	17	22 N	82	16 E	6.25
PREPARIS NORTH CHANNEL	15	22 N	93	48 E	9.2	ROUND ISLAND	8	30 N	81	13 E	4.43
PREPARIS SOUTH CHANNEL	14	28 N	93	33 E	9.2	ROUND ISLAND	9	55 N	98	3 E	8.99
PRONGS REEF LIGHT	18	53 N	72	48 E	2.26	ROUND MOUNTAIN	9	41 N	98	37 E	8.96
PRYCE CHANNEL	7	12 N	93	43 E	9.66	ROZI MATA TEMPLE	22	33 N	70	03 E	1.24, 1.25
PUDIMADAKA VILLAGE	17	30 N	83	00 E	6.25	RUPADIA SANDS	21	27 N	91	57 E	7.23
PULAU AMPAT	11	10 N	98	37 E	8.78	RUSSELL ISLAND	10	15 N	98	15 E	8.85
PULAU TING-NGA	11	12 N	98	39 E	8.78	RUTLAND ISLAND	11	25 N	92	39 E	9.22
PULICAT SHOALS	13	22 N	80	23 E	6.14	RUVAPARI LIGHT	21	47 N	72	14 E	2.13
PULO BADA	10	30 N	98	13 E	8.84	RYLAND PATCH	10	04 N	98	13 E	8.92
PULO BESIN	9	59 N	98	29 E	8.97						
PULO GABAN	10	58 N	98	13 E	8.86	<b>S</b>					
PULO GANGA	9	56 N	98	29 E	8.99	SACRAMENTO SHOAL	16	32 N	82	20 E	6.20
PULO HAYAT	10	35 N	98	14 E	8.84	SACRIFICE ROCK	11	30 N	75	32 E	3.25
PULO JUNGIS	10	00 N	98	29 E	8.97	SADDLE ISLAND	12	24 N	97	55 E	8.47
PULO MILO	7	24 N	93	42 E	9.63	SADDLE ISLAND	19	25 N	93	27 E	7.37
PULO PERLIN	9	58 N	98	30 E	8.97	SAGAR ISLAND	21	44 N	88	07 E	7.5
PULO PINGNGWE	9	54 N	98	29 E	8.99	SAGAR ISLAND LIGHT	21	39 N	88	03 E	7.4
PULO REMIAH	10	05 N	98	30 E	8.97	SAGAR ROADS	21	39 N	88	01 E	7.5
PULO RU	9	57 N	98	32 E	8.99	SAGU KYUN	18	48 N	93	58 E	7.49
PULO SAUNG KHARANG	9	55 N	98	31 E	8.99	SAIL ROCK	18	33 N	93	51 E	7.47
PULO TONTON	10	01 N	98	30 E	8.97	SAINGBAIN KIEU	16	20 N	94	11 E	7.59
PUNDI	18	40 N	84	27 E	7.4	SALAYA	22	19 N	69	36 E	1.19
PURI	19	48 N	85	50 E	6.34, 7.4	SALAYA HARBOR	22	26 N	69	33 E	1.19
PURIAN BANK	15	53 N	94	22 E	8.8	SANDERS ISLAND	9	37 N	97	59 E	8.93
PURIAN POINT	15	50 N	94	24 E	8.5	SANDERSON ROCK	8	07 N	93	27 E	9.58
PUSUR RIVER	21	46 N	89	30 E	7.13	SANDOWAY BAY	18	22 N	94	21 E	7.53
PYIN ISLAND	12	19 N	98	26 E	8.55	SANDOWAY RIVER	18	33 N	94	13 E	7.53
PYINBAN ROCKS	12	44 N	98	34 E	8.44	SANDWIP ISLAND	22	28 N	91	29 E	7.17
PYINGYI	13	47 N	98	12 E	8.38	SANGAMANKANDA POINT	7	01 N	81	52 E	4.39
PYRAMID BAY	18	41 N	93	39 E	7.46	SANTAPILLI ROCKS	18	01 N	83	43 E	6.23
						SAPTAMUKHI SAND	21	20 N	88	27 E	7.10
<b>Q</b>						SARWAH SAND	21	42 N	89	28 E	7.13
QUILON	8	53 N	76	35 E	3.32	SATARA REEF	18	20 N	84	09 E	6.30
QUOIN ISLAND	10	21 N	98	04 E	8.89	SATBAIA SANDHILL	20	38 N	86	56 E	6.38
QUOIN SANDHILL	21	36 N	87	28 E	7.3	SATELLITE BAY	8	02 N	93	30 E	9.60
						SATELLITE LEDGE	18	07 N	94	18 E	7.41
<b>R</b>						SATELLITE PATCH	8	01 N	93	30 E	9.60
RABNABAD CHANNEL ENTRANCE	21	50 N	90	16 E	7.16	SAUNDERS SHOAL	20	07 N	92	56 E	7.33
RAJAPUR BAY	16	37 N	73	20 E	2.40	SAUNGGYI KYUN	12	07 N	98	24 E	8.55
RAKIDU	3	19 N	73	27 E	5.48	SAURIN ISLAND	12	30 N	97	48 E	8.47
RAMAYPATNAM VILLAGE	15	03 N	80	03 E	6.18	SAWI BAY	9	14 N	92	45 E	9.52
RAMREE HARBOR	19	00 N	94	00 E	7.49	SEARLE PATCH	15	27 N	73	48 E	2.50
RAMREE HARBOR	19	01 N	94	02 E	7.47	SEAWARD PEAK	9	49 N	98	32 E	8.96
RAMREE ISLAND	19	07 N	93	47 E	7.39	SEMIRAMIS BAY	11	42 N	92	44 E	9.44
RAMSOM SHOAL	10	42 N	98	19 E	8.81	SESOSTRIS BANK	13	08 N	72	00 E	5.5
RANGAT BAY	12	29 N	92	58 E	9.31	SESOSTRIS BAY	11	40 N	92	46 E	9.45
RANGER FLAT	11	41 N	92	43 E	9.46	SESOSTRIS SHOAL	11	39 N	92	01 E	9.45
RANGER REEF	13	39 N	93	07 E	9.5	SETSE YELE PAYA	15	57 N	97	36 E	8.24
RANGOON	16	46 N	96	10 E	8.14	SHAHPURI FLAT	20	43 N	92	18 E	7.30
RANSOM REACH	16	17 N	94	39 E	8.8	SHALLINGER SHOAL	14	23 N	80	12 E	6.17
RAS MUARI	24	50 N	66	39 E	1.1	SHARK ISLAND	13	12 N	92	46 E	9.12
RASDU	4	16 N	73	00 E	5.43	SHEARME SAND	15	04 N	97	35 E	8.18
RASDU ATOLL	4	16 N	73	00 E	5.43	SHITPIN KYUN	10	49 N	98	26 E	8.82
RASULPUR RIVER	21	47 N	87	54 E	7.3, 7.5	SHIYAL BET	20	54 N	71	31 E	2.7
RATI BEACON	18	47 N	84	32 E	6.30	SHOAL BAY	11	56 N	92	47 E	9.41
RATNAGIRI BAY	16	59 N	73	17 E	2.38	SHONG PIANAM	9	34 N	98	28 E	8.101
REDSKIN ISLAND	11	33 N	92	36 E	9.20	SHORTT ISLAND	20	47 N	87	05 E	6.38
REEF ISLAND	13	30 N	92	53 E	9.11	SIDAW TAUNG	15	10 N	97	48 E	8.28
REJU SHOAL	21	17 N	91	59 E	7.19	SIDNEY ISLAND	11	52 N	98	25 E	8.74
RELANCE SHOAL	19	27 N	93	32 E	7.38	SIKKA	22	26 N	69	50 E	1.22
REMARKABLE ROCK	18	14 N	94	22 E	7.54	SIKKA CREEK ENTRANCE	22	29 N	69	47 E	1.22
RESEARCH STRAIT	19	58 N	93	02 E	7.34	SIKOTAR MATA	22	19 N	72	24 E	2.17
RETKAMAUK TAUNG	19	48 N	93	28 E	7.35	SIMAR	20	46 N	71	10 E	2.4
REVADANDA PORT	18	33 N	72	55 E	2.29	SIMILAN ISLANDS	8	35 N	97	39 E	8.103
RICHELIEU ROCK	9	21 N	98	02 E	8.95	SIMPSON SHOAL	15	08 N	97	45 E	8.30
RIOU ISLAND	10	56 N	98	26 E	8.78	SIMS REEF	10	02 N	98	29 E	8.97
RITCHIES ARCHIPELAGO	12	03 N	93	02 E	9.36	SINCLAIR SHOAL	14	53 N	97	21 E	8.18
ROBERT ISLAND	11	24 N	98	30 E	8.76	SINSWE KYUN	16	23 N	94	42 E	8.8
ROCK ISLET	12	35 N	97	54 E	8.46	SIR CHARLES METCALFE ISLAND	12	17 N	97	47 E	8.47, 8.60
ROCKINGHAM PATCHES	12	41 N	80	15 E	6.10	SIR CREEK	23	38 N	68	02 E	1.7
ROCKY POINT	19	00 N	93	41 E	7.42	SIR HUGH ROSE ISLAND	11	47 N	93	05 E	9.39
ROE BANK	10	08 N	96	38 E	8.87	SIR J. MALCOM ISLAND	11	18 N	98	15 E	8.70
ROGOLOCHANG BAY	12	09 N	92	50 E	9.34	SIR WILLIAM PEEL ISLAND	12	05 N	93	00 E	9.36
						SITAKUND MOUNTAIN	22	38 N	91	41 E	7.19

	Position				Sec. Para		Position				Sec. Para
	°	'	°	'			°	'	°	'	
SITAPAROKIA	20	33 N	92	32 E	7.27, 7.31	TANKHARO ISLAND	19	30 N	93	32 E	7.36
SITAPAROKIA PATCHES	20	32 N	92	26 E	7.27	TAPIR HILL	14	36 N	97	55 E	8.33
SITTANG RIVER ENTRANCE	16	50 N	96	55 E	8.18	TARAPUR POINT	19	50 N	72	39 E	2.21
SITTWE HARBOR	20	08 N	92	54 E	7.33	TARMUGLI ISLAND	11	35 N	92	34 E	9.20
SLAVE ISLAND	9	43 N	98	00 E	8.93	TAUNGNYO HILL	21	04 N	92	12 E	7.29
SLIPPER ISLAND	14	11 N	93	22 E	9.3	TAVOY	14	04 N	98	11 E	8.40
SMART ISLAND	12	17 N	97	52 E	8.47	TAVOY ISLAND	13	13 N	98	15 E	8.42
SMITH ISLAND	13	20 N	93	05 E	9.24	TAYLOR HILL	13	27 N	92	54 E	9.11
SMYTHE ROCK	12	03 N	92	48 E	9.40	TAYLOR PATCHES	12	16 N	92	42 E	9.15
SOMBRERO CHANNEL	7	41 N	93	36 E	9.62	TAYLOR SHOAL	20	15 N	92	25 E	7.27
SON ISLAND	11	12 N	98	05 E	8.70	TAZINGYUN	16	09 N	94	32 E	8.8
SONADIA ISLAND	21	29 N	91	53 E	7.23	TEKKU	9	14 N	76	25 E	3.31
SONNAPURAM	19	07 N	84	47 E	6.32	TEKRA LIGHT	22	56 N	70	07 E	1.27
SOUND ISLAND	12	58 N	92	59 E	9.27	TELLICHERRY	11	45 N	75	29 E	3.23
SOUTH BANK	12	16 N	92	26 E	9.7	TEMPLE POINT	20	25 N	86	44 E	6.37
SOUTH BANKS	9	57 N	79	57 E	4.53	TEMPLE SOUND	13	25 N	92	51 E	9.11
SOUTH BAY	6	48 N	93	52 E	9.72	TEN DEGREE CHANNEL	10	22 N	92	30 E	9.51
SOUTH BAY	7	53 N	93	24 E	9.61	TENASSERIM ISLAND	12	34 N	97	51 E	8.46
SOUTH BUTTON ISLAND	12	13 N	93	02 E	9.35	TENLAA BAY	7	02 N	93	56 E	9.71
SOUTH DELAY SHOAL	20	28 N	92	15 E	7.27	TERESSA ISLAND	8	18 N	93	07 E	9.56
SOUTH DIRECTION ISLAND	12	29 N	98	00 E	8.47	THALIA SHOAL	15	15 N	93	48 E	9.2
SOUTH HATIA ISLAND	22	15 N	91	05 E	7.16	THAMES POINT	19	09 N	93	36 E	7.40
SOUTH HUMP ISLAND	10	11 N	98	20 E	8.85	THAMIHIA KYUN	15	52 N	94	17 E	8.6
SOUTH ISLAND	12	54 N	98	19 E	8.42	THANE ISLAND	10	02 N	98	30 E	8.97
SOUTH ISLAND	13	20 N	74	42 E	3.14	THANKES ISLET	12	15 N	98	01 E	8.60
SOUTH ISLAND	8	29 N	97	39 E	8.104	THE BROTHERS	10	59 N	92	40 E	9.49
SOUTH MALE ATOLL	4	00 N	73	25 E	5.40	THE FORELAND	10	47 N	98	18 E	8.81
SOUTH PASSAGE ISLAND	11	46 N	98	07 E	8.64, 8.68	THE SISTERS	11	09 N	92	44 E	9.48
					7.19	THE SWATCH	23	40 N	67	27 E	1.7
SOUTH PATCHES	21	26 N	91	40 E	8.19	THE TERRIBLES	19	24 N	93	17 E	7.28
SOUTH REEF ISLAND	12	47 N	92	40 E	9.13	THETYAGI ISLAND	12	16 N	98	26 E	8.55
SOUTH ROCKS	12	50 N	98	19 E	8.42	THIN-BON KYUN	13	38 N	98	11 E	8.38
SOUTH SANDS	14	39 N	97	52 E	8.32	THORNHILL ISLAND	13	32 N	92	55 E	9.11
SOUTH SENTINEL ISLAND	10	58 N	92	14 E	9.8	THULUSDHOO	4	22 N	73	38 E	5.37
SOUTH SHOAL	15	28 N	97	39 E	8.26	THYNE BANK	17	46 N	94	19 E	7.42
SOUTH TERRIBLE	19	23 N	93	16 E	7.28	TILADUMMATI ATOLL	6	45 N	73	00 E	5.21
SOUTH TWIN ISLAND	10	28 N	98	41 E	8.87	TILLANCHONG ISLAND	8	31 N	93	38 E	9.55
SOUTH VAZHAPURAM	9	19 N	76	23 E	3.31	TIRUCHENDUR POINT	8	30 N	78	08 E	4.5
SOUTHEAST HUMP ISLAND	10	16 N	98	19 E	8.84	TIRUKKADAIYUR PORT	11	04 N	79	53 E	6.5
SPIKE HILL	16	22 N	94	18 E	7.58	TIRUMULLAIVASAL	11	15 N	79	51 E	6.6
SPIKE ISLAND	12	16 N	92	43 E	9.15	TOBY ROCK	15	16 N	97	43 E	8.27
SPITEFUL BAY	8	01 N	93	32 E	9.60	TODDU	4	26 N	72	57 E	5.42
SQUARE ROCK	15	59 N	73	27 E	2.46	TODDU	4	26 N	72	58 E	5.32
SRIVARDHAN POINT	18	01 N	73	00 E	2.31	TOLKESHWAR POINT	17	34 N	73	09 E	2.34
ST. ANDREW'S GROUP	10	10 N	97	55 E	8.89	TONDI	9	45 N	79	01 E	4.61
ST. GEORGES CHANNEL	7	17 N	93	46 E	9.67	TONGUE ISLAND	9	55 N	98	14 E	8.90
ST. JOHN'S ROCKS	17	28 N	94	20 E	7.42	TORILLA ISLAND	9	22 N	97	52 E	8.95
ST. LUKES ISLAND	10	09 N	98	12 E	8.85	TOUNZOUN POINT	16	14 N	97	32 E	8.22
ST. MARKS ISLET	10	03 N	98	13 E	8.92	TOWER HILL	7	43 N	81	24 E	4.41
ST. MARTINS ISLANDS	20	37 N	92	20 E	7.26	TOWN ROCK	16	29 N	97	37 E	8.24
ST. MARTINS REEF	20	37 N	92	13 E	7.27	TRAK ISLAND	7	28 N	93	37 E	9.62
ST. PAULS ISLAND	10	09 N	98	09 E	8.89	TRANQUEBAR	11	01 N	79	51 E	6.5
STEEP SHOAL	10	38 N	98	17 E	8.81	TREE ISLAND	11	32 N	97	58 E	8.69
STEWART ISLAND	13	01 N	92	56 E	9.28	TREE ISLET	11	36 N	72	11 E	5.3
STEWART SOUND	12	54 N	93	00 E	9.27	TRINCOMALEE HARBOR	8	33 N	81	13 E	4.48
STRAIT ISLAND	12	13 N	92	56 E	9.32	TRINKAT CHAMPLONG BAY	7	13 N	93	52 E	9.69
SUBARNAREKHA RIVER	21	34 N	87	23 E	7.2, 7.3	TRINKAT ISLAND	8	05 N	93	35 E	9.58
SUHELI PAR	10	05 N	72	16 E	5.11	TRIPALUR REEF	12	37 N	80	12 E	6.10
SUNK REEF	13	00 N	92	59 E	9.28	TRIVANDRUM	8	29 N	76	57 E	3.34
SUNK ROCK	18	53 N	72	50 E	2.26	TROMBAY PEAK	19	02 N	72	55 W	2.26
SURATKAL POINT LIGHT	13	00 N	74	47 E	3.15	TROTTER ISLAND	11	53 N	98	16 E	8.72
SUVADIVA ATOLL	0	30 N	73	15 E	5.61	TULUSDU	4	22 N	73	38 E	5.37
SUVALI POINT	21	05 N	72	38 E	2.14, 2.18	TUMMALAPENTA	14	54 N	80	04 E	6.14
					7.10	TUNDAHA OBELISK	19	54 N	86	13 E	6.35
SWATCH OF NO GROUND	21	05 N	89	17 E	7.10	TURAKUNA	7	07 N	72	54 E	5.18
SWIRL ROCK	12	25 N	98	11 E	8.58	TURRETS ISLANDS	10	31 N	98	27 E	8.86
SYDNEY ISLAND	11	32 N	98	27 E	8.75	TURTLE ISLANDS	13	22 N	93	05 E	9.24
						TUTICORIN	8	28 N	78	10 E	4.4
						TUTICORIN	8	48 N	78	10 E	4.6
						TUTTHABO MAW	10	37 N	98	27 E	8.86
						TWANTE CANAL	16	46 N	96	08 E	8.13
						TWIN ROCKS	11	53 N	98	27 E	8.73
TABLE ISLAND	14	11 N	93	23 E	9.3	TWO FATHOMS ROCK	12	10 N	92	58 E	9.35
TABLE ISLANDS	13	25 N	93	07 E	9.23	TWO HILL ISLAND	10	59 N	98	12 E	8.81
TADMA BAY	12	03 N	93	02 E	9.38	TWO TREE ISLAND	10	16 N	98	14 E	8.85
TADMA JURU	12	03 N	92	59 E	9.37						
TADRI RIVER	14	31 N	74	20 E	3.7						
TAKLA OYSTER POINT	12	55 N	92	55 E	9.29						
TAKUA PA INLET	9	02 N	98	18 E	8.105						
TALAIMANNAR	9	06 N	79	43 E	4.59	U PE BEACON	15	44 N	95	24 E	8.10
TANGALLE POINT	6	01 N	80	48 E	4.30	UKULAHU	4	13 N	72	51 E	5.44
TANGASSERI POINT LIGHT	8	53 N	76	43 E	3.32	UKULHAS	4	13 N	72	51 E	5.44

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