

TABLE 6

Tides at Long Island	Long Island		Pearl Reef		Sunday Island		Off Northwest Cape	
	Direction (true)	Rate	Direction (true)	Rate	Direction (true)	Rate	Direction (true)	Rate
5 hours before high water	Degrees	Knots	Degrees	Knots	Degrees	Knots	Degrees	Knots
	179	1½-3½	179	3½-1½	179	1½-1½	157	1
4 hours before high water	157	1½-3½	190	1½-3½	179	1½	157	1
3 hours before high water	157	1½-3½	190	1½-3½	179	1½	157	¾
2 hours before high water	157	1½	190	1½-3½	190	1½	Turning	-----
1 hour before high water	168	1¼-1½	190	1¼-1½	201	½	337	1¼-1½
High water	Turning	-----	Turning	-----	Turning	-----	337	1
1 hour after high water	337	½	314	¼	314	¼-1½	337	1¼
2 hours after high water	337	¾	314	1½-1½	337	.6	337	1½
3 hours after high water	337	1½-2	337	½-¾	337	.7	337	1½
4 hours after high water	325	1½	337	½-¾	337	.7	337	1¼
5 hours after high water	246	1¼-1½	337	½	337	.6	337	¾
6 hours after high water	201	½	359	1¼-1½	Turning	-----	Turning	-----

steering 223° until the islet bears 000° 1.5 miles, when a course 272° on the recommended track leads about 1 mile northward of the detached reef off Northwest Cape.

6-208 Vessels from the southwestward, during daylight, taking the inner route to Ashburton Road, or beyond, should give the reef off Northwest Cape a berth of about 1 mile, and follow the track line.

Approaching Observation Islet, during the period of the ebb, or north-going current, caution is necessary to avoid being set by it on to the shoal ground extending southward of that island.

Eastward of Observation Islet is the junction of the two tracks, the southernmost leading to Ashburton Road, in not less than 3½ fathoms at low-water springs, and the northernmost north of Ashburton Road, thence northeastward of Mary Anne Passage to sea, abreast Fortescue Road, in not less than 5 fathoms. The directions given for the various sections when coming from the eastward should be reversed.

This route affords a fairly sheltered passage for about 100 miles, from Northwest Cape to abreast Fortescue Road, for vessels of moderate draft.

6-209 Winds.—The winds experienced between the months of May and October, in

the vicinity of Northwest Cape, are very similar to those in Ashburton Roads and Mary Anne Passage, with the exception that southerly winds are more pronounced, lasting sometimes over 24 hours coming straight out of Exmouth Gulf; on approaching Observation Islet the direction shifts to the eastward.

6-210 EXMOUTH GULF (*H. O. Chart 3421*) recedes about 40 miles southward between Tubridgi Point and Northwest Cape, about 27 miles westward. It has an average width of about 23 miles. Sandlewood Peninsula at the head of the gulf separates Galleria Bay on the eastern side from Gales Sound on the western side. The head of the gulf is indistinctly seen from the entrance.

Northwest Cape Peninsula is formed by a high, rugged range of generally uniform height that drops off gradually to the low western shore of the gulf. The 1,038-foot summit of Mount King is the highest in this range, but it is conspicuous only from south-eastward.

Depths at the entrance of Exmouth Gulf are fairly regular, and nowhere seem to exceed 12 fathoms. There are a number of detached 3-to 5½-fathom patches, described hereinafter, in the entrance. The western shore appears moderately steep-to, but the

★ (6797) AUSTRALIA — Northwest coast — Exmouth Gulf — Learmonth  
Anchorage—Hydrographic information.—1. A pier exists in (approx.)  $22^{\circ}13.1'$   
S.,  $114^{\circ}05.0'$  E.

Note.—The legend "Pier" will be charted in the above position.

2. An anchorage buoy has been reported located about 1.55 miles  $076^{\circ}40'$   
from the position of the pier in (1).
3. Wapet Shoal with a depth of  $1\frac{1}{2}$  fathoms will be charted about 1.75 miles  
 $024^{\circ}$  from the position of the pier in (1).

Note.—The 2-fathom depth close eastward will be expunged.

(N.M. 43/66.)

(Second Officer, M.S. *Astrid Bakke*, NAVBROCEANO WILM: RS 13125/66.)  
H.O. Chart 3421.

H.O. Pub. 74, 1952, page 261.

eastern side is shallow for a considerable distance off, with rough and broken ground.

**Caution.**—Exmouth Gulf, southward of  $21^{\circ}54' S.$ , must be navigated with extreme caution due to the imperfect nature of the survey in that area.

A cyclone passed over the Bay of Rest on March 14, 1907, doing great damage to shipping.

**Warning.**—Exmouth Gulf is exposed and should be avoided in the hurricane season.

**6-211** The eastern shore, from Tubridgi Point, rises so gently from the sea as to be almost indeterminate. Islands of mangrove trees front the coast, which consists of almost level salt flats and swamp bearing a thin covering of grass and scrub. The southern shores are similar, except for Sandlewood Peninsula the northern and northwest shores of which are backed by low sandhills and are generally clear of mangroves.

**Whalebone Island**, 10 feet high and surrounded by a coral reef, is a bare rock island that lies about 15 miles southward of Y Islet. A drying sandbank lies about  $\frac{1}{2}$  mile northward. **Campbell Shoal**, with a depth of 11 feet, lies about  $4\frac{1}{4}$  miles north-northwestward of Whalebone Island, and depths of 10 and 11 feet lie  $2\frac{1}{4}$  miles southward of the island. **Snapper Shoal**, with a least depth of 9 feet, lies  $4\frac{1}{4}$  miles west-southwestward of Whalebone Island. **Hope Island**, which lies 19 miles southward of Tubridgi Point, consists of sandhills sparsely covered by grass and rises to 56 feet in height. Southward from Hope Island, the coast consists of numerous mangrove islands fronted by drying sands up to  $1\frac{1}{2}$  miles wide. **Giralia Bay**, in the southeastern corner of Exmouth Gulf, is mostly shoal with extensive drying sand flats channelled by shallow creeks.

**Point Maxwell** is a rocky outcrop at the western extremity of a low sandy island off the northwest coast of Sandlewood Peninsula. To the southwestward lies Gales Sound. The waters of the sound are generally shallow with numerous islands and sandbanks. The mangrove-fringed southern shores

are fringed by extensive drying sands.

**6-212** The western shore, from Northwest Cape, is also low and sandy, but rises gradually to the ridge of hills commencing at Vlaming Head. Point Murat lies about 2.3 miles southeastward of Northwest Cape. There are some bays along this side, with anchorage, but the bottom is generally rocky. For at least 6 miles from Point Murat coral reefs line the coast more than 1,000 yards off, the edge dropping quickly into 5 fathoms of water. **Bundegi Reef**,  $2\frac{1}{4}$  miles from the point, dries, and is within 1 mile from shore. Point Lefroy ( $22^{\circ}18' S.$ ,  $114^{\circ}10' E.$ ), fringed with coral, lies on the western side of the gulf about  $1\frac{1}{2}$  miles east-southeastward of the Bay of Rest. A  $1\frac{1}{2}$  fathom shoal lies about 3 miles north-northeastward of Point Lefroy. **Wapet** and **Stewart Shoals**, with depths of  $1\frac{1}{2}$  and  $2\frac{1}{4}$  fathoms, lie about  $7\frac{1}{2}$  and 10 miles north-northwestward of Point Lefroy.

**Channel.**—A swept channel, located in the western part of the gulf, is marked by a series of buoys starting about  $3\frac{1}{2}$  miles northeastward of Point Murat, the eastern extremity of Northwest Cape. The channel extends in a  $190^{\circ}$  direction to a position northward of the Bay of Rest and has a width of 500 yards and a depth of 40 feet. It was reported that the channel buoys are missing.

**Shoals.**—The following shoals are located in Exmouth Gulf, distances and bearings from Point Murat as follows:

Several detached 3-to  $5\frac{1}{2}$ -fathom patches lie close together about  $9\frac{1}{4}$  miles eastward.

A  $3\frac{1}{2}$ -fathom shoal, about 17 miles southward.

A 1-fathom shoal, about  $20\frac{1}{2}$  miles south-southeastward.

A  $1\frac{1}{2}$ -fathom shoal, about 14 miles south-southeastward.

A  $4\frac{1}{2}$ -fathom shoal, about  $15\frac{1}{2}$  miles southward.

A  $4\frac{1}{2}$ -fathom shoal, about  $21\frac{1}{2}$  miles southward.

A 2-fathom shoal, about  $22\frac{1}{2}$  miles south-southwestward.

Two 1-fathom shoals lie about 1 and 1½ miles, respectively, southeastward of Y Islet.

It was reported that the shoals in Exmouth Gulf may shift during summer storms.

6-213 Bay of Rest (Jogodor) ( $22^{\circ}19' S.$ ,  $114^{\circ}08' E.$ ), a cove on the western side of the gulf, 30 miles southward of Northwest Cape, is about 1 mile in extent, with anchorage in 4 fathoms, mud bottom, 1 mile from land. The shores of the bay are irregular, and from the eastern point shallow water extends to a small islet 4 miles southeastward.

From the islet, southeast of the Bay of Rest, the coast was seen to extend some 15 miles south-southwestward, and the head of the gulf was not explored beyond.

**Beacons.**—Three beacons are located along the shore in the vicinity of the Bay of Rest. The northernmost beacon, No. 1, is about 5 miles northwestward of the entrance to the Bay of Rest.

Several beacons stand near Giralia Landing, located southeastward of the Bay of Rest.

**Mooring buoys—Buoys.**—A mooring buoy is located about 3 miles northeastward of Beacon No. 1.

A net mooring buoy is located about 3½ miles eastward of Beacon No. 1.

A buoy, painted in red and white horizontal bands, is moored about 2 miles eastward of Beacon No. 1.

A yellow buoy is moored about 1½ miles east-northeastward of Beacon No. 1.

**Tides—Currents.**—Spring tides rise 10 to 12 feet; neaps rise 3 to 4 feet. Currents parallel to the coast have a velocity of 1 to 2 knots at maximum ebb and flood. It is reported that the time and height of tides are affected by surface winds.

**Settlement.**—Several buildings of a prospecting camp, including an airport, are located northwestward of the entrance to the Bay of Rest. The camp, called Learmonth, has frequent air-communication with Perth and Port Darwin and has radio facilities. A small amount of rain water is stored; no supplies are obtainable in quantity.

6-214 Anchorage.—In general holding ground in Exmouth Gulf is good, the fine brown sand having almost the consistency of mud. Anchorage becomes considerably less exposed towards the southern part. Little or no swell is experienced south of Learmonth about 8 miles north-northwestward of Point Lefroy. Shallow draft vessels may take good anchorage northward of Point Lefroy, which also provides the best landing, but is about 9 miles by road from the nearest habitation.

(5738) AUSTRALIA—West coast—Point Cloates—Light established.—1. A light, showing *Gp. Fl. W. (2) 15 sec. 128 ft. 17 M.*, has been established about **0.5** mile  $194^{\circ}$  from the old lighthouse ( $22^{\circ}41.5'$  S.,  $113^{\circ}40.5'$  E. approx.).  
2. Frazer Island Light ( $22^{\circ}38.0'$  S.,  $113^{\circ}37.8'$  E. approx.) has been discontinued.

(N.M. 36/66.)

(N.M. 30(296), Sydney, 1966.)

H.O. Chart **3421**.

H.O. Pub. 111B, Nos. **16235, 16240**.

H.O. Pub. 74, 1952, page **263**.

## CHAPTER 7

### VLAMING HEAD TO SWAN RIVER, WITH OFF-LYING ISLANDS AND SHOALS

7-1 THE COAST (*H. O. Chart 3421*) from Vlaming Head, 3 miles westward of Northwest Cape, trends southwestward for 12 miles to Low Point. False Island Point, northward of Low Point, makes as an island from northeast and southwestward. Southwest of Low Point the shore is steep and rocky, the barren country behind rising gradually to the long ridge extending southwestward from Vlaming Head. From Low Point the coast trends south-southwestward 40 miles, and thence about south, 10 miles, to Point Cloates.

Weajuggu (Wealjugoo) Hill 466 feet high, 10 miles northward of Point Cloates, is the southern end of the range extending from Vlaming Head.

The coast reef from Vlaming Head to Point Cloates extends off from 1 to 3 miles, with narrow passage through, but the waterway inside is said to be only navigable by boats.

There is a whaling station in Norwegian Bay situated on the southern side of the point southwestward of Weajuggu Hill. Off the station there is anchorage; it is principally used by vessels engaged in the whaling industry. The anchorage is sheltered by the reefs, which break heavily, from 2 to 3 miles offshore. There are three passages through these reefs, but the northernmost, situated with the disused Cloates Point Lighthouse bearing 158°, is recommended. This channel is marked by two black and white triangular range beacons in line bearing 117°. A rock over which there is a depth of 12 feet is reported to lie about 200 yards southward of the north

reef. A dangerous rock lies about 3½ miles, and another lies about 1½ miles north-north-eastward of the light on Frazer Islet.

**Moonta Rock.**—The steamer *Moonta* was reported in 1905 to have struck on a shoal at night when about 20 miles north of Point Cloates, in 22°24' S., 113°38' E.

7-2 **Frazer Islet**, about 2 miles offshore, and within the edge of the reef 5 miles northwest of Point Cloates, is sandy, 1,000 yards long, about 200 yards broad, and 23 feet high. Radar returns from Frazer Islet have been reported up to 12 miles in range.

**Light.**—A light is exhibited from a red steel skeleton tower, 74 feet high, situated on the summit of Frazer Islet.

**Caution.**—The outer extremity of a reef with outlying pinnacles is located about 12 miles 339° from the disused Point Cloates Lighthouse. Foul ground is reported to exist between this position and the coast line.

7-3 **Point Cloates Anchorages** (22°42' S., 113°41' E., *H.O. Chart 3421*).—Point Cloates, which is sandy, rises to Cloates Hill, 136 feet high, on which is the lighthouse. The coast reef abreast the point is 1 mile distant and breaks heavily; continuing southeastward parallel with the shore for 1.5 miles, it turns sharply northeastward for the distance of 1 mile. In the bight of the coast, eastward of the southern part of the reef, small vessels find shelter in a depth of about 2 fathoms.

**Black Rock**, 2.5 miles southwestward from Point Cloates, and probably a detached portion of the reef nearer the shore, always breaks; there is a pinnacle in the center 8 feet high.

7-14 **SHARK BAY** (*H. O. Chart 3436*) extends southward for a distance of 130 miles from Charles Point, and is from 20 to 50 miles wide. It is formed between Bernier, Dorre, and Dirk Hartog Islands on the west, and the low mainland on the east and south. The greater and southern portion of the bay is divided by Peron Peninsula into two arms, the western leading through Denham Sound, between numerous shoals, into Freycinet Estuary, and unnavigable inlets, and the eastern through Hopeless Reach, toward Hamelin Pool. The northern half is deep, and available for all classes of vessels.

Shark Bay is one of the headquarters of the pearl fisheries.

7-15 **Aspect.**—The eastern shore of Shark Bay, from Charles Point, trends south-southeastward for a distance of 26 miles, to Gascoyne River, and is mostly barren. Beagle Hill, over Charles Point, has a conspicuous sharp peak. North and South Bejaling Sand Patches are, respectively, 8 and 15 miles southward of Charles Point, with Whaleback Hill between them. Pelican Hill, 167 feet high, and 4 miles southward of South Bejaling, is conspicuous. Between these coast sand hills and Lyell Range, 200 to 300 feet high, about 10 miles inland, is an extensive marshy plain. Brown Range, 300 feet high, rises close southward of the mouth of Gascoyne River.

The eastern shore of Shark Bay, from Grennough Point ( $25^{\circ}14' S.$ ,  $113^{\circ}51' E.$ ), 25 miles southward of Gascoyne River, to Wuramel River, has not been examined, but was traced roughly during an exploration. The whole coast is low, intersected by creeks, and lined with mangroves, through which, in some places, the tide flows a considerable distance inland.

Over Greenough Point are three conspicuous sand hummocks, Denham Hummocks, 45 feet high. Grey Point, 10 miles northwest-

ward of Greenough Point, is low, with Bush Bay between them. The shores of Bush Bay are low and thickly covered with mangroves, intersected by many salt-water creeks.

A range of sand hills, scarcely more elevated than the mangroves, extends along the greater portion of this coast; the interior country being low and flat, is in some parts subject to inundations. The part between Greenough and Long Points is bordered by shallow flats extending from 3 to 8 miles from shore.

Long Point lies about 15 miles southward from Greenough Point.

7-16 **Entrances.**—Geographe Channel, the northern entrance into Shark Bay, is 20 miles wide between Charles Point on the east and Bernier Isle on the west, with depths of 20 to 28 fathoms in the fairway, decreasing toward the shores. The eastern shore is fronted by Fritzroy and Darwin Reefs, etc., described with Gascoyne Road, the western side is clear.

7-17 **Western Shore.**—Bernier Isle, the northernmost of the three principal islands forming the western boundary of Shark Bay, is 15 miles in length, north and south, 1.5 miles in breadth, and 120 feet high. It consists of a reddish limestone and of sandy dunes producing only some stunted bushes. The western coast of the island consists of high perpendicular cliffs, with a level outline. The island is frequented by many sea birds and turtle, but there is no fresh water.

A light is shown on the northern extremity of Bernier Isle.

Koks Islet ( $24^{\circ}45' S.$ ,  $113^{\circ}09' E.$ , *H. O. Chart 3436*), about 700 yards off the northern end of Bernier Isle, is about 500 yards in extent, and table-topped, terminating at each extremity in low cliffs. On the summit of the islets are several large boulders, about 25 feet high.

7-18 **Dorre Isle**, separated from the southern end of Bernier Isle by a rocky impassable channel about 1,200 yards wide,

with a dry rock about midway, is 17 miles in length, north and south, from 1,500 yards to 2 miles in breadth, and with a reef extending 1,000 yards or more from Cape St. Cricq, its southern end. This island is exactly of the same aspect, but a little higher than Bernier Isle, both being said to be bold to on their western sides, but there are no soundings on the charts in support of this statement. Quoin Bluff, near the northeastern side of Dorre Isle, is 150 feet high, and conspicuous. Observation Hillocks, over Cape St. Cricq, the southern extremity, is also conspicuous. Cape St. Cricq is reported (1959) to lie 1.3 miles westward of its charted position.

At the northeastern extremity of the isle there is a convenient boat harbor, charted as Disaster Cove.

**Anchorage.**—There is safe and protected anchorage close to White Beach Landing, on the eastern side of Dorre Island.

Uranie Bank, of sand and rock, with depths of from 1 to 3 fathoms, lies off the eastern side of Dorre Isle. It is 11 miles in length, north and south, from 2 to 7 miles in width, and the southeastern edge within the 5-fathom curve, with a depth of 2½ fathoms, lies 073°, 11 miles from Cape St. Cricq.

A detached 4-fathom shoal was reported (1963) to lie about 1 mile southward of the southeastern end of Uranie Bank and about 10½ miles eastward of Cape St. Cricq.

7-19 **Naturaliste Channel**, the western entrance into Shark Bay, between Dorre and Dirk Hartogs Islands, is 14 miles wide.

**Dampier Reef**, a drying reef which breaks in heavy weather, lies on the bar a little northward of the center of the fairway through Naturaliste Channel; it is about 1.5 miles in length, and should be given a wide berth. The western edge is charted 190°, 5.3 miles from Cape St. Cricq. There are strong overfalls on the west-going stream over this danger.

**Shoals.**—A shoal having a depth of less than 5 fathoms was reported (1931) to lie in Shark Bay, about 6 miles eastward of Dampier Reef.

A 3½-fathom shoal is reported to lie about 7½ miles southeastward of Cape St. Cricq

and about 1 mile northwestward of the above-mentioned shoal.

Depths of 6, 4½ and 3½ fathoms are reported (1958) about 10¼, 13½ and 12½ miles, respectively, east-northeastward of Cape Inscription. Depths of 3½ and 5 fathoms lie about 8½ and 10 miles, respectively, eastward; and a 4 fathom patch was reported (1960) about 7¼ miles east-southeastward of the above cape.

7-20 **Dirk Hartogs Island** extends from Cape Inscription, its northwestern extremity (a remarkably jagged head, 118 feet high, on which there is a light), for a distance of 41.5 miles southward to Ransonnet Point, the southern extremity, and is from 2 to 6 miles in breadth. Its western coast, like Bernier and Dorre Isles, is apparently bold of approach, and is formed of light brown sandstone cliffs, with occasional slopes and strips of whitish drift sand, here and there sharply indented at the base, the land immediately behind having a most barren aspect. The highest part, Herald Heights, has an elevation of 608 feet, while the cliffs vary from 300 to 100 feet in height northward in the direction of Cape Inscription, near which the land has a comparatively level and smooth outline.

The island is used as a sheep station; several wells have been sunk.

A station known as Brown's Station is situated on the eastern side, at 9 miles from its southern extremity.

Quoin Head, on the western side of Dirk Hartogs Island, 20 miles southward of Cape Inscription, is a conspicuous bold point.

Breakers extend about 1 mile from the shore between Cape Inscription and the point 4 miles southwestward of it. Breakers were reported (1960) about 11½ miles southwestward of Herald Heights.

**Light.**—A light is exhibited from a grey concrete tower 40 feet high, on Cape Inscription. Radar returns from Cape Inscription have been reported up to 28 miles in range.

7-21 **Turtle Bay** (*plan on H. O. Chart 3436*), at the northern end of Dirk Hartogs Island, between Cape Inscription and Cape Levillain, has good anchorage in 8 fathoms about 1,000 yards offshore, sheltered from

all winds southward of east-southeast and west-southwest, and these being the prevailing winds here, Turtle Bay may be considered a desirable stopping place, where turtle (in season) and fish may be procured in abundance. Turtle Bay, however, should be avoided during the period of the northwest gales, May to October.

From Cape Levillain, a spit, with depth under 3 fathoms, extends nearly 1,000 yards off. A patch of discolored water, with a depth of 6 fathoms, and possibly less, lies  $348^{\circ}$ , 1 mile from the cape.

**Landing.**—The western and greater portion of the shore is backed by cliffs from 120 to 169 feet high, and fronted by a rocky ledge, but the beach affords good landing, especially at high water.

**7-22 Directions.**—A vessel bound to Turtle Bay from southward should run along the western side of Dirk Hartogs Island until Cape Inscription Lighthouse is abeam, thence haul round the cape at a distance of about 1,000 yards and anchor with it bearing about  $278^{\circ}$ , distant nearly 2 miles, in a depth of about 8 fathoms.

From the eastward, having avoided Levillain Shoal (sec. 7-30), which breaks in places, southeastward of the cape, steer for Cape Inscription bearing  $278^{\circ}$ , which leads between the reef off Cape Levillain and the 6-fathom patch northward of the cape, and to the anchorage in about 8 fathoms.

**Tides.**—It is high water, full and change, in Turtle Bay, at 11h. 45m.; springs rise 6 feet. The currents of rising tide entering Shark Bay by the Geographe and Naturaliste Channels, meet near the southern end of Uranie Bank. Rate at springs about  $1\frac{1}{4}$  knots.

The east coast of Dirk Hartogs Island is described later.

**7-23 GASCOYNE ROAD** ( $24^{\circ}53' S.$ ,  $113^{\circ}36' E.$ , *plan on H. O. Chart 3436*) is available for all classes of vessels, but those

of deep draft must anchor a long distance off, there being but 5 fathoms nearly 5 miles from the mouth of the river. There is depth of  $2\frac{1}{2}$  to 3 fathoms about 1 mile off.

**7-24 Dangers in the approach.**—Fitz Roy Reef are two reefs about 1 mile apart, and about 2 miles offshore, at 22 miles northward of Gascoyne Road. The southern extremity of the outer reef lies  $198^{\circ}$  3 miles from Beagle Hill, within Charles Point. The sea nearly always breaks on them.

**Darwin Reefs**, with depths of less than 6 feet in places, are situated on the extremity of a ledge which extends 4 miles southward of the point 4 miles southeast of Beagle Hill; they usually break.

The southernmost patch of 3 fathoms lies  $171^{\circ}$  8 miles from Beagle Hill. There are depths of 10 to 12 fathoms close westward of these dangers.

**Bejaling Shoals**, patches of 2 and 3 fathoms, 1.5 miles apart, are situated 4.5 miles offshore, abreast Whaleback Hill. The outermost patch, 2 fathoms, lies  $163^{\circ}$  10 miles from Beagle Hill; there is a patch of  $4\frac{1}{2}$  fathoms at 1.3 miles southwest of the 2-fathom patch. The sea only breaks in bad weather.

Southward of these patches, between Pelican Hill and Whitmore Point, the 3-fathom curve extends about 2 miles offshore, outside which are Blowfish Banks.

**Blowfish Banks**, with depths of  $2\frac{1}{2}$  to 3 fathoms, extend offshore abreast Pelican Hill, the outer patch of 3 fathoms lying  $248^{\circ}$  4 miles from it.

A depth of  $3\frac{1}{2}$  fathoms was reported (1958)  $2\frac{3}{4}$  miles westward of Babbage Island Light.

**Elbow Shoal**, with depths of 2 to 3 fathoms, is the termination seaward of Gascoyne Flats, which extend 4 miles from the land, and dry in patches at low water, in the southern approach to the road. The Elbow, which is the edge of the 3-fathom curve, is 6.8 miles offshore, and  $200^{\circ}$  10 miles from the end of Babbage Island jetty. The 5-

fathom curve is 10 miles offshore, at 4 miles southeast of the Elbow.

**7-25 Tides.**—It is high water, full and change, in Gascoyne Road, at about 10h. 15m. Springs rise 5 feet. Strong southeast winds cause the water to remain about 2 feet below, and northwest winds about 2 feet above the mean low water level to which soundings are reduced.

**Tidal currents.**—The current of rising tide sets from about eastward to southeastward, and the falling tide northwestward, with a rate of from 1 to 2 knots.

A strong inshore set is occasionally experienced between Gascoyne River and Charles Point before and after northwest gales, rendering it necessary to give Fitz Roy and the reefs southward of it a wide berth.

**Lights.**—A light is exhibited from a white wooden structure 60 feet high, with the keeper's dwelling 100 yards northwestward, on Babbage Island in Shark Bay.

A light is exhibited from wooden gallows, 15 feet high, on Babbage Island Jetty.

A light is shown from a catwalk about one-half of a mile southeastward of the jetty.

A pole beacon, with cask, is erected on Mangrove Point.

An aeronautical light is located about 2 miles east-southeastward of Babbage Island Light.

An aviation radiobeacon is located about 1½ miles northeastward of the aeronautical light.

**7-26 Anchorage.**—The best anchorage, in about 3¼ fathoms sand bottom, is off the north entrance to the river 1.3 miles from the shore, with Babbage Island Light bearing 076° 1.2 miles.

There is anchorage off the southern entrance, in 2¾ fathoms, with Mangrove Point bearing 108° and Babbage Island Light bearing 016°, distant 1½ miles.

A continuance of strong southerly winds will reduce the depths shown on the chart by about 2 feet.

**Pilotage.**—There are no regular pilots at Carnarvon, pilot services from Fremantle can be arranged in advance.

**7-27 Directions.**—Approaching Gascoyne Road from the northward by Geographé Channel, a vessel should give the eastern shore a berth of at least 8 miles, to avoid Fitz Roy Reefs and the others between it and Gascoyne Road, and Babbage Island Light must be kept bearing less than 138° by vessels standing toward the shore, to avoid the occasional inset there toward that shore at times.

Vessels for Gascoyne Road from the southward, having passed through Naturaliste Channel on either side of Dampier Reefs, should keep Cape St. Cricq bearing more than 260°, until Quoin Bluff bears less than 320°, to avoid Uranie Bank; thence steer direct, allowing for the tidal current, for Gascoyne Road. The lead, if carefully attended to, will give good warning of too near an approach to the Elbow Shoal, which fronts the shore to the distance of 9 miles. The current of rising tide sets southeastward directly on to this shoal.

When Babbage Island Lighthouse is seen, it must be brought to bear not less than 030°, until the anchorage is reached.

Within 10 miles north or south of Gascoyne Road, a vessel may stand into 6 fathoms, and off to 14 and 15 fathoms, about midway between Dorre and Bernier Island, and the main. By night, the eastern shores of Dorre and Bernier Islands should not be approached to a depth less than 8 fathoms.

In approaching the jetty from either northward or southward, head for a position 4 miles 270° from Babbage Island Light; thence steer for the jetty, keeping the light on Babbage Island open northward of the light on the head of the jetty. It is best to berth alongside the northern side of the jetty,

with bow facing seaward and starboard anchor out.

**Jetty** ( $24^{\circ}53' S.$ ,  $113^{\circ}37' E.$ ).—From the northwestern point of Babbage Island, near the lighthouse, a jetty extends  $247^{\circ}$  for 4,900 feet. There is 320 feet of berthing on the northern side of the jetty, and 360 feet on the southern side, each having a depth of  $17\frac{1}{2}$  feet alongside. Vessels cannot lie alongside during strong northerly or northwesterly winds. Explosives may be discharged direct into trucks at the jetty. From the jetty a tramway runs to the town of Carnarvon. There is a landing place for boats on the north side of the jetty, with a depth of 20 feet alongside. A 3-fathom patch lies about 250 yards southwestward of the head of the jetty.

The old wooden pier northward of Mangrove Point is in ruins.

**7-28 Gascoyne River.**—The entrance of the river is divided into two channels by Babbage Island, which is low, sandy, nearly covered with samphire swamps, and intersected by creeks.

Gascoyne River rises near Mount Labouchere, in about  $24^{\circ}50' S.$ ,  $118^{\circ} E.$ . One branch, Lyons River, takes a northwesterly, and another a westerly and southwesterly, direction, meeting at about 100 miles from the entrance. From this junction the river trends northwest, and thence southwesterly to its mouth. There are several channels, separated from each other by long strips of land, forming islands in times of flood. The main channel, which is about 270 yards wide, was quite dry above the highest point reached by the sea, but from the driftwood seen high up in the branches of the trees, appeared to be occasionally filled up by a great body of water.

The extensive flat country through which Gascoyne River flows, consists of a fertile alluvial soil, with gently sloping rises, and

numerous fresh-water lagoons formed in a red clay soil. The country is lightly timbered, and well adapted for either agriculture or pasture.

The north entrance of the river is barely available for boats at high water.

South entrance is 600 yards wide, and takes an easterly and thence northeasterly direction, until its junction with north entrance abreast the northeastern extremity of Babbage Island. There is barely 1 foot at low-water springs across the mouth of south entrance, but the channel is available for small craft with local knowledge at high water. Owing to the many snags which obstruct the channel, a good lookout must be kept when entering.

A bridge spans the river about 8 miles above Carnarvon.

**7-29 CARNARVON** ( $24^{\circ}53' S.$ ,  $113^{\circ}40' E.$ ), the chief town of the large pastoral district of Gascoyne, is upon the southern shore, about 1,000 yards within the southern entrance of Gascoyne River. A 5-ton mobile crane is available. The town contains postal and telegraph facilities, resident magistrate and collector of customs, hospital, and various public buildings. The population of Carnarvon was 8,300 (1954).

Exports consist chiefly of cattle and sheep, pear shells, sandalwood, and wool.

**Supplies.**—Fresh provisions are plentiful. Fresh water is laid onto the jetty. A small stock of Diesel oil and gasoline is maintained.

**Caution.**—Blowfish (Tetrodon) of large size abound in Shark Bay. If eaten death usually ensues in a few hours. Poisonous blowfish of smaller size are found near the coast as far south as Cape Leewin.

**Communication.**—Mail steamers call at Gascoyne Road fortnightly; other steam and sailing vessels frequently arrive with and for cargoes.

There is an air mail service in operation. Carnarvon is in direct communication with the interstate telegraph system.

**Quarantine.**—The quarantine area is limited by a circle with a radius of one-fourth of a mile centered on the head of the jetty. Vessels are inspected at the jetty unless there is any suspected quarantinable disease, in which case the vessel is inspected at the anchorage.

Carnarvon is a first port of entry.

**Hospital.**—There is a small hospital at Carnarvon.

**Winds and weather—Cyclones.**—Shark Bay is occasionally, though rarely, visited by the outer cycle

of the cyclones, the centers of which are experienced northward of the bay. A vessel, therefore, at anchor off the Gascoyne, from December until the end of March should, upon indications of bad weather, be prepared to put to sea.

During the southeast monsoon, May to October, an occasional gale from the northwest, less severe and of shorter duration than those to the southward, is experienced. The barometer usually gives sufficient warning of the approach of these gales.

The surveying vessel *Meda* rode out in safety several northwesterly gales in Gascoyne Road.

The mean height of the barometer in 1884 was 29.95 inches; maximum 30.30; minimum 29.61. Mean temperature 74°; maximum 112°; minimum 39°. Mean annual rainfall for 6 years was 6.1 inches, but it varies considerably in different seasons.

**7-30 DENHAM SOUND (H. O. Chart 3436)**, between the eastern coast of Dirk Hartogs Island and Peron Peninsula, has general depths of 8 to 10 fathoms as far in as Herald Bay. A few isolated patches of 4½ and 5 fathoms will be seen on the chart, in or near the fairway. Possibly less water may exist on them. Bar Flats separate it from Freycinet Reach.

From Cape Levillain the eastern coast of Dirk Hartogs Island trends southward, 24 miles to Quoin Bluff, the southeastern point of Herald Bay. It consists of red cliffs of from 20 to 60 feet elevation, with occasional sandy beaches, and is bordered by a reef.

**Levillain Shoal**, within the 3-fathom curve, is about 2.5 miles in length in a north and south direction, with rocky heads, on which the sea breaks at times. Its northern extremity is 1 mile eastward of Cape Levillain, with a depth of 5 fathoms between.

**Shoal**.—About midway between Cape Levillain and Herald Bay lies another shoal, 2.5 miles in length north and south, and 1 mile in breadth, with depths of 4 to 12 feet of water, its outer or eastern edge being 2.5 miles offshore. The eastern extremity of the foul ground off it, with a depth of 3½ fathoms, lies 5.5 miles, 121° from the conspicuous white sand patch on the eastern coast of Dirk Hartogs Island.

**7-31 Herald Bay.—Quoin Bluff** (25°53' S., 113°08' E.) is a bold projection 120 feet high, appearing from the northward like an island, and forming the southeastern extremity of Herald Bay. Shallow water extends 1 mile northeastward from the bluff, and around the bay to about half that distance.

A shoal, with a least depth of 3½ fathoms, lies 001°, 2.5 miles from the bluff, with a patch of 2¾ fathoms between it and the head of the bay. A shoal, with apparently 4 fathoms least water, is charted 052°, 3 miles from the bluff.

Herald Bay affords anchorage in depths of 4 fathoms about 1 mile north-northwestward of Quoin Bluff.

**Tetrodon Loop** is a shallow bight, formed between Quoin Bluff and Notch Point, 3 miles farther southward.

The depths are less than 3 fathoms for a distance of 3.3 miles northeastward of Notch Point, terminating in a spit with a depth of 2 fathoms, which lies 1.5 miles, 102° from the northern side of Quoin Bluff; between this spit and Quoin Bluff is a depth of about 4 fathoms. **Guano (Egg) Islet** is at the eastern extremity of a ledge of sunken rocks extending from a point, about 1.5 miles to the southward of Quoin Bluff.

A patch of 3 feet lies about 2 miles southeastward of Notch Point, within the 3-fathom curve and a depth of 4½ fathoms lies about 4 miles southeastward of the same point, outside the 5-fathom curve.

**7-32 Coast**.—The remaining portion of the eastern coast of Dirk Hartogs Island, from Notch Point, trends southeastward to its southern extremity, Ransonnet Point, a bare wedge-shaped point of sandstone, with two bare rocks 7 feet high close off it. This coast is bordered by a shallow flat, and a small islet lies near the shore 2.5 miles northeastward of the cape.

**Supplies**.—Water and sheep may be obtained on Dirk Hartogs Island, at Brown's

sheep station 4 miles southward of Notch Point.

Anchorage, in 4½ fathoms, may be taken, with the sheep station store bearing 202°, 1.5 miles. Care is necessary in taking up this anchorage, as the shore flat is steep-to.

**7-33 SOUTH PASSAGE—Outer Bar** (*plan on H. O. Chart 3436*).—South Passage, leading from seaward to Denham Sound and Shark Bay, is about 1.5 miles wide, between Surf Point, the southwestern extremity of Dirk Hartogs Island, and Steep Point on the mainland. This entrance is obstructed by Outer Bar, which has a low water depth of 2 to 3 fathoms, and steep-to on its seaward side. Ledges which uncover at low water, and sunken dangers, extend nearly 1 mile in a southerly direction from Surf Point, and 200 yards off Monkey Rock on the opposite side, reducing the entrance to about 1,000 yards in width. Except with offshore winds the ledges are generally to be distinguished by surf beating upon them.

South Passage should not be attempted except by vessels possessing local knowledge, and of not more than 12 feet draft. (See paragraph Caution following Directions for this passage in section 7-38.)

**7-34 Landmarks—Steep Point** ( $26^{\circ}09' S.$ ,  $113^{\circ}07' E.$ ) is a bold cliffy projection with a cairn of stones upon it, 10 feet high, and 115 feet above high water. Steep Point is useful in distinguishing South Passage from False Entrance, about  $12\frac{1}{2}$  miles south-southeastward. A light is shown on Steep Point.

Monkey Rock, a small conspicuous bare islet, 11 feet high, lies about 400 yards eastward of Steep Point, with sunken dangers surrounding it at the distance of 400 yards. Surf Point, the northern entrance point, is a narrow cliffy peninsula about 70 feet high, with two rocky islets close-to, and sandy coast on either side. The south-

ern extremity of Herald Heights on Dirk Hartogs Island, a conspicuous sand patch, about 350 feet high, is about 1,500 yards northward of Surf Point. At 1,500 yards eastward of the point there is a bare sand hill, about 200 feet high, with a well of water at its western base.

**7-35 Blind Strait** (*H. O. Chart 3436*).—Within the Outer Bar, the channel, with depths of 4 and 5 fathoms, takes a south-easterly direction for 2.5 miles to abreast of Ransonnet Point; thence it trends northward, maintaining the same depths, and affording anchorage throughout, a distance of about 5 miles, to the inner bar; this channel is called Blind Strait. The fairway of Blind Strait is reported to lie farther to the eastward than charted.

**South Sand** (*H. O. Chart 3436, with plan of Inner Bar*), with depths of 1 to 6 feet, and deeper water inshore, extends in a direction parallel to the shore northward from Ransonnet Rocks, and terminates in a tongue forming the southwestern side of Inner Bar.

**North Sand**, with depths of 4 to 6 feet, is 800 yards northward of the northern extremity of South Sand. Both North and South Sands were, in August, distinguishable by streaks of dark seaweed growing upon them.

**East Sand** extends nearly 2 miles from the western shore of Bellefin Prong, with depths of 2 to 6 feet.

**Inner Bar**, between North and South Sands, has a depth of 12 feet of water over a bottom of coarse sand and shells.

**7-36 Tidal currents** (*H. O. Chart 3436, with plans of Inner and Outer Bars*).—In South Passage (August, 1882), the tidal rise and fall were found to be very irregular. The current with falling tide attained a velocity of 3 knots at springs, causing heavy overfalls on Outer Bar. Strong southerly winds are reported to cause the water to fall 2 feet below the mean level.

7-37 Directions—Outer Bar.—South Passage, as before stated, can not be taken in safety by vessels of more than 12 feet draft, as there is usually a considerable scend of the sea on the bar. No specific directions can be given for entering it, but should a vessel without local knowledge be compelled by circumstances to take the passage, she must be guided by the eye between the breakers when crossing Outer Bar, and thence the lead will prove of service if carefully attended to. As a general guide, open out the passage by bringing a point on the southern shore, with a small islet close to it, opposite Ransonnet Point, well open northward of Monkey Rock, bearing about  $135^{\circ}$ , and steer to pass 600 yards eastward of the latter. Within Outer Bar, a midchannel course should be kept until abreast of Ransonnet Rocks, and from thence northward along South Sand, and between its northern extremity and East Sand.

Vessels are recommended to favor the eastern side of Blind Strait, the edge of the bank on that side being more uniform and showing up clearer than on the western side. Blind Strait is reported to be about 1,000 yards to the eastward of its charted position.

7-38 Caution (*H.O. Chart 3436*).—Epineux (False Entrance) is a shallow inlet about 12 miles southward of South Passage. As both openings take a southeasterly direction, with entrance points similar in appearance, Epineux, it is stated, is liable to be mistaken for South Passage when approaching from the southward.

7-39 Cape Bellefin ( $26^{\circ}01' S.$ ,  $113^{\circ}17'$

E.), in the southern part of Denham Sound, is the northern extremity of Bellefin Prong, a narrow tongue of the mainland, 204 feet in height, extending northward 10 miles from the eastern side of an inlet, 7 miles within Steep Point, entrance to South Passage.

Useless Inlet.—Cape Bellefin, and Cape Heirisson, 3 miles eastward, form the entrance points of Useless Inlet, which trends southward for a distance of about 18 miles. It is about 600 yards wide but, as may be concluded from its name, is unworthy of further notice as an anchorage. Extensive beds of pearl-shell oysters have been worked.

Bellefin and Heirisson Flats, two narrow spits, with depths of 1 and 3 fathoms, extend from Capes Bellefin and Heirisson into Denham Sound; that from the latter, which has some knolls on it, is 9 miles in length, extending to about 5 miles eastward of Quoin Bluff. Between these flats is the narrow entrance to Useless Inlet.

The channel between these spits and the spit extending from Notch Point, Dirk Hartogs Island, is about 3 miles wide, with depths of 6 to 8 fathoms, and the inner approach to South Passage.

7-40 Coast.—From Cape Heirisson, 95 feet in height, the coast which forms the eastern side of Heirisson Prong and the western side of Freycinet Reach, trends southward 6 miles to the entrance of Useless Loop, an inlet about 1 mile wide; and from thence southward 12 miles to another bight, the eastern entrance point of which forms the western side of the entrance of Freycinet Estuary. The whole of this coast is fronted

by a flat with islets on it, and extending from 1 to 4 miles from the shore.

7-41 **PERON PENINSULA**, which divides the southern portion of Shark Bay into two arms, is 45 miles in length north and south, and 12 miles in breadth at the center.

**Shoals.**—Cape Peron Flats, a narrow spit, with depths of 3 to 12 feet, extends northward for a distance of 8 miles from the northern point of the peninsula. Depths of less than 5 fathoms extend about 1 mile farther northward.

7-42 **Western side.**—Cape Lesueur ( $25^{\circ} 44' S.$ ,  $113^{\circ} 23' E.$ ), on the western side of the peninsula, 14 miles south-southwestward of Cape Peron, is a bright sandy bluff, forming the western elbow of a ridge of red barren-looking sandstone cliffs. Peron Hills, 142 feet in height, are within. The chart shows a flagstaff on the cape.

From Cape Lesueur the coast trends south-southeastward 13 miles to Lagoon Point, which is 100 feet high, with a lagoon close northeastward of it. Thence the coast trends southward for 11 miles, to Eagle Bluff, the southwestern point of Peron Peninsula.

**Shoal.**—The coast from Cape Lesueur to Eagle Bluff is bordered by a shallow flat with less than 2 fathoms, to the distance of 2 to 4 miles.

**Pearling camps** are established on Peron Peninsula, one at Cape Lesueur, and another at Denham, a settlement situated about 1 mile southeastward to Lagoon Point. Denham has a population of about 180.

**Telegraph.**—There is a telegraph station on Lagoon Point.

**Range lights.**—Two range lights are shown from a position in the vicinity of Denham. The upper light is exhibited at a height of 40 feet; and the lower light at an elevation of 30 feet. These lights in range

are intended to keep the local small craft clear of the shallow water south of Denham.

7-43 **Eagle Bluff** ( $26^{\circ} 06' S.$ ,  $113^{\circ} 34' E.$ ) is a bold sandstone cliff, 137 feet high, marked by red and white stripes. The land within the bluff slopes down to a bushy plain; a small green islet lies near the base of the cliff.

From Eagle Bluff the remaining portion of the western coast of Peron Peninsula trends southeastward 10 miles to Goulet Bluff, 88 feet high, on the western side and near the center of Taillefer Isthmus.

7-44 **Freycinet Reach—Bar Flats.**—Freycinet Reach, the channel leading from Denham Sound into Freycinet Estuary is 10 miles wide, between Cape Heirisson and Lagoon Point, but the approach is so encumbered with the Bar Flats, stretching nearly across the entrance, between Heirisson Flats and Cape Lesueur, and which are reported to have extended considerably, so as to render navigation difficult for other than light-draft vessels. Within these flats the channel increases in width, with 6 to 8 fathoms of water in the fairway. Bar Flats have a least depth of 3 feet, and are reported to be subject to considerable change.

**Caution.**—Southward of Bar Flats on the eastern side of Denham Channel, the depths are reported (1928) to be less than shown on the charts.

7-45 **Denham Channel** is the narrow channel, with a depth of 4 fathoms at the entrance and 6 fathoms inside, between Cape Heirisson flats and the southwestern side of Bar Flats. A depth of 4 fathoms lies on the southwestern side of the channel, about 1,500 yards within the entrance.

**Lights.**—A light is shown from a pile beacon on the northwestern extremity of Heirisson Flats and marks the western side of the northern entrance to Denham Channel.

A light beacon is located on the northeast side of the southern entrance to Denham Channel in a position about 3 miles northeastward of Cape Heirisson.

7-46 FREYCINET ESTUARY (*H. O. Chart 3436*) is the continuation of Freycinet Reach, and from Goulet Bluff extends south 23 miles, to Disappointment Loop, the southern extremity of Shark Bay, and is 17 miles wide.

There appears to be a regular depth of water in Freycinet Estuary, varying from 4 to 7 fathoms, and in some places secure anchorage might be found. But as the approach from northward is difficult, this estuary seems to possess no recommendations, the adjacent country being mostly parched, and quite destitute of water.

Fork Flat, one of many shoals which more or less obstruct the reach, is nearly in mid-channel abreast Goulet Bluff; it is 4 miles long, with 4 feet of water on the southern end, and with a passage on either side of it. For other dangers, see the chart.

7-47 Coast and islands.—Disappointment Loop ( $26^{\circ}38' S.$ ,  $113^{\circ}39' E.$ ) is separated from Depuch Loop, a more extensive inlet to the northwestward, by a peninsula, of which Giraud Point is the northern extremity. Freycinet Islet, 58 feet high, and surrounded by a reef, lies 3.5 miles northward of the point. Boat Haven Loop, and Brown Inlet at its head, are separated from Depuch Loop by Cararang Peninsula. These inlets are too encumbered with shoals to be available except for boats.

There are several small islets on the flats, which border the western shore, and a chain

of four small islets fronts the shore, extending about 7 miles northward from the eastern point of Disappointment Loop.

The southern shore from Disappointment Loop trends eastward for a distance of 7 miles, to Fording Point, from which a shallow ridge or ford extends northwestward 5 miles, inclosing Salutation or Leschenault Islet. White Islet, 54 feet high, surrounded by a reef, is 5.5 miles northward of Salutation Islet.

From Fording Point, the eastern shore of Freycinet Estuary trends northward to Goulet Bluff, eastern side of the entrance, fronted by a flat with less than 3 fathoms of water to the distance of from 1 to 3 miles.

Tides.—It is high water, full and change, at Cape Peron, at 0h. 45m., springs rise 5 feet 6 inches. At Goulet Bluff, 3h. 0m., rise 5 feet. At Freycinet Estuary, 4h. 15m., springs rise 3 feet 3 inches.

The south-going tidal current runs from 4 hours before until 2 hours after high water, and the north-going for the other 6 hours, both at the rate of from 1 to 2 knots.

7-48 Hopeless Reach, the eastern arm of Shark Bay, southeastward of Cape Peron, has depths of 7 to 8 fathoms with a bottom of sand and shells, and there is not less water in the approaches. It is open to the northwestward.

From Cape Peron, the northern point of Peron Peninsula, the western shore of this arm of the gulf trends southeastward 26 miles, to Dubaut Point, the easternmost extremity of the peninsula, and the northwestern entrance point of Lharidon Bight, an inlet trending southward for about 18 miles, to Taillefer Isthmus.

7-49 **Herald Bight** ( $25^{\circ}34' S.$ ,  $113^{\circ}32' E.$ ) lies between Cape Peron and Guichenot Point, 8 miles apart, with Herald Bluff, 129 feet high, within the point.

**Reef.**—A sunken ledge extends 3.5 miles northward of Guichenot Point, the greater part of which has less depths than 1 fathom of water. The bight affords anchorage westward of this ledge, in  $4\frac{1}{2}$  to 6 fathoms; its shores range from 163 feet high near Cape Peron to 76 feet high in the bight.

**Eastern Bluff**, or Cape Rolland, 112 feet high, lies 12 miles southeast from Herald Bluff.

**Channels—Shoals.**—Southward of Hopeless Reach the shoals are so numerous and the channels so narrow that a full written description would be of little value; these will be best understood by referring to the chart. The most important are here referred to.

7-50 **Faure Isle** ( $25^{\circ}51' S.$ ,  $113^{\circ}52' E.$ ), about 6 miles eastward of Dubaut Point, the eastern point of Peron Peninsula, is 6.5 miles in length, 124 feet high, and has a narrow spit extending 9 miles north-northwestward, and a flat, nearly dry in places, from 2 to 3 miles from the western side. A detached flat, with depths under 1 fathom, lies between the spit and the shoal bordering Eastern Bluff on the western shore, with Herald Gut, a narrow channel with about  $3\frac{1}{2}$  fathoms of water, and probably less, separating the flat from the shore.

**Supplies.**—Green turtles are abundant in May and June around Faure Isle. Fish may be taken with the seine in Red Cliff Bay, close northward of Eastern Bluff.

7-51 **Coast.**—**Petit Point**, 3 miles southward from Faure Isle, is the northern extremity of a hilly peninsula, 145 feet high, forming the western shore of Hamelin Pool, and the eastern shore of Lharidon Bight. Between Faure Isle and Petit Point is Faure

Flat, with about 3 feet of water, which extends above 5 miles westward from the point, and eastward to the mainland.

**Lharidon Bight** is 6 miles wide at the entrance, whence it trends southward for a distance of 15 miles to Taillefer Isthmus. The only probable entrance to the bight is by a narrow channel, winding between the flats extending from Faure Isle and Petit Point, and those from the western shore. This channel has about  $3\frac{1}{2}$  fathoms of water; within the bight the depths are 5 to 6 fathoms.

7-52 **Disappointment Reach**, a narrow channel, with about 6 fathoms of water, between Faure Isle northern spit and the flat extending from the mainland to the eastward, forms the approach to Hamelin Pool, but after trending southeastward as far as Faure Isle, it is divided into two branches by Pelican Isle spit; the western one is barred by Faure Flat, which stretches across this entrance of the pool. Herald Loop, the eastern branch, has a charted depth of 10 feet across the flat at its southern end.

**Wuramel River**, which flows into the eastern side of Shark Bay abreast Faure Isle and Pelican Islet, is reported by pearling vessels to have anchorage close southward of its mouth, with a channel leading thereto available for vessels of 12 feet draft.

Wuramel River is the principal outlet for the local sandalwood industry.

7-53 **Gladstone** is a settlement situated a few miles southward of Wuramel River, in  $25^{\circ}54' S.$ , and is connected with the telegraph system.

**Hamelin Pool**, the eastern head of Shark Bay, is 17 miles wide between Petit Point and the mainland to the eastward and extends 28 miles southward. The western shore is bordered by a rocky shoal extending from 1 to 2 miles from the coast, the neck of land between Hamelin Pool and Freycinet

Estuary being at the narrowest part about 4 miles across. It can only be entered by Herald Loop, as above.

The southern and eastern shores of Hamelin Pool are also bordered by flats, those along the eastern side extending from 1 to 5 miles from the shore, which is of a broken nature, and partly fronted with reef. The pool within Faure Flat, with 4 to 5 fathoms of water, extends upward of 20 miles north and south and is 8 miles across.

**Tides.**—It is high water, full and change, in Hamelin Pool, at about 5h. 0m.; springs rise 3 feet 6 inches.

**Telegraph.**—Flint Cliff ( $26^{\circ}24' S.$ ,  $114^{\circ}08' E.$ ), at the head of Hamelin Pool, is a telegraph station.

**7-54 THE COAST (H. O. Chart 3422)** from Steep Point, entrance to South Passage, extends south-southeastward to Epineux to Shark Bay, previously mentioned.

From thence it continues in the same direction for a distance of about 95 miles, and consists of a range of rocky cliffs rising abruptly from the sea to the height of about 300 or 400 feet. The outline of the land is so level and the coast so uniform as to present no summits nor points by which any part of the coast might be recognized, and the shore is fringed with an uninterrupted line of high breakers.

Gantheaume Bay ( $27^{\circ}40' S.$ ,  $114^{\circ}10' E.$ ) is an exposed bight, with rocky and sandy shores, backed by hills bearing a stunted vegetation, but about 1 mile up the Murchison River valley the country has a more fertile appearance.

**7-55** Murchison River has a bar across the mouth, protected from the sea by a reef, which generally breaks heavily. There appeared to be no passage even for a boat, except at high water, but in fine weather there is a convenient landing place under the shelter of the reef. Murchison River takes its rise between Mount Labouchere and

Robinson Range, near the source of the Gascoyne, and flows to the southwestward. At about 200 miles from its source it is joined by a branch from the eastward and about 20 miles farther southward by Sandford River. The river runs through a mining district, and extensive sheep stations have been formed on its banks. Gold mines are being worked in the vicinity.

**7-56 Coast.**—Red Point, the southern extremity of Gantheaume Bay, is a steep bluff with a conspicuous hill 650 feet high, just within it, forming the northerly extremity of a range of reddish-colored cliffs, about 200 feet high, and 6 miles in length; these cliffs are succeeded by a sandy shore with occasional rocky points and bays trending nearly south 20 miles to Shoal Point.

Shoal Point ( $28^{\circ}07' S.$ ,  $114^{\circ}11' E.$ ) is a low sandy projection fronted with several rocks awash at low water, 700 yards distant. There is a conspicuous dark bluff about 7 miles northward of this point, and nearly midway are some remarkable sandhills of considerable height.

A light is shown from a white tower located about 4 miles northward of Shoal Point.

Radar returns from Shoal Point have been reported up to a range of 20 miles.

**7-57 Coast—Hutt Lagoon.**—From Shoal Point the low sandy shore trends southeastward 5.5 miles to Hillock Point, the northern point of Port Gregory, thence 4 miles to Hutt River entrance.

Hutt Lagoon, which extends from within and abreast Shoal Point to Port Gregory, is 8.5 miles in length and from 1,500 yards to 1.8 miles in breadth, with only a narrow strip of bare sand hillocks between it and the sea; in the vicinity of the port these hillocks are scantily covered with scrub. About 1,000 yards southward of Shoal Point, with heavy westerly gales, the sea washes over the low sandy beach into the lagoon.

On the eastern side of Hutt Lagoon there is a ridge of grassy hills, attaining abreast its southern end a height of 420 feet.

7-58 **Port Gregory** ( $28^{\circ}12' S.$ ,  $114^{\circ}15' E.$ , plan on *H. O. Chart 3422*), a safe harbor for vessels of less than 12 feet draft, may be known by a conspicuous bare white sand patch on the eastern side of the northern entrance, visible about 12 miles off, and by Scrubby Hillock, 700 yards southward from the bare white sand patch.

Port Gregory is principally frequented by small vessels conveying lead ore to Champion Bay for transhipment. The ore is brought down in trams from the Geraldine Mine on Murchison River, about 26 miles in a direct line from the coast.

Pakington and Lynton are the two settlements near Port Gregory.

7-59 **Dangers.**—Port Gregory is formed between the mainland and ledges of rocks lying nearly parallel with the coast at an average distance of 500 yards. The main ledge, 2 to 3 feet high, is a little over 2 miles in length and 50 yards in breadth, with a bank of sand and weed extending about 200 yards from its inner side; the southerly end of this ledge curves toward and nearly joins the beach abreast the highest sand hillock, 2 miles southeastward of Hillock Point.

Two detached ledges, named Flat and North Rocks, each about 3 feet high, with channels between, extend 1,000 yards northwest from the northwest end of the main ledge. A shallow bank, over which the sea breaks in a heavy swell, lies nearly 1,000 yards northwestward of North Rock and extends to the northwest for some distance.

At 1,100 yards northwest from Hillock Point and 300 yards offshore is a sunken rock on the eastern side of Leander Passage; the plan shows another rock 600 yards northwest of it.

7-60 **Depths.**—Within and eastward of Hillock Point the port widens to about 300 yards, and the water gradually shoals to the southeastward. Abreast the jetty (not charted), situated nearly 1,500 yards south-

east of Hillock Point, the depth is not more than 12 feet decreasing to 6 feet in the southeastern part of the port. There is a narrow boat channel between the beach and the southeastern end of the main ledge which can only be used in fine weather.

**A ridge of rocks** (*H. O. Chart 3437*), the southern part awash at low water, lies 1,000 yards southward of Port Gregory and 400 yards offshore.

**Archdeacon Ledge**, with  $1\frac{1}{2}$  fathoms of water, on which the sea seldom breaks, lies  $246^{\circ}$ , 1.8 miles, from Hutt River entrance.

7-61 **Hero Passage** (*H. O. Chart 3422, plan of Port Gregory*), the best entrance to the port, is a clear channel 300 yards wide, between North and Flat Rocks, with a depth of 4 fathoms in the fairway and nearly up to the rocks.

**Leander Passage**, the northern passage, is 700 yards wide at the entrance, between North Rock and Bare White Sand Patch, with a depth of about 4 fathoms. Within these entrances the channel contracts to 100 yards in breadth at the narrowest part, abreast the northwestern end of the main ledge, with a least depth of  $3\frac{1}{2}$  fathoms.

**Gold Digger Passage**, between Flat Rock and the northern end of the main reef, is only available for boats.

7-62 **Directions—Anchorage** (*H. O. Chart 3422*).—Vessels bound to Port Gregory from southward should keep Shoal Point well open westward of North Rock, bearing  $334^{\circ}$ , until the mouth of Hutt River bears  $078^{\circ}$ , when Hero or Leander Passages may be steered for. If proceeding through Hero Passage, pass round the northern side of Flat Rock and steer to the southeast, keeping within 100 yards of the ledges, and when nearly abreast Gold Digger Passage steer toward Hillock Point, passing midway between it and the sunken rocks extending from the northeastern extremity of the main

ledge. When the northeastern point of the ledge bears  $222^{\circ}$ , keep along the edge of the shore sandbank, and anchor in 3 fathoms, rock and sand, with the northeastern point of the main ledge bearing  $266^{\circ}$ , 400 yards.

This confined space in Port Gregory does not afford sufficient room for swinging at single anchor; vessels must therefore moor with one anchor on the shoal bank within the main ledge and the other on the beach.

It is not recommended for vessels without local knowledge to enter from the northward alongshore by Leander Passage.

**7-63 Tides.**—It is high water, full and change, in Port Gregory, about 11h. 30m.; springs rise 3 feet. The rise and fall are influenced by the wind.

A current generally sets northward through the passages at the rate of 1 to 2 knots, attaining a velocity at times of 3 knots. During winter, with a succession of northwesterly gales, the current runs in the opposite direction.

In the offing the current generally sets northwestward from  $\frac{1}{2}$  to 2 knots per hour during a great portion of the year; when north and northwest winds prevail, it runs in the opposite direction, though not so strong, the tendency, however, in both cases being to set a vessel toward the land.

**7-64 Hutt River** (*H. O. Chart 3437*), the mouth of which is generally closed by a sand bar, drains a considerable tract of country southeastward of Port Gregory. About 3 miles eastward of the mouth of this river are two remarkable conical peaks, each about 500 feet high, named Mounts Victoria and Albert.

**7-65 The coast.**—From Hutt river a rocky coast trends southeastward for a distance of 13.5 miles to Bowes River; the first 10 miles has a steep grassy ridge rising from the beach and varying from 300 or 400 feet in height; just midway between these rivers

the perpendicular cliffs are nearly white and form a conspicuous feature. About 4 miles northward of Bowes River the ridge recedes slightly from the beach, with two conspicuous bare sand patches between it and the sea. The shore in this vicinity is fringed with a line of reefs at a distance of 500 yards.

**7-66 Bowes River** ( $28^{\circ}25' S.$ ,  $114^{\circ}27' E.$ ) is usually closed by a sand bar. At 2.3 miles north of the river is Whaleboat Cove, an opening in the reef through which a boat might pass and find shelter on the beach inside.

**Aspect.**—Southward of Bowes River, for a distance of about 20 miles, the hills at the back are table topped with perpendicular sides, varying from 600 to 800 feet high; the southern range, named Moresby Range ( $28^{\circ}43' S.$ ) has at the southern extremity a flat-topped peak with a gap between it and Mount Fairfax. At 6.5 miles southeast from Mount Fairfax is Wizard Peak, a conspicuous cone, 750 feet high, with comparatively low country between; irregular table-topped hills extend southeastward from Wizard Peak.

**7-67 Northampton** ( $28^{\circ}22' S.$ ,  $114^{\circ}39' E.$ ), on Nokanena Brook, one of the branches of Bowes River, about 10 miles from the coast, is the center of a large mineral district. It is connected with Geraldton, in Champion Bay, 25 miles distant, by railway; thence by main line to Perth. There is also a line which runs northward from Northampton to Ajana.

**7-68 The coast** from Bowes River trends southeastward 1.8 miles, to a grassy head, 408 feet high, thence in the same direction for 6 miles to a narrow gap, through which the Woolwar Gully stream issues; 2.5 miles to the southward is Yellow Gully stream. From Yellow Gully, the rocky coast is lower and more even, and trends in a southerly

direction 3.3 miles to Oakajee River, and from thence for a similar distance to Buller River, usually barred, and which has several ledges awash at low water to the northward. On the northern side of this river there is a sand hillock, and at 1,000 yards south of a conspicuous sand patch.

Smugglers Cove, distant 2.7 miles southward of Buller River, is a slight indentation, having in it several rocky ledges. Landing may be effected on the beach inside the ledges in fair weather.

7-69 The coast from Sandy Point, the southern point of Smugglers Cove, extends south 5 miles, and thence west 1.5 miles to Moore Point, the southern extremity of Champion Bay.

**Shoals.**—Breakers extend about 1 mile off Sandy Point, thence southwestward to the Four-fathom Banks off Champion Bay.

7-70 **CHAMPION BAY** (*H. O. Chart 3437*) is protected on its southern and western sides by Moore Point and the reefs extending from it; Four-fathom Banks northward of Moore Point Reef protect it in some measure from gales from the northwestward. It has depths of 4 to 6 fathoms at the anchorage, and there is a least depth of 31 feet in the fairway of the approaches.

**Landmarks.**—The water tower on Scott Hill, located about 2 miles eastward of Moore Point, is conspicuous on the sky line. The twin yellow towers of the Roman Catholic Cathedral, located about one-fourth of a mile westward of the water tower, are conspicuous. The radio masts, located about one-half of a mile westward of the cathedral, and the two radio masts that are located about 3½ miles northeastward of Moore Point are also conspicuous. Radar returns from Moore Point have been reported up to a range of 18 miles; radar returns from Geraldton have been reported up to 28 miles.

7-71 **Reefs—Four-fathom Banks.**—Moore Point, the southwestern extremity of

the bay, is a low sandy projection extending nearly 1.5 miles from the general line of coast, and is 500 yards broad; several ledges, dry at low water, extend 1,000 yards off the point. Northward and southward of these ledges are Moore Point Reefs, numerous sunken rocks, on which the sea generally breaks; those to the northward terminate about 1.3 miles from the point, where there is a clear channel 500 yards wide. On the northern side of the channel are Four-fathom Banks, extending northward toward Sandy Point, with several rocky patches of 3½-fathom depth; with westerly gales or swell the sea breaks nearly all over them.

A 2-fathom patch, with a 2½-fathom shoal close north-northeastward of it, lies about 2½ miles north-northwestward of Moore Point Light.

**Outer Knoll**, the northernmost rock of Moore Point Reefs, has a depth of 3 fathoms, and lies 1.5 miles, 359° from Moore Point Lighthouse.

**Buoy.**—A black conical buoy, with a black conical topmark, is moored in 5½ fathoms, 100 yards east-northeastward of Outer Knoll.

**Inner Knoll**, northern patch, with a depth of 2½ fathoms, lies 1.5 miles, 021° from Moore Point Light.

**Buoy.**—A black conical buoy with black conical topmark is moored about 150 yards north-northeastward of this patch in 5 fathoms.

**Caution.**—Two much reliance must not be placed on the position of these buoys, as they are liable to drift. The range marks into the bay are well defined. It was reported that vessels with drafts of greater than 22 feet should not enter past the 10-fathom curve unless the immediate swell conditions are known.

7-72 **Chapman River**, 4 miles northeastward of Moore Point Lighthouse, is generally closed by a sand bar.

**Lights.**—A light 110 feet above high water is exhibited from a conical iron tower 114 feet high painted with red and white hori-

zontal bands, on the western extremity of Moore Point.

A light is shown from the head of each breakwater at the entrance to the inner harbor.

An aeronautical light is occasionally shown in a position about 6 1/4 miles eastward of Moore Point Light.

AN AERONAUTICAL RADIOBEACON is located about 1 mile southwestward of Mount Fairfax.

RANGE LIGHTS.—Champion Bay front range light is shown from a steel tower, 23 feet high, in a position on the northeastern side of the bay about 1 1/4 miles southwestward of Chapman River, and about 3/4 mile west-southwestward of the church tower. The middle and the rear range lights are shown from steel towers about 2/3 and 3/4 mile, 071 1/3° from the front range light. The lights in range lead through the entrance channel, northward of Outer Knoll, Moore Point Reefs. The lower light is frequently obscured by mist. Mariners are cautioned that a church similar in appearance stands close to the middle range light tower.

RANGE BEACONS.—A front range beacon with a triangular top mark is located on the shore about 600 yards southwestward of the foot of Town Jetty and the rear beacon, with an inverted triangular topmark, stands about 165 yards 180° from the front beacon. These beacons in range lead through the dredged channel to the inner harbor. Two lights are shown from each of these beacons.

BUOYS.—A light buoy, painted black and showing a flashing white light, is moored on the western side of the channel in a position about one-half of a mile northward of the head of the western breakwater, and another light buoy, painted red and showing a flashing red light, is moored on the eastern side of the channel about 150 yards eastward of the black light buoy.

There are several mooring buoys in the harbor.

7-73 INNER HARBOR.—The inner harbor is protected from seaward by two breakwaters. The western side of the inner harbor is protected by a continuous breakwater that extends northward from the shore, thence eastward, the head of which curves a short

distance northward. To the eastward of the elbow of the western breakwater is an island breakwater, extending about 200 yards eastward. A dredged channel, 300 feet wide, with a depth of 32 feet (1966), leads from seaward to the 30 foot dredged basin in the inner harbor, and to the wharf. The entrance to the inner harbor between these breakwaters is 600 feet wide.

Due to the restricted turning area, a limit of a maximum length of 560 feet has been placed on vessels using the port. It was reported (1964) that vessels with drafts of 27 feet can berth alongside at Geraldton when wind and weather conditions are moderate.

SHOALS.—A shoal with a least depth of 3 fathoms lies about 800 feet north-northeastward of the entrance of the dredged channel. Another 3-fathom patch with a 2 3/4-fathom patch close southward of it, lies about 750 feet northeastward of the entrance.

7-74 ANCHORAGE.—The anchorage in Champion Bay is well sheltered from all winds except those between northwest and north by east, from which direction winter gales between May and November sometimes blow strongly. Vessels with good ground tackle and a long scope of cable have ridden out heavy gales in this bay. The wind, as a rule, hauls more quickly to the southwest than in gales experienced farther southward. With the wind west-southwest, at which point these gales blow hardest, the sea breaks heavily on Four-fathom Banks; these banks shelter the anchorage to a great degree.

It was reported (1965) that good holding ground, and anchorage can be found with Moore Point Light bearing 195°, distant a little over 2 miles.

PROHIBITED ANCHORAGE.—Anchorage is prohibited in the inner harbor in an area northward and westward of a line drawn from the light on the western end of the island breakwater in a 233° direction for a distance of 700 yards, and thence in a 180° direction to the shore.

QUARANTINE.—Geraldton is a first port of entry, see section 1-18. The quarantine area is marked by a line drawn in a 000° direction from the light structure at the eastern end of the detached breakwater. Customs and health officers board in the vicinity of

Inner Knoll Buoy. A radio message, giving the state of health on board, should be sent to the port health authorities not less than 12 hours prior to arrival.

7-75 TIDES.—High-water interval at Champion Bay is 7h. 40m.; mean range 3 1/2 feet. The tides are greatly influenced by winds; the land winds prevailing during the summer months from midnight until about 9 or 10 a.m. cause the lowest tides, and westerly and northwesterly winds, more prevalent in winter, cause the highest.

With a falling barometer, accompanied by an unusual rise of the water, a northwest gale may be looked for, and during the continuance of the gale the sea continues about 3 to 4 feet above its ordinary level. This occurs all along this coast to beyond Cape Leeuwin.

The sea level is correspondingly lowered during southerly winds, and low water then falls below datum. A maximum of 2 feet below datum has been recorded.

It was reported (1965) that the rise and fall of spring tides was 2 1/2 feet, and the rise and fall of neap tides was 1 1/2 feet.

CURRENTS.—During summer months the current generally runs in a northerly direction, and in winter in a southerly direction. The ocean swell, however, being generally from westward, has a tendency to set a vessel toward the shore. See caution sec. 7-71.

7-76 PILOTAGE is compulsory; vessels are met in the approach outside the shoals north-northwestward of Moore Point Lighthouse.

If wind and swell conditions are abnormal the pilot launch may not be able to get out to the above position. In this case port authorities will advise where the pilot will board. The pilot will usually board off the Inner Knoll Buoy under these conditions.

The pilot boat is a white motorboat and displays the International pilot flag. Vessels will not be taken in at night except for emergencies.

7-77 DIRECTIONS (H.O. Chart 3437).—Approaching Champion Bay from southward the locality may be easily recognized—when

not capped with clouds—by the flat-topped mountains to the northward, and by Mount Fairfax and Wizard Peak (conical) to the east and southeastward.

Moore Point Lighthouse should be kept bearing eastward of 020° until Wizard Peak bears 080°, when a course should be shaped to pass 1.5 miles off the lighthouse.

The steel light towers, about 1 1/4 miles southward of Chapman River, in range 071 1/3°, lead through the channel between Moore Point Reefs and Four-fathom Banks, in 32 feet (1966), and northward of Outer and Inner Knoll Buoys. When the light on the head of the western breakwater bears 156° the vessel should steer about 141°, and anchor in 5 1/2 fathoms, sandy bottom, with Moore Point Light bearing 215°, or nearer the shore in less depths.

If after passing the Knoll Buoys it be necessary to work to the anchorage, the lead will be the best guide.

AT NIGHT, from southwestward do not shoal to less than 20 fathoms until Moore Point Light bears eastward of 040°, when a 000° course may be steered until the three red range lights located about 2 miles northward of town are in range 071°, which, being steered for, will lead through the channel north of Moore Point Reefs in not less than 32 feet (1966). Vessels should anchor westward of the channel leading into the inner harbor in 5 fathoms with Moore Point Light bearing 215°, or nearer the shore.

From the northward, Four-fathom Banks should not be approached into less depths than 20 fathoms, nor Moore Point Light brought to bear southward of 152° until the range lights are in line bearing 071°, then proceed as before.

The depths near the new extremity of Railway Jetty and to the southward of Inner Knoll have altered somewhat and the chart should be used with caution in this vicinity.

7-78 GERALDTON (28°47'S., 114°37'E., H.O. Chart 3437), a town of importance in Western Australia, is in the southern corner of Champion Bay, being the port of the Murchison Goldfield, and of large horse and sheep raising stations, and grain-growing districts in the vicinity. There are many public buildings, parks, baths, and hospitals. The town has a population of about 11,000.

Wheat is the chief article of export and a grain elevator is located in the port. Several storage tanks are located in the port area.

WHARVES.—Geraldton Wharf, on the southern side of the inner harbor, is 1,644 feet long and provides two berths with 30 feet alongside and one berth with 29 feet alongside (1966). During bad weather it is necessary to keep vessels off the wharf by means of bow and stern hawsers to hauling-off buoy. No. 1 berth is the most exposed. The wharf is connected with the general railway system, and is equipped with a 10-ton travelling crane. There is a landing stage with a depth of 12 feet alongside. Water is laid on to the wharf.

Work was in progress (1964) on an extension to the west end of Geraldton Wharf.

There is a small jetty on the southern side of the inner harbor about 300 yards westward of the western end of Geraldton Wharf.

The Town Jetty, at the eastern end of Geraldton Wharf, is partly demolished.

The Railway Jetty ruins extend northwestward from a position on the shore about 700 yards northeastward of the eastern end of Geraldton Wharf.

REPAIRS.—There is a building slip for small vessels and also a slip for boats. Minor repairs to engines can be effected.

There are no tugs available for assistance.

SUPPLIES.—Fresh provisions are plentiful. There are moderate stocks of Diesel oil and gasoline.

COMMUNICATION.—From Geraldton there are railroads northward to Northampton; eastward to Cue, 262 miles; and southward to Dongara and Perth. There is a daily service by railroad to Perth. Geraldton is connected with the main telegraph system. There is also telephone service.

There is a radio station at Geraldton. This station sends out radio weather bulletins, storm warnings, and navigational warnings.

There is communication by mail steamers about fortnightly with Fremantle and Singapore via N.W. ports; and steamer communication with Darwin and ports on the West Coast.

There is an air mail service which operates twice weekly; and air communication with Fremantle and Wyndham.

HOSPITALS.—There are two hospitals with a total of 34 beds at Geraldton.

CLIMATE.—The hottest weather is generally experienced toward the end of February and the coldest about the end of July. The mean annual heights of the barometer is 30.03 inches; maximum, 30.47, and minimum, 29.55 inches. Mean annual temperature 66°; maximum, 105°, minimum, 35°. Mean rainfall for 43 years was 18.69 inches.

7-79 GEELVINK CHANNEL (H.O. Chart 3437), which separates Houtman Rocks from the mainland, between Shoal Point and Champion Bay, is 30 miles wide, with depths of 16 to 30 fathoms over a bottom of sand and shells, the slightly deeper water being toward Houtman Rocks. An 8-fathom shoal, coral bottom, lies 22 miles 308° from Moore Point Light.

Shoal patches with depths of 3 1/2 and 4 fathoms over them were reported (1961) to lie about 23 and 21 miles respectively, west-northwestward of Moore Point.

7-80 HOUTMAN ROCKS (Abrolhos), form three groups of small islands and rocks, enclosed by reefs, extending north-northwest and south-southeast about 49 miles, with a breadth of 10 to 13 miles; Wallabi, the northernmost group, being separated from Easter Group by Middle Channel, and the latter from Pelsart Group by Zeewyk Channel.

GENERAL REMARKS.—The basis of all the islands, rocks, and reefs of Houtman Groups is formed of limestone, chiefly consisting of coral shells; all the islands on the eastern side of Easter and Pelsart Groups being merely ridges of dead coral and shells, whilst those on the western side are flat blocks of limestone, about 5 feet above the level of the sea, with a covering of light sandy or guano soil, producing a stunted vegetation, chiefly several kinds of samphire.

Few soundings appear to have been obtained immediately off the sea barrier reefs of the Houtman Groups; but from the heavy breakers on these reefs, and the long ocean swell rolling into the channels between the groups, there appeared to be no extensive outlying dangers.

A few hair seals were met with on the Pelsart Group, and much guano has been shipped from Rat Island, but it is apparently worked out.

Water has been obtained on Wallabi, and on Middle Isles of Pelsart Group, but it can not be depended upon, owing to the porous nature of the rock; it may probably be found in many places in the rainy season. It should be searched for in places where the limestone foundation is observed, as the cupformations retain it.

**TIDES.**—It is high water, full and change, at the Houtman Rocks, at 11h.30m.; springs rise 2 feet 6 inches.

**7-81 WALLABI GROUP**, sonamed from the great numbers of a small kind of kangaroo found on the two largest islands, is more extensive than either the Easter or Pelsart Groups. It consists of three islands which are considerably higher and larger than those of the other groups, and several small islets and rocks, mostly connected by reefs.

**7-82 NORTH ISLE** ( $28^{\circ} 18' S.$ ,  $113^{\circ} 36' E.$ , H.O. Chart 3437) is on the eastern edge of a reef extending 2.5 miles from the northern extremity 1 mile from the western side, and, as far as was ascertained, about 4.5 miles from the southern point of the island. It is 1 mile in extent, with a flat top, surrounded by sand hills, the most elevated being 42 feet high. The summit of the island was covered with a coarse grass and some stunted scrub.

**ANCHORAGE.**—The British naval vessel Beagle anchored in 12 fathoms, at 1,500 yards off a sandy bight on the northeastern side of North Isle.

**REEF** (H.O. Chart 3422).—A shoal, 2 miles in length north and south, which breaks heavily, lies 14 miles,  $339^{\circ}$  from North Isle; a depth of 6 fathoms was obtained at its northern

extremity; less water may possibly exist, as it has not been sounded out.

**7-83 EAST WALLABI ISLE** (H.O. Chart 3437, plan of Recruit Bay), 10 miles southeastward from North Isle, is the most elevated of the Houtman Group; Flag Hill, on its northeastern part, being 50 feet high. From the base of this hill, Fish Point, a narrow tongue of land, projects 1,000 yards to the northeastward. The center of East Wallabi Isle forms a low flat of limestone formation, inclosed except to the southward, by hills terminating near the southeastern extremity of the island at Eagle Hill, which is 40 feet high, and to the southwestward, at 500 yards to the southward of a hill 35 feet high. Radar returns from East Wallabi Isle have been reported up to a range of 20 miles.

**7-84 REEFS.**—East Wallabi Isle is fringed by a reef from 200 to 600 yards broad, with rocky ledges and foul ground projecting 1.5 miles from the northern coast of the island; its southern point, close off which lie the three Pigeon Islets and numerous rocks, being connected with West Wallabi Islet by a reef, partly dry at low water, extending 2.5 miles to the southward.

**NORTHEAST REEF** lies in the eastern approach to Recruit Bay, bearing  $080^{\circ}$  4.3 miles from Flag Hill, East Wallabi Isle; it should be carefully avoided, as it breaks only at long intervals.

**7-85 RECRUIT BAY** ( $28^{\circ} 26' S.$ ,  $113^{\circ} 45' E.$ ) is a good anchorage, formed by an opening in the reef, protected by East Wallabi and the Pigeon Islets to the westward and by Shelter Reefs to the eastward. The bay is 1 mile wide at the entrance, abreast of Flag Hill, contracting southward to 500 yards, with 5 to 12 fathoms of water, but like other (continued on page 285)

anchorages in these groups it is encumbered by numerous coral patches.

A rock, with 1½ fathoms of water, lies at the mouth of Recruit Bay, 143° 700 yards from Flag Hill. Information is lacking as to directions for clearing the various shoals at the entrance.

7-86 West Wallabi Isle (28° 27' S., 113° 41' E., H. O. Chart 3437), the northern point being 1 mile westward of East Wallabi Isle, is nearly 3 miles in length, north-northeast and south-southwest, and 1.3 miles in breadth at the center. The northern end is a level stony flat, terminating toward the sea in projecting cliffs, 6 to 8 feet high, with patches of bushes. On the southern part of the island are some sand hills 30 feet high, that part of the island being covered with a thick scrub.

**Water.**—At 1,000 yards westward of the eastern point of West Wallabi Island are two caverns, from which the *Beagle* procured in the month of May 3 tons of good water.

7-87 Reefs extend about 5 miles from the western side of West Wallabi Isle toward the reef projecting southward from North Isle, leaving between them an unexamined space 2 miles wide, which from the swell observed rolling in from the westward may prove a navigable channel; but it should not be attempted while any doubt exists.

**Morning and Noon Reefs** form the southeastern limits of Wallabi Group, their outer edges being 4.5 miles from East Wallabi. Morning Reef is 3 miles in length northeast and southwest and 1 mile wide, with several rocks above water on it, and is separated from Noon Reef to the westward by an opening 1,000 yards wide, with a depth of 23 fathoms in its northern entrance, apparently the only part sounded.

Noon Reef is nearly 4 miles in length, and appears to join the reef connecting the two

Wallabi Isles; it has also numerous small islets and rocks on it, and incloses a lagoon.

**Evening Reef**, between 1 and 3.5 miles southward of West Wallabi Isle, is 1.5 miles broad, and forms the southern limit of Wallabi Group.

**Tide rips**, resembling breakers when distant 1 mile, were seen east northeastward 17 miles from East Wallabi Isle, just outside the 20-fathom curve, fronting the main. When passing through them the depths were 22 to 23 fathoms.

**Middle Channel**, between Wallabi and Easter Groups, is 6 miles wide between the reefs. The depths near the fairway are from 22 to 27 fathoms, sand bottom.

7-88 EASTER GROUP.—**Coral Islet** (28° 38' S., 113° 53' E.), the northeastern extremity of this group, is 5 feet high and surrounded by a reef projecting 1,000 yards from its northeastern end. From the islet Easter Group extends 12 miles southwestward, and is about 8 miles in breadth.

A channel 1.3 miles wide, with a fairway depth of about 22 fathoms, separates Coral Islet from a group of small islets on a reef to the southward. This reef is 1.5 miles broad, and separated from the main body of the Easter Group by a passage nearly 1 mile wide, with a depth of about 20 fathoms.

**Rat Isle**, the largest of Easter Group, is nearly in the center of a lagoon, mostly inclosed by reefs, its northern entrance being Good Friday Bay, which leads toward Rat Isle from the northward.

Rat Isle is about 1,500 yards in length by about 670 yards in breadth; it has a dry rock close off its northern end a cluster of small islets within 1 mile of its southern point, with which the largest of the cluster appears to be connected. From the summit of Rat Isle, 13 feet high, its surface descends to overhanging limestone cliffs, 6 or 7 feet

high, the soil being partly composed of guano, thickly burrowed by the sooty petrel and mutton bird. Some thousands of tons of guano have been shipped from here, but it is apparently worked out.

**Supplies.**—No drinking water is procurable on Rat Island during the summer months. Mutton-bird eggs are plentiful.

7-89 **Good Friday Bay** ( $28^{\circ}42' S.$ ,  $113^{\circ}46' E.$ , *plan on H. O. Chart 3437*) is a secure harbor, affording anchorage for a number of vessels. The bay, including its entrance from the northward, is bordered on both sides by reefs extending from 3 to 5 miles northward of Rat Isle.

The mouth of Good Friday Bay is 1.5 miles wide east and west, gradually contracting southeastward in the direction of the anchorage, which is nearly 1,500 yards in extent between the reefs; the narrowest part of the channel is 800 yards wide, being 1 mile northward of Rat Isle. The depths are regular, decreasing from about 20 fathoms in the entrance to 16 fathoms at the anchorage, situated 800 yards northeastward of the dry rock off the northern end of Rat Isle.

7-90 **Dangers.**—The approach to the anchorage appears free from detached dangers until within about 1,350 yards of the northern end of Rat Isle, where several small sunken detached patches lie in the fairway; the northernmost, with 6 feet of water, lies  $031^{\circ}$  1,000 yards from the dry rock off the northern extremity of Rat Isle. Two patches, with 12 feet of water lie southeast and southwest, respectively, about 200 yards from the 6-foot patch.

A continuation of deep water extends from the anchorage southward, between some coral patches, and along the eastern side of Rat Isle, but it appears not to have been traced beyond the islets which lie off the southern end of Rat Isle.

**Patches.**—Two small patches, with depths

of 4 and 6 fathoms on them, and 20 to 28 fathoms close around, lie on the eastern side of the approach to Good Friday Bay, bearing  $261^{\circ}$  5 miles from Coral Islet. These should be given a wide berth.

A 2-fathom patch lies about 1,700 yards north-northwestward of the dry rock off the northern extremity of Rat Isle.

A rock, with a depth of less than 6 feet, lies about one-half of a mile northeastward of the northeastern extremity of Rat Isle.

7-91 **Directions.**—Good Friday Bay, like most coral harbors, requires a vessel to be guided from aloft, and with the sun astern, whence the various coral patches are most easily seen.

In entering from northward, steer in with the northeastern point of Rat Isle, bearing  $166^{\circ}$ , keeping a good lookout for the northern extremity of Rat Isle Reef, which is only 300 yards from the nearest 2-fathom patch eastward of the reef. When White Bank, which lies about one-half of a mile northward of the northwestern extremity of Rat Isle, bears  $290^{\circ}$  steer a southeasterly course, and anchor in 15 or 16 fathoms sand and mud bottom, with the dry rock in range with the northwestern point of Rat Isle, bearing  $239^{\circ}$ , and the eastern extremity of the islets and south of Rat Island, bearing  $185^{\circ}$ .

7-92 **Eastern side of group** (*H. O. Chart 3437*).—From the eastern entrance point of Good Friday Bay the northern edge of the reefs trends eastward, to the northern end of a barrier of islets and coral banks 7 miles in length, nowhere exceeding an elevation of 13 feet, and generally below 3 feet. This barrier is the eastern boundary of the lagoon within Easter Reefs; its southwestern extremity, on which is Sandy Islet, the southernmost of the group, forms the northeastern side of an opening 1.3 miles wide, with a depth of 22 fathoms in the center,

but is useless for navigation as a channel into Good Friday Bay.

**Wooded Island Passage.**—Wooded Island lies 1.8 miles northeastward of Sandy Islet, and is conspicuous as being the only islet of the group thickly wooded with mangroves.

**Channel.**—A channel, 300 yards wide, leading into Good Friday Bay exists southward of Wooded Island. This passage is used by sailing vessels visiting Rat Isle, in order to avoid the delay of warping up Good Friday Bay against the prevailing southerly wind.

A pilot can probably be obtained at Champion Bay.

A spit is reported to extend about 200 yards from the southern side of Wooded Island.

**7-93 Reefs.**—From the western side of the opening westward of Sandy Islet, a barrier reef, forming the southwestern boundary of the lagoon, extends 5.5 miles north-northwestward; the southeastern extremity of the reef being the south, and the northwestern extremity the western point of Easter Group.

A sunken reef, of very doubtful position, was reported by the *County of Ayr*, October, 1891, as existing 6.5 miles westward of the northern extremity of Rat Isle, charted in  $28^{\circ}42' S.$ ,  $113^{\circ}39' E.$

**7-94 Zeewyk Channel** separates Easter Group from Pelsart Group, and is 4.5 miles wide in its western and narrowest part, where the depth of water is about 33 fathoms, gradually decreasing eastward to 21 fathoms, over a sand and coral bottom.

**Snapper Bank** is in the eastern approach to Zeewyk Channel and distant about 7 miles from the Easter Group. This bank is 1.8 miles in length north and south and 1,500 yards in breadth, the least depth of water found on it being 6 fathoms, coral bottom.

**Mid Reef** ( $28^{\circ}46' S.$ ,  $114^{\circ}08' E.$ ), about 8

miles southeastward of Snapper Bank, is about 1,000 yards in length east and west and 400 yards in breadth; the eastern portion is nearly awash. There are depths of 25 and 26 fathoms near this danger.

A shoal, which breaks, is charted 2 miles  $157^{\circ}$  of Mid Reef; the position is doubtful.

**7-95 PELSART GROUP** is somewhat similar in its general features to Easter Group, the main body being of a triangular form, inclosing a lagoon, with several small islands, and having an opening to the northward.

**Hummock Islet**, the northeasternmost of the Pelsart Group, has a small mound 16 feet high on its southeastern end and is surrounded by a reef about 500 yards in extent.

**King Reef**, which seldom breaks, is a sunken danger, of small extent, and lies  $151^{\circ}$ , 2.5 miles from Hummock Islet. Banks of dead coral, 3 feet high in places, lie  $255^{\circ}$  2.5 miles from King Reef.

**Pelsart Isle** is a narrow ridge of dead coral, 6 miles in length by 300 yards in breadth, forming the southeastern barrier of a lagoon. The Dutch ship *Batavia*, Commodore Pelsart, was supposed to have been lost on its southern end in 1629. The highest and most conspicuous part of Pelsart Isle is a clump of mangroves 15 feet high growing about midway between the two extremities of the island, in  $28^{\circ}56' S.$ ,  $113^{\circ}58' E.$

**7-96 Western side.**—From Wreck Point a narrow reef extends 1 mile southward, thence gradually trending northwestward for 11.5 miles to the northwestern point of the group, and forming the southwest or sea barrier of the lagoon. At about 4 miles to the southward of the northwestern extremity of this barrier is a singular indentation in the outer edge of the reef, near which the Dutch ship *Zeewyk* was supposed to have been lost in 1727.

From the northwestern extremity of Pelsart Group the outer edge of numerous coral patches, with gaps of deep water between them, takes an east-southeasterly direction for 6 miles, to an islet situated 1.3 miles northward of Middle Isle.

7-97 Batavia Road is formed by a slight curve in the eastern coast of Pelsart Island immediately northward of Wreck Point, and affords temporary anchorage in 12 or 13 fathoms sheltered from winds between south-southeast, round by west, to about northeast; a coral patch, with 2 fathoms of water, lies about 1,500 yards northward of Wreck Point.

Middle Isle, in the center of Pelsart Lagoon, is about 1,000 yards in extent, and the second largest island of the group.

Water.—Middle Isle is most worthy of notice from the circumstance of fresh water having been found there by an exploring party from Swan River. The well is on the southern point of the island, and the water rises and falls with the tide.

Gun Isle, about 3 miles northwestward of Middle Isle, received its name from a small brass 4-pounder having been found on it in 1840, with other articles of Dutch manufacture, probably left there by the crew of the *Zeewyk*, above-mentioned.

Square Islet ( $28^{\circ}54' S.$ ,  $113^{\circ}51' E.$ ), 2 miles eastward from Middle Isle, appears from its peculiar shape and position, near the northern entrance of the lagoon, a good mark for vessels entering.

Mangrove Islets, between 1.5 and 3 miles northeastward of Square Islet, are inclosed by a reef, with several sunken patches to the northward, and form the eastern side of the northeastern entrance into the lagoon.

7-98 Anchorage.—The northeastern entrance into Pelsart Lagoon, or the space between Square and Mangrove Islets, appears to afford secure anchorage in about 15 fath-

oms; the only known detached dangers to be avoided after entering being a chain of sunken patches extending southward from Mangrove Islets.

There are several spaces of deep water in the southern and northwestern parts of the lagoon, probably affording anchorage; but nearly the whole of the lagoon being thickly studded with shallow coral patches, any other anchorage than that between Square and Mangrove Islets must be difficult for a sailing vessel to enter.

The anchorage between Square and Mangrove Islets, like Good Friday Bay and other anchorages in the Houtman Groups, is well sheltered from the sea, but is exposed to the full force of the wind, as none of the islands are sufficiently elevated to give shelter from it. As the water is quite smooth between the reefs, the anchorage is secure with a proper scope of cable.

7-99 Off-lying dangers—Shoal (*H. O. Chart 3423*).—A shoal, 9 miles long in a north and south direction, was reported to be situated about 25 miles westward of the northwestern extremity of the Pelsart Group. This shoal was unsuccessfully searched for in 1908; a depth of 25 fathoms was found at 10 miles eastward of its reported position.

Turtle Dove Shoal is about 2.5 miles in extent, with depths varying from 5 to 12 fathoms, coral and sand bottom, plainly visible at the latter depth, and from 35 to 50 fathoms around. The shoal lies about 3.5 miles within the 100-fathom curve of the coast soundings; and the shoalest spot found, 5 fathoms, is in  $29^{\circ}21'30'' S.$ ,  $114^{\circ}11'30'' E.$ , and bearing  $152^{\circ}$ , 25 miles from Wreck Point, the southern extremity of Pelsart Island.

Heavy breakers were seen from the surveying schooner *Meda* near the shoalest portion of the bank; but, on the following day, when crossing the 5-fathom patch in the

vessel, a high swell but no breakers were observed. Shoaler depths, therefore, than 5 fathoms may exist on Turtle Dove Shoal.

**Clio Reef.**—A heavy breaker at long intervals was seen from surveying schooner *Meda* in 1885, on the position of Clio breakers, 6 miles,  $014^{\circ}$ , of Turtle Dove Shoals, seen from the British naval vessel *Clio*, March 1873; and it was considered that there was less water than upon Turtle Dove Shoal, the heavy rollers on which were observed at the same time, when passing between these dangers.

7-100 **Pelsart Bank** ( $29^{\circ}27' S.$ ,  $114^{\circ}14' E.$ , *H. O. Chart 3423*) has depths varying from 18 to 30 fathoms, with a bottom of coarse sand mixed with broken coral and shells; it is 5 miles in length in a north-northwest and opposite direction, 2 miles wide, within the depths of 30 fathoms, and with 40 to 60 fathoms around it. The shoalest spot found, 18 fathoms, is situated 6 miles southward from Turtle Dove Shoal; it is probable that much less water may exist on the bank.

A bank with 18 fathoms over it lies about 17 miles south-southeastward of the 18 fathom patch on Pelsart Bank; there are depths of from 21 to 29 fathoms within about 10 miles east-northeastward and eastward of this bank.

**Caution.**—As these shoals lie directly in the track of vessels between Fremantle and Champion Bay, caution is necessary when navigating in their vicinity.

7-101 **Current.**—The east-going current divides off Cape Leeuwin, one part setting northward along the western coast of Australia and the other part eastward along the southern coast. That on the western coast during the summer months varies in strength from  $\frac{1}{2}$  to 1 knot or more with a prevalence of strong southerly winds; in winter or during the northwesterly winds it runs in an opposite direction. The winds and ocean swell, usually coming from some western quarter, causes the currents to be

deflected toward the coast. Between Cape Naturaliste and Rottnest Island this deflection is greatest from October to April.

**Soundings.**—The 100-fathom curve of the bank of coast soundings passes close westward of Houtman Rocks and Turtle Dove Shoal. Thence it passes 15 and 13 miles, respectively, westward of Cervantes and Rottnest Islands. A depth of 20 fathoms will be found close outside the coast dangers, and in thick weather the coast should not be approached to less than 30 fathoms if uncertain of the reckoning.

7-102 **THE COAST** (*H. O. Charts 3437, 3495*).—Reefs extend from Moore Point, Champion Bay, in a southerly direction over 2 miles, and thence front the shore to a distance of about 1.3 miles until abreast Cape Burney, nearly 5 miles to the southward.

**Port Grey** ( $28^{\circ}48' S.$ ,  $114^{\circ}36' E.$ ).—The coast from Moore Point, Champion Bay, trends in an easterly direction 1 mile to Separation Point, with a dry ledge extending off nearly 1,500 yards; the bight eastward of this point, named Port Grey, is an unsafe resort, heavy rollers generally setting in with the slightest breeze or swell from the southwestward, causing a high and constant surf on the beach.

7-103 **The coast** (*H. O. Chart 3437*).—From Port Grey the coast trends in a southerly direction 4.5 miles to Cape Burney, which is smooth and of moderate height, fronted by reef, as above mentioned; on the northern side of the cape is an entrance to Greenough River, generally barred by a sand bank.

**African Reef**, with probably 12 feet of water, where the sea only breaks in a heavy swell, is of considerable extent, having some patches extending from it for 1.5 miles in a northeasterly direction. Seaward of the reef there are depths of 9 fathoms. The outer and southern reef lies  $167^{\circ}$ , 11.3 miles from Moore Point Light. A red sector is shown over this danger from Moore Point Light,

and the white light should not be brought to bear westward of  $357^{\circ}$ .

A wreck lies sunk on African Reef.

7-104 The coast (*H. O. Chart 3423*) from Cape Burney trends southeastward 29 miles to Leander Point, and is formed of sand hills varying from 130 to 300 feet in height, inland of which are several scattered table-topped hills upwards of 800 feet high. The shore between 9 and 15 miles southward of Cape Burney is fronted by reef, and at 20 miles southward it recommences, and is continuous to Dongara.

Off-lying Reef.—A reef, which has been seen to break, is charted about 2 miles in length at 7 miles offshore, and 17 miles southward of Cape Burney, in  $29^{\circ}09' S.$ ,  $114^{\circ}45' E.$ ; it has not been surveyed, and should be given a wide berth.

7-105 PORT DONGARA (DENISON) ( $29^{\circ}17' S.$ ,  $114^{\circ}55' E.$ , *H. O. Chart 3423*) is the small and open bay, close northeastward of Leander Point, with depths of 4 to 5 fathoms.

7-106 Dangers in the approach.—North Bank forms the northern side of Main Passage; the southern extremity, with 3 fathoms of water, lies  $285^{\circ} 2.1$  miles from Leander Point Beacon. From this extremity it trends in a north direction, with patches of 1 to 3 fathoms; the northern limit is not known, but there are depths of 7 to 8 fathoms between the southern portion and the shore.

At about 4 miles westward of North Bank is an unsurveyed reef, situated about 7 miles southward of the off-lying reef above mentioned.

Irwin Reef forms the southern side of Main Passage; its northern extremity lies  $257^{\circ} 2.8$  miles from Leander Point Beacon, whence the reef extends in a southerly direction for 3 miles, and usually breaks in places. A patch, with a depth of  $4\frac{3}{4}$  fathoms, lies  $1\frac{1}{2}$  miles westward of the southern extremity of Irwin Reef.

Leander Reef.—The northern extremity of this reef lies  $216^{\circ} 8$  miles from Leander Point, and about 7 miles from White Point abreast it. It generally breaks, but the extent southward is not known.

7-107 Leander Point, the southern extremity of Port Dongara, is low and rocky; eastward of the point are some wooded ridges 150 feet in height, with a bare sand-patch 123 feet high, about 1.5 miles to the southeastward of the point.

Reefs, which dry with offshore winds, extend 600 yards north-northwestward from Leander Point. The water is shallow for 200 yards beyond.

A patch, with 3 fathoms of water, lies  $346^{\circ} 1,500$  yards from Leander Point Beacon.

7-108 Main Passage is 1.4 miles wide between Irwin and Leander Reefs, with depths of 7 to 8 fathoms, except over a small patch of 5 fathoms nearly in midchannel.

Beacons.—Near the extremity of Leander Point is a white stone beacon, 33 feet in height, and on the crest of the hills, about 1,500 yards within is another beacon (position approximate). These in range about  $087^{\circ}$ , lead in the fairway of Main Passage.

7-109 Irwin River, 1.3 miles northward of Leander Point, is about 35 miles in length; the mouth is generally closed. Shallow water extends about 400 yards off, and is continued around the bay to Leander Point, but at a less distance.

Two conspicuous peaks are located about 1 and  $1\frac{1}{2}$  miles, respectively, northward of the mouth of Irwin River. A conspicuous brick chimney is located on the east side of the river bank about  $\frac{1}{2}$  mile within the entrance.

Coal has been found on the banks of the Irwin River.

Jetty.—A wooden jetty, 1,260 feet in length, with a depth of 14 feet at the end, lies 700 yards northeastward of Leander Point. There are a few houses near the jetty.

The jetty is considered unsafe for traffic

and therefore may not be used by vessels until further notice.

7-110 Anchorage in about 4 fathoms of water may be found, with the jetty end bearing  $166^{\circ}$ , 200 yards, and nearer the shore in less depths.

Coasting vessels resort here for grain during summer months, but the anchorage is unsafe in winter or with strong winds from northward of west.

Tides.—The time of high water is irregular. The rise and fall is greatly influenced by onshore and offshore winds, respectively.

7-111 Directions.—The port is used only by small craft; they lie alongside the jetty except with winds from between west and northwest. A vessel from the southward bound for Port Dongara should, after passing westward of Leander and Irwin Reefs, bring the white beacons on Leander Point in range  $087^{\circ}$ , and steer for them until within 1 mile of the point; thence steer to round Leander Point about 1,000 yards, and anchor about 200 yards from the end of the jetty, as above. The holding ground is rocky, and not to be depended on.

From the northward, having kept about 10 miles offshore, in depths of 16 to 20 fathoms until Leander Point Beacons are in range, proceed as before.

7-112 Dongara (*H. O. plan on Chart 3423*).—At 1,000 yards within the mouth of the Irwin River is the settlement of Dongara. There are a few houses near the jetty, within Leander Point, before mentioned. Population last report about 200. Dongara is connected with Geraldton and Perth by railroad. There is a postoffice and daily mail train. The town is connected with the telegraph system of the State.

7-113 THE COAST (*H. O. Chart 3423*)—Aspect.—The coast from Leander Point trends southward for a distance of 7.5 miles to White Point, a bare sandy projection (the bare sand continuing to the southward about 2 miles); thence 8 miles to Cliff Head, 137

feet high, and conspicuous, the dark cliffs contrasting with the white sandy coast north and south of it.

From Cliff Head ( $29^{\circ}32' S.$ ,  $114^{\circ}59' E.$ ) the coast trends south-southwestward about 8 miles, to Knobby Head, 270 feet high, 2 miles north of which is Freshwater Point, a limestone cliff, having on its northern side a stream of fresh water. This appears to be the outlet of Arrowsmith River. The Wudada Range, about 15 miles within the coast, is from 700 to 800 feet high, being nearly flat, and without any conspicuous feature. From Knobby Head to Green Head, 24 miles to the southward, the coast recedes a little, and is lower.

Two conspicuous sand patches lie, respectively, 6.5 and 11 miles southward of Knobby Head, the southernmost extending over 1 mile in length along the coast; at the back of these, 1 mile from the shore, are several salt lakes and swamps extending in a southerly direction to within a short distance of Jurien Bay. About 6 miles southeastward of Knobby Head is Wudada Hill, 323 feet high, the northern end of a range some 12 miles in length with a hill 346 feet high near its southern extremity. Southward of this range the hills join those eastward of Jurien Bay.

7-114 Beagle Islets ( $29^{\circ}49' S.$ ,  $114^{\circ}51' E.$ ), two in number, about 25 feet high, lie  $211^{\circ} 9.5$  miles from Knobby Head, and 4.8 miles off the nearest shore.

Reefs.—The outer reef charted in this vicinity lies  $346^{\circ}$  3 miles from Beagle Islets; southward of Beagle Islets, reefs, parallel to the shore, extend about 5 miles; others may exist, as the locality has not been surveyed.

7-115 The coast—Aspect.—From abreast Beagle Islets to Green Head, 16 miles to the southward, the coast is low and cliffy, with salt lakes within, and fronted with numerous outlying rocks, many of which are awash; 8

miles northward of the head is a small islet named Snag, 20 feet high. Green Head is a round, grassy-topped hillock, 94 feet high.

7-116 **Fisherman Isles.**—About 3 miles to the southward is a remarkable bare sand patch, abreast which nearly 3 miles from the shore lies the Fisherman Isles, 32 feet high and 1,000 yards apart north and south, with several ledges awash between. The tops of these islands are covered with grass and scrub and the northern isle has a small sandy beach on its eastern side.

Sunken reefs extend north and northwest of the Fisherman Isles, but on the southern side there appears a tolerably good channel 1,500 yards wide. From a short distance southward of this channel the reefs extend toward Sandy Point, with a small bight on the northeastern side of it, where landing may be effected in moderate weather.

7-117 The coast for 1.5 miles south of Sandy Point is composed of bare ridges, terminating in a slight sandy projection between which and North Head are three indentations, the two projections forming them being bare sand hillocks.

A little over 1.5 miles southward from the point and 500 yards offshore lies Green Islet, low and cliffy, with a grassy summit; north and south of the islet there are some dry ledges and sunken rocks extend over 1 mile in a southwesterly direction.

**Rock.**—Bearing 303° 1.3 miles from Green Islet, is a sunken rock which generally breaks.

7-118 **JURIEN BAY** ( $30^{\circ}14' S.$ ,  $115^{\circ}00' E.$ , *plan on H. O. Chart 3423*), between North Head and Island Point, is 5.5 miles in length and is protected on the southern and southwestern sides by several islets and reefs extending about 4 miles offshore. It affords anchorage in from 5 to 6 fathoms, open to the northwestward.

The northern portion of the bay has depths of less than 3 fathoms, extending 1,500 yards offshore.

7-119 **Aspect (H. O. Chart 3423).**—The locality of Jurien Bay may be recognized by two conspicuous table-topped hills (Mount Peron, 903 feet, and Mount Lesueur, 1,014 feet high), which are situated about 10 miles northeastward and east-northeastward of North Head. Mount Benia, 842 feet high, southeastward of them, is probably conspicuous.

Middle Head, in the center of the bay, is 51 feet high; southward the beach hills become much lower and the shore trends gradually round to Island Point, 15 feet high, the southern extremity of the bay.

**Submarine spring.**—A short distance northward of Middle Head, and about 200 yards offshore, in 9 feet of water, a spring of fresh water rises, conspicuous at low water.

7-120 **Favorite Island**, 47 feet high, near the middle of Jurien Bay, is about 300 yards in length, northward and southward, covered with scrub, and has a cliff face to seaward; a dry sandbank extends from its eastern side about 200 yards, on which landing may be effected. Sunken rocks extend about 1,000 yards northward and westward from the island. A rocky patch, with a depth of 3 fathoms, lies about  $1\frac{1}{4}$  miles northwestward of Favorite Island, and a rock, with a depth of  $2\frac{1}{4}$  fathoms, lies about 1 mile northward of Favorite Island.

**Rock.**—A rock with depth of less than 6 feet has been reported (1932) to lie 1,000 yards 023° from the northern extremity of Favorite Island.

A sand bar extending from Favorite Island to the main divides the outer from the inner anchorage, the deepest water over it being 12 feet over a breadth of about 400 yards. On the eastern side of the channel

are Channel Rocks with from 6 to 10 feet of water.

**7-121 Long Island** ( $30^{\circ}19' S.$ ,  $115^{\circ}00' E.$ ), 1.8 miles southward from Favorite Island, forms at high water two islands; the western island, 30 feet high, is 500 yards in length, and 200 yards in breadth, with a sandcliff on its seaward side; off the northern extremity extends some dry ledges with a rock 12 feet high near their northern end. The eastern and larger island, 22 feet high, is covered with grass and scrub; a ridge of scrubby hillocks skirts its southern side, and at the eastern end is a rocky head. A small island, about 1,500 yards wide in an easterly and westerly direction and 33 feet high, lies about 1,500 yards northward of the northern extremity of this island.

**Water.**—Fresh water may be obtained by digging on a flat, 200 yards southward of the eastern head of Long Island.

**7-122 Escape Island**, 38 feet high, southwestward of Long Island, is covered with grass and scrub. The island has been reported to give good radar returns up to 14 miles.

**Light.**—A light is shown from a red steel framework tower, 74 feet high, located near the center of Escape Island.

Abnormal magnetic variation is reported to exist about 9 miles westward of Escape Island.

**Escape Rocks** are three in number, with several dry ledges extending from them. The southwestern rock, 23 feet high, lies  $211^{\circ} 2.5$  miles from Island Point.

Between Escape Island and Escape Rocks there are several sunken rocks on which the sea generally breaks, with boat passages between.

**7-123 Southwestern side—Seaward Ledge.**—Westward of Favorite and Long Islands there are several ledges forming the western protection to Jurien Bay; the largest is Seaward Ledge, awash at high water with a rock 9 feet high on it. Sunken rocks

extend 1.5 miles to the southward and break at uncertain intervals. At 1 mile northward of Seaward Ledge is a ledge awash.

**North Tail.**—Several reefs extend from this ledge in a north and northeasterly direction; North Tail, the northernmost rock, with 4 fathoms of water lies  $001^{\circ}$  1,500 yards from the ledge; it breaks with a heavy swell.

A rocky spit extends from North Head, terminating in 4 fathoms of water 1 mile southward of it. Patches of  $3\frac{1}{2}$  fathoms lie westward of this extremity, and break with a heavy swell. These patches form the northern side of the channel leading to the outer anchorage.

**Tides.**—It is high water, full and change, in Jurien Bay, at 9h. 00m.; springs rise 2 feet, neaps 1 foot 3 inches.

**7-124 Anchorages.**—The outer anchorage, in about 5 fathoms, lies 1,500 yards northeastward of Favorite Island. The inner, within the 12-foot sand bar, southeast of the island, has depths of 4 to 6 fathoms.

**7-125 Directions.**—Bound into Jurien Bay from southward, Seaward Ledge may be skirted about 1 mile distant, and after rounding North Tail Rock at the distance of about 200 yards, Middle Head should be steered for, bearing  $098^{\circ}$ , between the shoals extending from Favorite Island and from North Head. When standing toward the eastern shore, do not bring Island Point to bear southward of  $177^{\circ}$  (small vessels may stand further over, remembering that there is a rock with 8 feet nearly 1 mile off Middle Head), and anchor according to draft with the northern end of Favorite Island bearing  $222^{\circ}$ .

Proceeding to the inner anchorage, owing to the absence of range marks, it would be desirable to send a boat to mark Channel Rocks on the eastern side of the bar channel, which channel has a least depth of 12 feet close westward of the rocks, as before men-

tioned; after crossing the bar do not approach the shore into less than 5 fathoms at low water.

Coasting vessels generally anchor close inshore, in  $4\frac{3}{4}$  to 5 fathoms, in this inner anchorage, with the southern end of Favorite Island bearing  $300^{\circ}$ , and Island Point  $213^{\circ}$ . There is a good boat passage between Island Point and Long Island, and between the reefs to the southward.

Vessels should not use the passages between North Tail and Seaward Ledge or between Seaward Ledge and Escape Island.

**Water.**—Fresh water may be obtained by digging on the flats inside the beach hillocks. A stream of fresh water runs down the gully during the winter between Mounts Peron and Lesueur, emptying itself into one of the salt lakes near the coast. No supplies are to be obtained, and wood is very scarce in Jurien Bay.

**7-126 THE COAST (H. O. Chart 3423)**  
from Island Point trends southward about 11.5 miles to a low scrubby point abreast Cervantes Islets, thence in the same direction 19.5 miles to Wedge Islets, and is fronted with several dry rocks and reefs extending 2 to 3 miles offshore. North Nemban Flat, 11 miles southward of Mount Lesueur, is a conical hill, 723 feet high.

**7-127 Hill River ( $30^{\circ}23' S.$ ,  $115^{\circ}04' E.$ ).**—Nearly 5 miles southward of Island Point is the mouth of Hill River, which is generally closed; 2.3 miles southeastward from it there is a conspicuous bare sandhill with a dome-shaped top, 186 feet high. Molah Hill, 307 feet high, lies eastward of the river.

**Ledges.**—Several dry rocks and ledges extend in a northwest direction from the low scrubby point abreast Cervantes Islets; the outer rock, 18 feet high, lies  $325^{\circ}$ , 5 miles from the point and 3 miles offshore. Another rock, with a height of 12 feet, lies  $158^{\circ}$  from this rock. The area between these two rocks is known as Sand Knoll Ledge.

**Landing.**—At 1,500 yards northward of the same point is a slight indentation where boats might land in moderate weather.

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**7-128 Cervantes Islets** are two in number; the southern and smaller is 26 feet high, and the northern, though lower, is 500 yards in length north and south, and 150 yards in breadth, with numerous sunken rocks off its northern end. The outer reefs extend 1.5 miles westward of Cervantes Islets.

**On the coast**, 4 miles southward of Cervantes Islets, is a dark bushy head, off which, to the distance of about 1.8 miles, are some rocks 7 and 9 feet high; abreast these the coast ridge southward is somewhat smoother and greener in appearance, the sandy beach being fronted with rocks.

**7-129 Green Islets—Reefs.**—Midway between Cervantes Islets and Wedge Islet, 20 miles to the southward, and 1.8 miles offshore, are Green Islets, two in number, nearly 200 yards apart, and 25 feet high, with two small islets about 1.5 miles north of them. Bearing about  $160^{\circ}$ , 500 yards from Green Islets, is a rock 9 feet high from which a chain of broken reefs extends to 1,000 yards outside Wedge Island.

**Flat Rock.**—At 4 miles from Wedge Islet, and 1,000 yards offshore, is Flat Rock, 40 feet high.

**Currents.**—There is a fairly constant current, southerly or southeasterly, from about latitude  $30^{\circ}S.$  past Cape Leewin. The possibility of onshore sets throughout the year should be borne in mind. Strong variable currents are reported from 20 to 27 miles offshore between Cervantes Islets and Lancelin Islet. These currents average from 2 to 3 knots and set in various directions, but the southeastern direction predominates.

**7-130 Aspect.**—Eastward of Cervantes Islets the land at the back of the coast suddenly rises, and about 2 miles inland, in a southeasterly direction, is a long range of sandhills with two remarkable dark bushy summits, North and South Hummocks, 390 feet high, near the southern end. Thence to abreast Wedge Islet the ridges are clothed with grass and shrub, the highest part, 553 feet high, being about 7 miles northeastward of Wedge Islet. From abreast Wedge Islet an extensive tract of bare sand stretches along the shore for about 6 miles, extending 3 miles inland to a sand ridge 425 feet in

height, lying nearly parallel with the coast. Several conspicuous sand patches are shown on the chart in this locality.

**Darling Range.**—At about 40 miles within the coast is the Darling Range of hills, which extends southward to Swan River, where it is 20 miles from the coast, and estimated to be 1,346 feet in height.

**7-131 Wedge Islet** ( $30^{\circ}50' S.$ ,  $115^{\circ}12' E.$ ), 70 feet high, lies off an extensive white sandy point; it is perpendicular on the southern side and slopes gradually to the northward.

Landing may be effected on the northeastern end of Wedge Islet in fine weather.

**Water.**—Tolerable water may be obtained by digging on the sand flat 1,500 yards east of Wedge Point, also on a sand flat 3.3 miles north of the point, at 200 yards from the beach.

**Lancelin Islet**, 56 feet high, and covered with grass, lies 12 miles southward of Wedge Islet, and 1,000 yards offshore. On its eastern side is a small sand beach with safe landing. Radar returns from Lancelin Islet have been reported up to a range of 11 miles.

**Reefs.**—The coast between Wedge and Lancelin Islets is fronted with rocks and ledges, many awash at low water. The outer reefs do not appear to extend more than 1.3 miles offshore.

**7-132 Coast.**—**Edward Islet**, 18 feet high, lies 1.5 miles southward of Lancelin Islet, and about 300 yards from the shore. The shore abreast these islets is composed of bare white sand, extending 2 miles inland, and is the first sand of any extent north of Swan River; within the shore, the high ridges are clothed with grass and scrub, attaining a height of 453 feet at a distance of 4 to 5 miles inland.

**Outlying bank.**—A bank, with a depth of 22 fathoms, lies about 30 miles west-southwestward of Edward Islet.

**7-133 Ledge Point—Reefs.**—At 6.8 miles southward of Lancelin Islet is Ledge Point, having numerous rocky ledges between, most of them awash at low water. The outer coast reefs southward of Lancelin Islet gradually increase their distance from the shore, being 2 miles off abreast Ledge Point, and at 6 miles southward 3 miles off; thence for the next 4 miles many are awash at low water.

Breton Bay is an indentation of the coast northward of Cape Leschenault, the southern part of the bay being fronted by reefs extending northward from the cape.

**7-134 Cape Leschenault** ( $31^{\circ}18' S.$ ,  $115^{\circ}27' E.$ ), when seen from southward, appears as a dark bluff. At about 2.5 miles southward of the cape there is a sand patch 130 feet high, and at 5.5 miles from the cape a conspicuous sand patch 230 feet high, with the mouth of Moore River between.

**Leschenault Reefs.**—Abreast Cape Leschenault are Leschenault Reefs, about 200 yards apart, and the sea only breaks in a heavy swell; they lie  $271^{\circ}$ , 6 miles from Cape Leschenault. There are depths of 16 to 17 fathoms close westward of them.

**Moore River**, 4 miles southward of Cape Leschenault, is generally open, but too shallow for boats to cross except after freshets. The river takes its rise in the Darling Range, and trends south-southeast for about 20 miles, thence west-southwest, for about 30 miles, to Karakin Lake, again south-southeast for about 15 miles, thence in a southwesterly direction to the mouth. Moore River drains a large tract of pastoral country.

The coast reefs extend nearly 3 miles off the mouth of Moore River.

**Direction Bank**, in the offing, within the 20-fathom line, is 9 miles in length by 3 miles in breadth; the least known depth is 16 fathoms near its center, and lies  $261^{\circ} 15'$

miles from Wreck Point. There is a depth of 17 fathoms near its northern extremity and 13 fathoms southward of its center.

Three banks with depths of 10 to 20 fathoms lie from 4 to 10 miles south-southeastward of Direction Bank.

7-135 **Coast—Eglinton Rocks.**—From Moore River the coast trends south-southeastward for a distance of 25 miles, thence southward 20 miles to Swan River. At 10 miles south of Moore River is Wreck Point, with two small islets off and three sand patches close southward. At 10 miles southward of these patches are Eglinton Rocks, 6 feet high. Between Wreck Point and Eglinton Rocks reefs extend from 3 to 1.5 miles offshore, respectively.

At 6 miles southward of Eglinton Rocks is a small projection with a sand patch,

southwest of which at 1,500 yards from the coast are some rocks 7 feet high; about 6 miles farther southward is another projection, with Little Island, 8 feet high, about 1 mile off it. The reefs in the vicinity of Little Island are from 2 to 2.5 miles offshore, at which distance they continue for about 4 miles to the southward.

7-136 **Directions for clearing.**—The red chimney, 121 feet high, of the electric power house, at the base of Arthur Head, Fremantle, bearing eastward of  $163^{\circ}$ , will lead westward of all the reefs in the vicinity of Little Island.

7-137 **Triggs Islet** ( $31^{\circ}52' S.$ ,  $115^{\circ}44' E.$ ), situated 4 miles southward of Little Island, is 15 feet high, and connected with the mainland at low water. Abreast this islet the reefs do not extend more than 1.5 miles offshore.

## CHAPTER 8

### SWAN RIVER TO CAPE LEEUWIN

**8-1 SWAN RIVER APPROACH (H. O. Chart 1907)**—General remarks.—The roadstead generally known by the name of Fremantle, includes Gage Roads, Owen Anchorage, and Cockburn Sound. Fremantle inner harbor, at the mouth of Swan River, had a depth of 36 feet (1963) at low water, and admits the largest vessels trading to Australia. The water is deeper in the main approach northward of Rottnest Island, the channel southward, known as South Passage, being only suitable for vessels with local knowledge.

The three roadsteads provide spacious anchorages, mostly sheltered from seaward by Rottnest and Garden Islands, and the chain of reefs between and seaward of them, extending from Rottnest Island to Cape Peron, or for a distance of about 20 miles. Gage Roads is accessible at all times and for all classes of vessels, the other two are only available by vessels which can transit the dredged channels across Success and Parmelia Banks.

**Naval exercises.**—Target practice and other exercises may be carried out by British naval vessels in the vicinity of Fremantle.

British naval vessels engaged in target practice display a large blue flag at the masthead. Masters of merchant vessels are requested to keep clear of naval vessels displaying this flag.

Due warning will be given by local authorities of any night practices, of practices involving the firing of heavy guns by day, and of any submarine exercises.

**Abnormal magnetic conditions.**—Magnetic variation varying  $30^{\circ}$  more to  $30^{\circ}$  less than normal, is reported to exist up to 10 miles northward of the northern shore of Rottnest Island.

**8-2 ROTTNEST ISLAND** is a prominent object when making Fremantle from the westward. It is situated west-northwestward about 10 miles from Swan River entrance, is 5.5 miles in length in an east and west direction, 2.3 miles in breadth at the widest part, and is surrounded with rocks and shoals extending for a distance of 1,000 yards to  $1\frac{1}{2}$  miles. The island has been reported to give good radar returns up to 22 miles.

**8-3 Cape Vlaming** ( $32^{\circ}01' S.$ ,  $115^{\circ}27' E.$ ), the western extremity of Rottnest Island, is a narrow cliffy point 120 feet high. Rocks extend about  $\frac{1}{2}$  mile west-southwestward of Cape Vlaming. The outer rock has depths of less than 6 feet, and depths of 10 fathoms are found 200 yards beyond.

**8-4** The coast of Rottnest Island from Cape Vlaming to North Point consists of numerous rocky projections with sandy beaches between: the whole being skirted by Horseshoe Reefs and other rocky ledges, many dry at low water, extending from 1,000 to 1,500 yards offshore. Nearly 1.5 miles eastward of the cape the island is not over 200 yards broad, and is formed of low sandy hillocks, 50 feet high, mostly bare or scantily sprinkled with scrubby bush.

A rock, with 4 fathoms and deep water around, which breaks with a heavy swell,

lies just on the edge of the 10-fathom curve, about 1,600 yards  $330^{\circ}$  from Cape Vlaming.

8-5 Horseshoe Reefs extend nearly 1 mile off the northwestern side of Rottnest Island, consist of several rocks with from 5 to 10 feet of water on them and deep water around. The outer or northwestern rock, with 10 feet of water, lies near the edge of the 10-fathom curve, 1.4 miles  $004^{\circ}$  from Cape Vlaming.

Northward of Horseshoe Reefs, at about 2 miles from the nearest shore are several patches of 9 to 10 fathoms and 14 to 20 fathoms close around; during heavy northerly and westerly gales there is a confused and dangerous sea on these patches.

**Directions for clearing.**—Duck Rock Beacon, well open northward of North Point, bearing  $093^{\circ}$ , leads northward of Horseshoe Reefs, but amongst the deep-water patches just mentioned.

North Point Reef, which breaks in bad weather, has a least depth of  $4\frac{3}{4}$  fathoms and 9 to 12 fathoms close around, and lies 2.5 miles,  $290^{\circ}$ , from Bathurst Point Lighthouse.

8-6 Bathurst Point ( $31^{\circ}59' S.$ ,  $115^{\circ}33' E.$ , *H. O. Chart 3614*), the northeastern extremity of Rottnest Island, is low, with a gray stone lighthouse near its extremity.

**Duck Rock—Beacon.**—Duck Rock, 16 feet high, with a white triangular beacon on its summit, lies 200 yards off Bathurst Point, and has several rocky ledges extending about 700 yards northward of it.

Roe Reef, 300 yards in diameter, with a depth of  $2\frac{1}{4}$  fathoms on the shoalest part, lies nearly 1 mile northward of Bathurst Point and 1,600 yards  $342^{\circ}$  from Duck Rock Beacon.

A rock, with  $3\frac{1}{2}$  fathoms and 7 to 8 fathoms around, lies 200 yards from the southwestern end of the reef.

A shoal with depths of 37 feet is situated about  $1\frac{1}{4}$  miles northward of Bathurst Point.

A shoal with depths of 29 feet is situated close northwestward of Roe Reef.

Two narrow rocky banks, with depths of 8 to 9 fathoms on the southwestern bank, and 9 fathoms on the northeast and southwest direction from about 1,000 yards to 1.3 miles northeastward of Roe Reef.

Halfway between Point Clune and Duck Rock on the northern side of Rottnest Island are numerous detached rocks, with the depths of less than 3 fathoms over them. The position of these can be seen on the chart.

**Directions for clearing.**—The northern part of Cape Vlaming, open northward of Bare Hill Point, bearing  $236^{\circ}$ , leads northwestward of Roe Reef and Government house (in Thompson Bay, painted white) in line with Bathurst Point, bearing  $182^{\circ}$ , leads eastward.

8-7 Thompson Bay is a shallow bight southeastward of Bathurst Point fronted with rocks and sunken reefs; on its western shore are situated Government house and flagstaff and the Government native penal settlement, forming a conspicuous row of white buildings; near the southern end of these buildings is a small stone jetty about 30 yards in length. A light is shown on the outer end of the jetty. Another small jetty is located about  $\frac{1}{2}$  mile northwestward of the above-mentioned jetty. The eastern portion of the bay affords secure anchorage for small coasting vessels except during northwest gales. Four beacons, located in the western part of the bay, mark rocks, with depths of less than 6 feet over them.

Phillip Point, the southern point of Thompson Bay and the eastern extremity of Rottnest Island, is 52 feet high, formed of scrubby sand hillocks, with a narrow ledge of rocks, awash at high water, extending 300 yards off; at 100 and 300 yards eastward of the extremity of this ledge are two shallow rocks. A beacon marks the outermost of these rocks.

**Phillip Rock Light.**—A light is exhibited at an elevation of 24 feet, from a red beacon on Phillip Rock, located about  $1\frac{1}{4}$  miles southeastward of Bathurst Point Light. A white mooring buoy lies about  $\frac{1}{2}$  mile west-northwestward of Phillip Rock.

A light is shown from a black beacon with

topmark, about 1/3 mile north-northwestward of Phillip Rock. This light and the light on the end of the main jetty in range  $224^{\circ}$  lead clear of Transit Rocks. The light north-northwestward of Phillip Rock and Bathurst Point light in range  $289^{\circ}$  lead clear of Pilot Reef.

8-8 **Kingston Reefs**, with depths under 3 fathoms and with numerous rocks dry and awash at high water, extends 1.2 miles eastward from Duck Rock. Transit Rocks and others, dry at low water, lie on this reef. The northernmost rock, with  $2\frac{1}{4}$  fathoms over it, lies 1,600 yards,  $062^{\circ}$  from Bathurst Point Lighthouse.

**Kingston Spit**, within a depth of 5 fathoms, extends 1,300 yards eastward of Kingston Reef. A patch of  $2\frac{1}{2}$  fathoms near the eastern edge lies 1.8 miles,  $086^{\circ}$  from Bathurst Point Light.

**Directions for clearing.**—Rottnest Lighthouse open northward of Duck Rock Beacon, bearing  $238^{\circ}$ , leads northward, and Parker Point (southern extremity of Rottnest Island), in range with Bickley Point, bearing  $233^{\circ}$ , leads southward of Kingston Reefs, but just northward of patches of  $3\frac{1}{2}$  and  $3\frac{3}{4}$  fathoms within the 5-fathom curve.

8-9 **Wallace Islet—Twin Rocks.**—Wallace Islet, 200 yards off Bickley Point, is a rugged gray rock; at 500 yards to the northeastward are the Twin Rocks, which are bold-to.

A patch of  $3\frac{1}{4}$  fathoms lies 500 yards southeastward of Wallace Islet, and one of 3 fathoms  $148^{\circ}$  1,200 yards from the point.

8-10 **Beagle Road**, off the eastern end of Rottnest Island, between Phillip and Bickley Points, affords shelter for small vessels from the usual northwest to southwest winter gales, which occur between the months of May and October. The best berth close in is in  $3\frac{1}{2}$  fathoms, sand bottom, with Phillip Rock bearing  $356^{\circ}$ , about 1,000 yards, and Parker Point a little open of Bickley Point. A heavy swell sets into Beagle Road with strong southwest winds. A vessel seeking shelter here during a northwesterly gale should be prepared to weigh when the wind

shifts to west-southwest.

The telephone cable from the mainland passes through Beagle Road, as charted, and vessels should avoid anchoring near it.

Owing to the existence of other submarine cables close northward of this cable, vessels are cautioned not to anchor, sweep or trawl in the vicinity.

8-11 **Porpoise Bay—Direction Islet.**—Porpoise Bay, between Bickley and Parker Points, has numerous rocks and ledges extending nearly 1 mile offshore. Off Bickley Point are some small islets; the southernmost and largest, named Direction or Dyer's Islet, a rocky mass 42 feet high, lies 1,000 yards southward from the point. Near the edge of the reef, at 600 yards southward from this island, is a rock with 2 fathoms of water and 6 fathoms close outside; the bottom between is foul. A cairn of stones is erected on the northeastern extremity of Direction Islet.

A 2-fathom patch lies 1,000 yards southwestward of the islet. An 18-foot patch lies about 800 yards eastward of the islet, and a 9-foot patch lies about 700 yards east-north-eastward of the islet.

8-12 **Parker Point** ( $32^{\circ}01' S.$ ,  $115^{\circ}32' E.$ , *H. O. Chart 1907*), the southern extremity of Rottnest Island, is a round bare head, 80 feet high, connected with the shore by a low narrow ledge of rock, and when seen from an east or west direction appears detached. It is surrounded with reefs, the outermost danger lying 1,000 yards southwestward from it.

**Salmon Bay**, westward of Parker Point, and the bight to the westward of it, are foul and rocky.

**Duffield Ridge**, on which the sea is said to break in heavy gales, is a narrow ledge of rock, 1 mile in length, in an east and west direction, with 9 fathoms least water, and 13 to 16 fathoms close-to. Its western end lies 1 mile  $142^{\circ}$  from Cape Vlaming.

**Rottnest Island Light** is exhibited from a gray, cylindrical sandstone tower, 110 feet high, on the center of the island, 2.8 miles from the eastern end.

**Bathurst Point Light** is exhibited from a 65-foot gray stone tower.

It is connected by telephone with the main lighthouse.

**8-13 Pilots.**—Pilotage is optional into Gage Roads, but it is compulsory for merchant vessels within the boundaries of the Fremantle port area inward from the Gage Roads anchorage. Vessels desiring the optional sea pilot into Gage Roads should so indicate in their estimated time of arrival message. The optional sea pilot boarding place is located  $5\frac{1}{2}$  miles east-northeastward of the eastern end of Rottnest Island in a position about  $1\frac{1}{2}$  miles west-northwestward of Fairway Lighted Bell Buoy. The compulsory pilot boarding place is about 1 mile westward of Hall Bank. If arrangements have been made for a vessel to proceed directly to a berth, it will be boarded by a pilot after it has passed Fairway Light Buoy and before reaching the vicinity of Hall Bank Light Buoy. The pilot ladder should be made ready on the port side. Other vessels should proceed to anchorage in Gage Roads, southward of  $32^{\circ}01' S.$ , taking care to avoid the charted prohibited anchorage westward of the entrance of the inner harbor. If explosives are carried, anchorage should be taken westward of  $115^{\circ}42'24"E$ . A vessel proceeding directly to Owen Anchorage to discharge or load explosives will be boarded by a pilot and the quarantine and customs officers in the usual manner.

There are two pilot vessels; both display a large red and white flag.

The pilot signal (sec. 8-35) should be made as soon as possible.

The following instructions are in force for vessels requiring a pilot:—

The vessel shall lay to off the pilot boarding ground so as to give the best possible lee, and should be making headway.

The vessel shall provide on the lee side a pilot ladder fitted with spreaders and a man rope on each side secured to the vessel independently of the ladder. At night the ladder shall be suitably illuminated.

In vessels of high structure, in which gangway doors are fitted, one of such doors shall be opened and the pilot ladder rigged there.

A suitable boat rope is to be provided with the forward end made fast well forward of the ladder, and the after end held abaft the ladder ready to be let go as soon as the pilot has secured the boat rope.

All scuppers, sanitary and other refuse outlets in the vicinity of the pilot ladder shall be closed.

It is required that a vessel report to the Harbor Master by radio at least 24 hours before her expected time of arrival at Fairway Lighted Bell Buoy. A request for pilot, if desired, should be included in this message. A second radio report is to be sent 2 hours before the expected time of arrival, confirming or amending the first report. Vessels carrying explosives shall include this fact in their first report.

**8-14 South Passage** leads into Gage Road southward of Rottnest Island, and is 1,000 yards wide between Nineteen Feet Rock and the shallow patches extending northwestward from Champion Rock. The approach to this passage from the southwest is fronted with several rocky patches of 4 to 5 fathoms, having 6 to 9 fathoms close-to, on which, in heavy westerly gales, the sea breaks at uncertain intervals; their positions are best seen on the chart.

**Northern side dangers.**—**Middle Bank**, with depths of 2 to 3 fathoms, nearly midway between Phillip Point and Champion Rock, is 600 yards in length north and south. The shoalest part near its northern end lies 1.6 miles,  $135^{\circ}$  from Phillip Rock Light Beacon. A patch of  $3\frac{1}{2}$  fathoms lies 800 yards,  $056^{\circ}$  from Middle Bank, with foul ground southeast of it. From the southern end of Middle Bank rocky heads extend nearly to Jackson Rock.

**8-15 Pilot Reef**, northward of Middle Bank, is a rocky ledge about 100 yards in extent, with a depth of  $1\frac{3}{4}$  fathoms on its northern end, it lies 1.1 miles,  $112^{\circ}$  from

Phillip Rock Light Beacon, and Parker Point is in range with the northern end of Direction Islet.

**Directions for clearing.**—The clump of trees southward of Bathurst Point Lighthouse open northward of Phillip Rock bearing  $290^{\circ}$  leads northward of it.

**Shoals.**—At 500 yards,  $201^{\circ}$  from this Pilot Reef is a small rocky patch of  $3\frac{1}{2}$  fathoms with 5 fathoms close around, and between it and Middle Bank are depths of 4 fathoms.

**8-16 Bank.**—A bank, with depths of from 4 to 5 fathoms extends 4 miles eastward of Pilot Reef. The northeastern end of this bank was reported in 1937, to have extended.

A patch of  $5\frac{1}{2}$  fathoms was reported to lie about  $4\frac{3}{4}$  miles  $335^{\circ}$  from the head of the north mole at Swan River. Other shoals and an obstruction have been reported northward of this position. A  $4\frac{1}{2}$ -fathom patch lies about  $6\frac{3}{4}$  miles  $341^{\circ}$  from the head of the same mole.

**Fairway Lighted Bell Buoy**, lies about  $5\frac{1}{4}$  miles  $337^{\circ}$  from the light on the head of the South Mole at Swan River.

Vessels of more than 6 fathoms draft should pass northward and eastward of the buoy.

**Nineteen Feet Rock**, two heads 100 yards apart, with a least depth of 3 fathoms of water over them, lies 1.3 miles,  $139^{\circ}$  from Pilot Reef, on the western edge of the bank just mentioned.

**8-17 Jackson Rock**, with a depth of  $1\frac{3}{4}$  fathoms, and 6 to 7 fathoms of water close around, lies 950 yards,  $182^{\circ}$  from the shoal-est part of the Middle Bank.

**Directions for clearing.**—Cape Vlaming open southward of Parker Point, bearing  $271^{\circ}$ , leads 200 yards southward; and Duck Rock Beacon in range with Phillip Point leads westward of Jackson Rock.

**Shoals.**—There are several patches of 4 to 5 fathoms between 1,000 yards and 1.5 miles southwestward of Jackson Rock, and others farther southward, as charted, within the 10-fathom curve.

**8-18 Southern side dangers (H. O. Chart 1907).**—Champion Rock, with a depth of less than 6 feet, is the northernmost danger on the southern side of South Passage; it lies 4 miles,  $093^{\circ}$  from Parker Point and with Duck Rock Beacon open westward of Phillip Rock. Depths of less than 3 fathoms extend 400 yards northward of the rock.

A patch of  $2\frac{3}{4}$  fathoms lies about 600 yards northwestward of the rock, and a patch of 3 fathoms the same distance west-southwestward from the rock.

**Directions for clearing.**—Duck Rock Beacon open eastward of Phillip Rock Light Beacon, bearing  $305^{\circ}$ , leads eastward; Parker Point, bearing  $268^{\circ}$  (Cape Vlaming shut in), leads northward, and Bathurst Lighthouse, in range with Phillip Point Beacon, bearing  $314^{\circ}$ , leads westward.

**8-19 Directions for South Passage.**—South Passage should only be used by day by those acquainted with the locality and holding a pilot exemption certificate, and in vessels of less than 18 feet draft. Rottnest Island should not be approached nearer than 1 mile, as the whole southern shore of the island is foul and a heavy ground swell sets directly on to it, especially westward of Parker Point.

Being eastward of Parker Point Reefs, steer northeastward until the southern extremity of Cape Vlaming is only just open southward of Parker Point and bears  $271^{\circ}$ , which mark will lead 300 yards southward of Jackson Rock.

When the lighthouse on Bathurst Point bears  $314^{\circ}$  and is seen over the low part of Phillip Point, Jackson Rock will be past; then edge northward until Cape Vlaming is

only just shut in by the southern fall of the hill close northwestward of Parker Point, bearing  $269^{\circ}$ , which mark astern leads between Nineteen Feet Rock and Champion Rock. When Duck Rock Beacon bears less than  $305^{\circ}$  and is well open eastward of Phillip Rock Light Beacon, steer for the anchorage in Gage Roads, or for the harbor, as requisite.

**8-20 Straggler Rocks** ( $32^{\circ}04' S.$ ,  $115^{\circ}38' E.$ ) form a cluster of small pointed rocks; the largest and highest is 40 feet high, situated  $118^{\circ}$ , 7.5 miles from Rottnest Light-house. Numerous rocky ledges, some dry at low water, extend southward and eastward of the Stragglers, from 1,000 yards to nearly 1,500 yards.

A rocky shoal, with a depth of  $3\frac{2}{3}$  fathoms, lies almost 1 mile northeastward of Straggler Rocks, and between the two there are depths of less than 3 fathoms.

A  $5\frac{3}{4}$ -fathom patch lies about  $2\frac{1}{4}$  miles east-northeastward of the eastern extremity of Straggler Rocks.

**Straggler Reefs**, including Champion Rock, northward of them, form an almost continuous line of reefs extending north-northwest 8.3 miles from the northern end of Garden Island.

Rocks awash, named the Roarers, lie about 2.5 miles southward of the Straggler Rocks, and there are many other rocks on this line of reefs awash or nearly so at low water springs.

In bad weather the sea breaks heavily upon the Stragglers and Roarers, and all the foul ground between the 5-fathom curve eastward and westward of them.

**8-21 Channels**.—Hügel and Lambert passages, between Carnac Island and Straggler Rocks, and Challenger Pass and North Channel between Carnac and Garden Islands, are channels through this extensive reef leading to Gage Roads and Owen Anchorage; they are only available by those thoroughly acquainted with their navigation. A rock, with a depth of less than 6 feet over it, lies in the middle of Lambert passage about 2 miles south-southeastward of Straggler Rocks.

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Success Bank, forming the southern side of Gage Roads, and others southward of it, are described with Owen Anchorage.

**8-22 GAGE ROADS** ( $32^{\circ}03' S.$ ,  $115^{\circ}43' E.$ , *H. O. Charts 3614 and 3496*), in the approach to Swan River and Fremantle inner harbor in its entrance, afford anchorage in from 7 to 9 fathoms, over sand bottom; there is room for a considerable number of vessels, and there is not less than 6 fathoms in the fairway of the approach; but it is open to northerly and northwesterly winds. The reefs and ledges connecting Garden and Rottnest Islands, above described, give considerable protection against westerly and southerly winds. From October to April is the safest season for vessels visiting this road.

Owen Anchorage, southward of Success Bank, is more secure for vessels of less than 18 feet draft.

Most vessels now proceed direct into Fremantle Harbor.

**8-23 Coast.—Rous Head** (*H. O. Chart 3614*), 25 feet high, on the northern side of Fremantle Harbor, is the starting point of the north breakwater; from this head a low sandy coast trends 3.5 miles north-northeastward to a conspicuous sandy hill, 145 feet high, the beach between being fringed with rocks. At about 2 to  $2\frac{1}{2}$  miles north-northeastward of Rous Head, and 200 to 300 yards from the shore, is a rocky ledge extending to the southward nearly 1,000 yards, part of which is dry at low water. At 1,000 yards inshore is Buckland Hill, 230 feet high, having on its summit a white obelisk 15 feet high.

The telephone cable from Rottnest Island is landed under Buckland Hill; vessels should avoid anchoring near it.

A small jetty extends westward from the coast about  $3\frac{1}{4}$  miles north-northeastward of Rous Head. A rock, with a depth of less than 6 feet over it, lies close southward of the jetty about 100 yards offshore.

**Outfall pipe**.—A submerged drainage outfall pipe extends about 150 yards from the

shore about 7 miles northward of Fremantle.

8-24 **North Rock**.—About  $5\frac{1}{2}$  miles northward of Rous Head, and 1.3 miles offshore, is the southern of two rocky patches, with a depth of  $2\frac{1}{2}$  fathoms and 7 fathoms close-to; between it and the shore there are depths of 6 fathoms. The northern patch, 1,000 yards beyond North Rock, on the same bearing, has a depth of  $3\frac{1}{3}$  fathoms.

Shoals are located as follows from North Rock:

A  $4\frac{1}{4}$ -fathom patch about  $2\frac{1}{2}$  miles west-northwestward.

A 3-fathom patch about  $2\frac{1}{2}$  miles north-northwestward.

A  $3\frac{1}{2}$ -fathom patch about 2 miles northward.

A shoal, with a least depth of 3 fathoms, and 400 yards in extent, lies about 1,600 yards offshore, and  $356^{\circ}$ , 1.7 miles from Rous Head.

8-25 **Hall Bank** is a rocky patch 400 yards in length, with  $2\frac{3}{4}$  fathoms least water, and 7 to 8 fathoms at a short distance; the shoalest part lies  $311^{\circ}$ , 1.7 miles from Rous Head.

Several shoals with depths of  $4\frac{1}{2}$  to  $5\frac{1}{2}$  fathoms lie between Hall Bank and a position 2 miles southward of North Rock.

**Light buoy**.—A red conical light buoy showing a flashing red light is moored in about  $4\frac{1}{2}$  fathoms near the southwestern edge of Hall Bank.

**Eleanor Rocks** (*H. O. Chart 3496*), the shoalest having a depth of 2 fathoms, lie  $019^{\circ}$  1,150 yards from the North Mole Lighthouse.

There are several isolated rocks with  $4\frac{1}{2}$  to 5 fathoms, and 6 to 7 fathoms close around them, extending to the distance of about 1,300 yards northward, westward and southwestward from Eleanor Rocks.

Two detached 3-fathom patches lie about

320 yards and 140 yards eastward of Eleanor Rocks.

The space between Eleanor Rock and Rous Head was formerly used as a dumping ground for dredged material, chiefly rock from the harbor.

A patch of 3 fathoms, with  $4\frac{1}{2}$  to 5 fathoms around, lies 200 yards  $000^{\circ}$  from the North Mole Lighthouse.

8-26 **Beagle Rocks**, 300 yards in extent, consist of several rocky heads with general depths of less than 3 fathoms over them and a rock awash on their southwestern side. The northernmost rock lies  $149^{\circ}$ , 700 yards from the North Mole Lighthouse.

**Wreck**.—The wreck of a steamer lies stranded on Beagle Rocks. Two green cylindrical buoys mark this wreck.

**Buoy**.—A black can buoy lies close northward of the northern patch of the rocks in 24 feet of water. An area of foul ground, indicated by pecked lines on the chart, exists in the vicinity of the northwestern part of Beagle Rocks with its center about 200 yards southwestward of the black buoy.

8-27 **Minden Reefs**, with 15 feet least water, lie off the northern extremity of a spit with less than 3 fathoms of water, extending from the shore southward of the South Mole. The northwestern extremity of Minden Reefs, 18 feet, lies  $173^{\circ}$ , 1,400 yards from the North Mole Lighthouse. A 3-fathom shoal lies about 200 yards southwestward of Minden Reefs in a position  $177^{\circ}$ , 1,600 yards from North Mole Lighthouse.

A beacon stands on the coastal bank about 1,700 yards southeastward of the extremity of Minden Reefs.

**Lights, buoys and beacons** (*H. O. Chart 1907*).—Woodman Point Light, is exhibited from a gray circular stone tower, 42 feet high on the hill at 1 mile within Woodman

Point, and at about 5 miles southward of the harbor entrance.

On North Mole (*H.O. Chart 3496*), a light is exhibited from a 30-foot circular iron tower painted gray, with white dome and fitted with a radar reflector.

On South Mole, a light is exhibited from a 30-foot circular iron tower painted gray, with white dome.

A light is exhibited at the outer end of the fishing boat harbor breakwater westward of South Jetty.

Light buoys Nos. "1" and "A" and light beacons Nos. "2" and "B" are located about 2 miles west-southwestward of North Mole Light. The channel which they mark was dredged (1956) to 38 feet.

The northern side of the entrance channel to Fremantle Harbor is marked by light buoys and two lights are shown on the southwestern end of Berth No. 1, North Quay. The southern side is marked by two light buoys and one light beacon. A light is shown on a dolphin about 200 yards northeastward of the light beacon. These lights, in range 219°, indicate the center line of the inner harbor.

Two lights are shown from the roof of Shed G, Victoria Quay.

An aeronautical light and an aviation radio beacon are located about 12 miles north-eastward of Fremantle.

**8-28 Landmarks.**—On the southern side of Swan River, at the eastern part of the town, a ridge of limestone hillocks, from 110 to 160 feet high, extends southward nearly parallel to the coast. The War Memorial, a conspicuous building, 54 feet high, is on the summit of one of the highest, Church Hill. The white obelisk on Buckland Hill is 2 miles northward. The clock tower of the town hall and belfry of the grammar school are conspicuous.

The following are conspicuous, distances and bearings from the light on the North Mole as follows:

A silo, about 1 1/3 miles 052 1/2°.

A church, about 2 miles 114°.

Cantonment Hill, 109 feet high, about 1/4 mile eastward of the inner harbor.

**Tides and tidal currents.**—It is high water, full and change, in Gage Roads, at 8h. 50m.; and in Thompson Bay, Rottnest Island, at 7h. 50m., rise not exceeding 2 feet 9 inches. The northgoing current runs 10 hours and southgoing current 14 hours, there being only one high and one low water in 24 hours.

The velocity is uncertain, but usually small, depending greatly upon the strength and direction of the wind.

The lowest tides prevail during the summer months when land breezes are general, and the highest tides during the winter months when northerly and northwesterly winds are most prevalent. Previous to and during the continuance of a north or northwest gale the water rises and remains stationary at about 5 feet above the ordinary low-water level. A tide gage is located at Victoria Quay.

**8-29 Directions.**—Gage Roads should be approached by passing northward of Rottnest Island, which should be given a berth of about 4 miles. The Fairway lighted bell buoy should then be steered for; pass eastward of the buoy if more than 6 fathoms depth is required, otherwise pass westward of it. Course may then be shaped for the pilot boarding area westward of Hall Bank Light Buoy, where further direction will be governed by the pilot regulations set forth in section 8-13.

The mast of the Applecross radio station, kept open north of the obelisk on Buckland Hill, will lead clear of all reefs and dangers north of Rottnest Island.

The signals regarding berthing and entering shown from Harbor Trust Building signal mast must be attended to.

(6029) AUSTRALIA—West coast—Fremantle—**Fishing Boat Harbor—Light information.**—1. Fishing Boat Harbor Breakwater Light (32°03.7' S., 115°44.3' E. approx.) has been discontinued.

**Note.**—The head of the mole is now floodlighted.

2. The following lights have been established as indicated; distances and bearings from the former position of (1):

(a) *Qk. Fl. R. 12 ft. 2 M.* about 880 feet 207°. The light is shown from a pile beacon and is visible from 188° to 096°.

(b) *Qk. Fl. G. 12 ft. 2 M.* about 810 feet 187°. The light is shown from a pile beacon and is visible from 149° to 096°.

(N.M. 38/66.)

(N.M. 32(318), Sydney, 1966.)

H.O. Charts **3496, 3614, 1907.**

H.O. Pub. 111B, No. **16050, 16044, 16046.**

H.O. Pub. 74, 1952, page **304.**

(1246) AUSTRALIA—West coast—Fremantle—**Wind signals.**—The following signals, when exhibited from the Signal Station of the Port Authority Administration Building (32°03.3' S., 115°44.2' E. approx.), will indicate that winds with a speed in excess of 20 knots are forecast:

**By Day.**—A red square flag over a black diamond shape.

**By Night.**—A green light over a red light, 6 feet apart.

(N.M. 8/66.)

(N.M. 2(34), Sydney, 1966.)

H.O. Chart **3496.**

H.O. Pub. 74, 1952, page **305.**

Currents, at all seasons, generally run with the wind, at  $\frac{1}{2}$  to  $1\frac{1}{2}$  knots.

At night, the powerful light on Rottnest Island, Gage Roads Light on Woodman Point, the light and bell buoy in the approach to Gage Roads, and the lights on the moles, are all sufficient guide for the ordinary navigator.

No depths will be found of less than 6 fathoms between the pilots' boarding ground and the entrance to the inner harbor, if vessels keep in the white sector of Woodman Point Light. Vessels requiring more than 6 fathoms to navigate, should pass to the eastward of the light and bell buoy and then edge over into the white sector of Woodman Point Light.

In thick weather, if uncertain of the position, Rottnest Island should not be approached on its western or northwestern side to a less depth than 30 fathoms, or the northern side of the island under 20 fathoms.

**8-30 Anchorage.**—In the summer season, October to April, safe and convenient anchorages will be found in Gage Roads, in 8 to 9 fathoms, fine sand bottom about 1 mile west-southwestward of the entrance to Fremantle Harbor.

In winter, vessels should anchor about 1,000 yards farther westward or northwestward. The ground inshore is rocky. Most vessels now enter Fremantle Harbor.

**Prohibited anchorage.**—Anchorage is prohibited within the limits of a line extending about  $1\frac{1}{3}$  miles  $284^{\circ}$  from North Mole Lighthouse and a line extending about  $1\frac{1}{4}$  miles  $263^{\circ}$  from South Mole Lighthouse.

**8-31 Storm signals.**—The following special storm signals are displayed at the signal station:—

*By day.* — A black ball above a black cone, point up, from the northern yardarm of the signal mast.

*By night.* — Two red lights vertically disposed on the signal mast.

All vessels in the inner and outer harbors must take necessary precautions when these signals are displayed.

Vessels at anchor in outer anchorages during winter months should heed the following instructions:

1. With northerly winds and falling barometer, a good lookout should be kept for bad weather, the second anchor must be always ready, and cables clear to bare ends.

2. With a falling barometer, when the wind shifts to westward of north, let go the second anchor, giving proportionate amount of cable to first anchor.

3. On the wind shifting to northwest, with barometer still falling, the gale will have commenced, when all cable should be given to the ship to insure her riding safely.

4. When the wind shifts to west and west-southwest, it generally increases; care should then be taken not to ride with too short a scope on port cable.

5. As the wind shifts southward, with rising barometer and weather moderating, the second anchor should be weighed to prevent turns being taken in the hawse in the event of the wind going round east about, as it generally does, and returns to the northeast quarter, when the former precautions should be taken, having about 50 fathoms on starboard cable.

6. Should the wind, after backing to southwest, veer to west and northwest, the gale is not over, but will probably blow harder than before, the barometer keeping below 30 inches.

The barometer is a certain indicator of the weather, as a general rule rising with southerly and falling with northerly winds, and should be strictly attended to. It invariably gives several hours' notice of the approach of bad weather.

**8-32 Quarantine.**—Fremantle is a first port of entry, (sec. 1-18). Vessels arriving from ports outside the colony must not communicate with the shore until the health officer has granted pratique. The quarantine (land) station is at Woodman Point.

The anchorage in the outer harbor for vessels subject to quarantine is bounded by

an imaginary line drawn from the seaward end of the North Mole to the center of Mewstone Rock to the southward and Lat. 32° 01' S., to the northward, excluding the prohibited area westward of the entrance to the inner harbor. In the inner harbor the anchorage area is up to the quarantine line.

The quarantine line referred to in the quarantine act (sec. 1-18) is described by proclamation as an imaginary line across the Swan River at the outer mooring buoy.

8-33 Radar station and signal station (*H.O. Chart 3496*).—A radar station with a range up to 25 miles is located on the Harbor Trust Building, close westward of the customhouse. Day and night signals as shown in regulations to be observed within the Port of Fremantle, are made from the Harbor Trust Building signal mast by shapes and flags signifying the type and ownership of vessels approaching Fremantle, for the information of the harbor authorities and others interested. They are kept hoisted until the vessel is berthed. Special storm signals are displayed (sec. 8-31). The signal station is floodlighted.

Traffic signals.—The following signals are displayed for movement of vessels through Success and Parmelia Banks channels to or from Cockburn Sound.

Signal	Meaning
Two black balls or two red lights, displayed horizontally, 6 feet apart from south yardarm of signal mast.	Vessels may enter Success Bank from the northward.
Three black balls or 3 red lights displayed horizontally, 6 feet apart from south yardarm of signal mast.	Success and Parmelia bank channels are closed to all vessels from the northward.

Note.—When conditions are such as to interfere with a clear view of day or night signals, a vessel should not attempt to enter the channels. A flashing red light will also be shown from the signal station building when the above lights are exhibited.

The following signals are shown in order to avoid any risk or danger by incoming and outgoing vessels meeting in the entrance channel, or Inner Harbor. These signals will

be displayed in daylight and at night, respectively, from the mast head of the signal staff at Harbor Trust Building signal mast.

(1) Two black balls shown one beneath the other, 6 feet apart by day, and two green lights one beneath the other, 12 feet apart, by night will indicate to an incoming vessel that movements are taking place in the Inner Harbor and entrance channel, and that the incoming vessel must wait in Gage Roads clear of the mouth of the channel until the flags are lowered or the lights extinguished.

(2) One black ball by day, and one green light by night, will indicate that a vessel is entering the entrance channel, and this must be taken as a warning to any vessel about to move in the Inner Harbor that she is to remain at her berth until the signals are lowered or extinguished, respectively, (Regulation No. 53.)

The following signals indicate that the Inner Harbor is closed:—

(3) Three black balls in daylight, or three green lights shown one below the other, 6 feet apart at night, will indicate to all vessels desiring to pass into or out of the Inner Harbor that the said Inner Harbor entrance channel is closed against all movements of vessels. (Regulation No. 53.)

(4) A light, flashing red, will be shown from the northwestern corner of the signal station building when the above-mentioned green lights are shown.

8-34 Berthing signals made from Harbor Trust Building.—An enlarged International Code flag "Z" flown by itself from the masthead will indicate that the berth of the incoming vessel has been suddenly altered, and the pilot or exempt master, as the case may be, must carefully watch the signal station for berthing signals. During night time this information will be given by Morse code signal from the signal station masthead. (Regulation No. 53.)

**Fire Signals.**—The following signal shall be shown from the signal station masthead to denote an outbreak of fire:

*By Day.*—A large white flag with a letter "F" in red upon it.

*By Night.*—A red light.

**Artillery Practice.**—The following signals will be exhibited from the signal station:

*Port Open by Day.*—International code flag "IB"—Keep clear of firing range.

*Port Closed by Day.*—2 red balls, disposed vertically, with a green cone apex uppermost, between them.

*Port Closed by Night.*—A green light between two red lights, disposed vertically.

**Miscellaneous signals**, for use of vessels in port, are contained in Regulations No. 56 of the Fremantle Harbor Trust Handbook of Regulations.

**8-35 Signals made from vessels.**—The following signals are to be used when requisite by vessels at the port:

*Customs boat.*—International Code "K G W" at the peak or other prominent place.

*Quarantine.*—Day signal: International Code "Q" at the mainmast head. Night signal: A triangle of three lights, two red and one white, 6 feet apart, with apex white light above, shown amidships. Cholera, yellow fever, or plague: International Code "L" at the mainmast head.

*Sea pilot.*—Day signal; International Code flag "G", the Pilot Jack at the fore, or the flag signal "PT". Night signal: A blue flare exhibited every 15 minutes, the signal "PT" by flashing light, or a bright white light flashed at short intervals for a minute at a time.

*Harbor pilot.*—International Code "S" at the foremast head.

*Medical assistance.*—International Code "YL" at peak or other prominent place.

*Water police.*—Day signal: International Code "YVX" at the mainmast head. Night signal: Two white lights, vertical, 5 feet apart, at any masthead or the peak.

*Tug wanted.*—International Code "YP." Night signal: two blasts of the whistle; one

long, one short.

*Mails on board.*—International Code "REW" at the mainmast head.

*Explosives on board.*—International Code "B" at the foremast head.

*Boarding officer wanted.*—International code flags "SPI."

*Lighter wanted.*—International Code "YM."

*Pilot exemption flag.*—White flag at the mainmast head. Night signal: The owner's private night signal.

Steamers or other vessels fitted with sound whistles, sirens, or horns are not permitted to use these in the inner harbor except for navigational or maneuvering purposes.

The following sound signals for vessels in sight of one another, in addition to those laid down in the Regulations for Prevention of Collisions at Sea, is to be used:

Four short blasts, to mean "My ship is out of control; keep clear."

**8-36 Harbor regulations—Extracts.**—All naval vessels of any nationality, and also all vessels owned by the Governments of any British States or colonies, shall be exempt from the payment of pilotage or port dues so long as such vessels are not engaged in trade.

A vessel shall be considered as being engaged in trade when carrying any trade commodity which would pay freight if carried by a privately owned vessel, even though such commodity may be the property of or to be used exclusively by or for the purposes of the Government which owned the vessel in question. (Regulation No. 63.)

*Exemption from pilotage.*—All coasting vessels and all whale-killing vessels not exceeding 100 tons net register, and also all coasting and interstate vessels whose masters hold exemption from pilotage certificates, shall be exempt from pilotage except in case where pilots are taken, in which case the usual pilotage rates will in all cases apply. (Regulation No. 64.)

*Inward pilotage compulsory.*—Pilotage shall be compulsory upon all vessels entering the port of Fremantle, except such as are

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specially exempted by these regulations. (Regulation No. 65.)

Harbor master or berthing master to have entire control of anchoring and berthing, and can remove vessels. (Regulation No. 196. See complete copy.)

Anchors let go in port are to be buoyed. (Regulation No. 231.)

Vessels having explosives on board or desiring to load explosives while in port, shall anchor in Gage Roads not less than one mile from any other vessel and westward of  $115^{\circ} 41' 24'' E.$ , unless otherwise directed by the Harbor Master. Smoother water for handling of explosives by lighters may be obtained by approaching as close as possible, consistent with safety, to the light buoy marking the northern end of Success Bank Channel keeping clear of the approaches to the channel. Anchorage can also be taken, by vessels not exceeding 34 feet in draft, between Success and Parmelia Banks in 7 to 8 fathoms, about  $3\frac{1}{4}$  miles west-northwestward of Woodman Point Light.

Masters of vessels on arrival should obtain for their own guidance a copy of the port regulations.

The speed of any vessel navigating the inner harbor shall not exceed the minimum speed at which such vessel may be safely navigated.

When passing any dredger or any vessel employed in the execution of such work, care should be taken to see that such work or dredger or other vessel will not be interrupted or damaged. (Regulation No. 189.)

#### 8-37 FREMANTLE HARBOR (H. O. Chart 3496)—General remarks—Depths—

**Wharfage.**—The port of Fremantle consists of Gage Roads, Owen Anchorage, Cockburn Sound, and the inner harbor. Gage Roads is situated between a long line of islands and reefs before described, and the mainland; the combined anchorages are about 8 miles long and 5 miles broad, being open only to the northward. Owen Anchorage and Cockburn Sound are situated southward of Gage Roads. Anchorage in any of these areas is good and safe in nearly all weathers, the bottom being sand.

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The inner harbor, where practically all the shipping business of the port is now carried on, is a modern artificial harbor which has been constructed within the estuary of Swan River.

The entrance to this harbor is protected by two rubble moles, the northern being about 4,840 feet in length and the southern 2,040 feet. The dredged channel between the moles extends from the 6 fathom curve to the inner harbor. Abreast the head of the North Mole and up to the first pair of light buoys the channel is about 650 feet wide; thence the width decreases to about 500 feet between the last pair of light buoys; the width then increases to about 750 feet where the channel joins the inner harbor.

The inner harbor has a length of about 5000 feet, and for the most part is about 1400 feet in width.

Due to the restricted turning area, vessels using this port are limited to a maximum length of 800 feet.

The depth in the entrance channel and in the inner harbor is 36 feet.

A submarine cable is laid across the dredged channel between the north and south moles.

**Tides.**—The tides are irregular, and depend much on the direction of the wind. The rise and fall ordinarily is about 2 feet.

**Mooring buoys.**—Inside the inner harbor are two mooring buoys, capable of taking the largest vessel coming to Australia, where steamers can take bunker supplies, stores, and cargo, if they should elect to do so, instead of coming to a wharf.

**8-38 FREMANTLE (H. O. Chart 3496).** The chief place of commerce in Western Australia is situated on the southern side of the entrance to Swan River, on a low sandy flat connecting Arthur Head with the mainland, and 12 miles by the river from Perth. There are half-hourly trains between Fremantle and Perth and frequent steam vessels by river.

Population, within the municipal boundaries, in 1954 was 47,273; this includes Fremantle, North Fremantle, East Fremantle, and Claremont.

The Sailors' Rest is on Marine Terrace facing the southern beach. There are two Missions in the port.

**Wharfage.**—The wharfage accommodations inside the inner harbor consists of two quays: the Victoria Quay, 5,270 feet long, on the southern side and the North Quay, 5,880 feet long, on the northern side. There are depths of 34 feet alongside both quays.