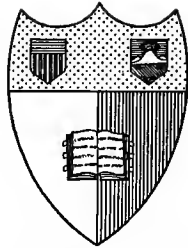


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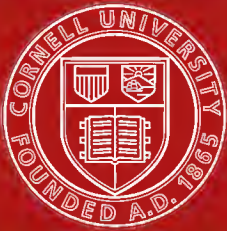
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THE
CHINA SEA DIRECTORY

VOL. I.

CONTAINING

DIRECTIONS FOR THE APPROACHES TO
THE CHINA SEA,
BY MALACCA, SINGAPORE, SUNDA, BANKA,
GASPAR, CARIMATA, RHIO, VARELLA,
AND DURIAN STRAITS.

THIRD EDITION.

PUBLISHED BY ORDER OF THE LORDS COMMISSIONERS OF THE ADMIRALTY.

LONDON:
PRINTED FOR THE HYDROGRAPHIC OFFICE, ADMIRALTY;
AND SOLD BY
J. D. POTTER, AGENT FOR THE SALE OF ADMIRALTY CHARTS,
31 POULTRY, AND 11 KING STREET, TOWER HILL.
1886.

Price Four Shillings and Sixpence.

ADVERTISEMENT TO THIRD EDITION.

The China Sea Directory, Vol. I., contains Sailing Directions for the approaches to the China Sea by Malacca, Singapore, Sunda, Banka, Gaspar, Carimata, Rhio, Varella, and Durian Straits; also general observations on the passages from the Cape of Good Hope to Sunda Strait and Singapore.

The material used has been gathered from the following sources: Malacca strait from the surveys of Lieutenants Ward and Jackson, Indian Navy, 1852-60. Portions of it, viz., the Lankawa islands, Penang and its approaches, Diuding island and channel, Perak river entrance and its approaches, and Larut river, have been re-surveyed by Captain Napier, Commander the Honourable F. Vereker, and Lieutenant H. Belam, in H.M. surveying vessels, 1876-84; also the south shore between Aroa islands and the Carimon islands has been partially re-surveyed by the Dutch.

Singapore, Banka, and Rhio straits are from the surveys of Messrs. Richards, Stanton, and Reed, Masters R.N., 1860-68, and Mr. Thompson, Government Surveyor, 1843-49; portions of Banka and Rhio strait have been re-surveyed by the Dutch Government.

Durian strait is from the surveys of Lieutenants Collinson and Moresby, Indian Navy, 1822; Lieutenant Tjassens, Dutch Navy, 1843, with additions by Mr. Stanton, 1862.

Sunda strait to Banka strait is from various authorities. H.M. surveying vessels in 1865-6 searched in vain for many reported dangers and rectified the positions of others; similar work is being carried on by the Dutch surveyors; yet, as no complete survey has been made, vessels should navigate it with caution.

Gaspar and Carimata straits are principally from the re-surveys made by the Dutch from 1880-5; the southern approaches to Carimata were partially examined by H.M.'s surveying vessels *Sylvia* and *Nassau*, 1874-6, and the Carimata islands, with some of the Montaren group, were surveyed by Lieutenant H. Hoskyn, H.M.S. *Flying Fish* in 1880. The positions of some of the outlying reefs, however, have yet to be investigated.

A second edition, revised by Staff-Commanders J. C. Richards and J. Hitchfield, of the Hydrographic Department, was published in 1878.

To the present edition, revised by Staff-Commander C. H. C. Langdon, of the Hydrographic Department, has been added directions for the west coast of Sumatra. These, are compiled from Horsburgh, various old authorities, and partial surveys conducted by the Dutch from 1871-77, with amendments to 1885; but little is known of this large extent of coast. Directions for the coast of Java between Sunda strait and Batavia, resulting from recent Dutch surveys, have also been added.

Much valuable information for this work has also been gathered from the Remark books of H.M. vessels employed on the China station.

As this volume embraces a large extent of coast, and many islands and dangers which are but imperfectly explored, it must be considered incomplete. Seamen therefore are invited to transmit to the Secretary of the Admiralty notice of any errors or omissions they may discover, or additional information they may obtain, with a view to the improvement of this work for the benefit of the mariner.

W. J. L. W.

Hydrographic Office, Admiralty, London,
October 1886.

ORTHOGRAPHY.

As far as has been found possible with existing knowledge the native names in this book are spelt in accordance with the following system, which will be gradually introduced into all Admiralty Sailing Directions.

Where native names have been so long written in a form, which, though not in accordance with this system, has become familiar to English eyes from being so spelt in all charts and maps, they are retained, and no European names are changed from the correct orthography.

Information as to the proper spelling of native names so as to produce the nearest approximation to the true sound, by this system, is invited, but it must be remembered that only an approximation is aimed at. The position of the accent denoting the syllable on which emphasis, or the "stress," should be laid is very important, as the sound of so many words is utterly changed by its misplacement.

Letters.	Pronunciation and Remarks.	Examples.
a	<i>ah</i> , <i>a</i> as in <i>father</i> -	Java, Banána, Somáli Bari.
e	<i>eh</i> , <i>e</i> as in <i>benefit</i>	Tel-el-Kebír, Oléhleh, Yezo, Levúka, Peru.
i	English <i>e</i> ; <i>i</i> as in <i>ravine</i> ; the sound of <i>ee</i> in <i>beet</i> . Thus, not <i>Feejee</i> , but -	Fíji, Hindi.
o	<i>o</i> as in <i>mote</i> -	Tokio.
u	long <i>u</i> as in <i>flute</i> ; the sound of <i>oo</i> in <i>boot</i> . <i>oo</i> or <i>ou</i> should never be employed for this sound. Thus, not <i>Zooloo</i> or <i>Zoulou</i> , but - All vowels are shortened in sound by doubling the following consonant. Doubling of a vowel is only necessary where there is a distinct repetition of the single sound.	Zulu, Sumatra. Yarra, Tanna, Mecca, Jidda, Bonny. Nuulúá.
ai	English <i>i</i> as in <i>ice</i> -	Shanghai.
au	<i>ow</i> as in <i>how</i> - thus, not <i>Foochow</i> , but -	Fuchan.
ao	is slightly different from above -	Macao.
ei	is the sound of the two Italian vowels, but is frequently slurred over, when it is scarcely to be distinguished from <i>ey</i> in the English <i>they</i> .	Beirút, Beilúí.
b	English <i>b</i> .	
c	is always soft, but is so nearly the sound of <i>s</i> that it should be seldom used. If <i>Celebes</i> were not already recognised it would be written <i>Selebes</i> .	Celebes.
ch	is always soft as in <i>church</i>	Chingchin.
d	English <i>d</i> .	
f	English <i>f</i> . <i>ph</i> should not be used for the sound of <i>f</i> . Thus, not <i>Haiphong</i> , but	Haifong, Nafa.

Letters.	Pronunciation and Remarks.	Examples.
g	is always hard. (Soft <i>g</i> is given by <i>j</i>)	- Galápagos.
h	is always pronounced when inserted.	-
j	English <i>j</i> . <i>Dj</i> should never be put for this sound.	Japan, Jinchuen.
k	English <i>k</i> . It should always be put for the hard <i>c</i> . Thus, not <i>Corea</i> , but	-
kh	The Oriental guttural	- Korea.
gh	is another guttural, as in the Turkish	- Khan.
i	} As in English.	- Dagb, Ghazi.
m		
n		
ng		has two separate sounds, the one hard as in the English word <i>finger</i> , the other as in <i>singer</i> . As these two sounds are rarely employed in the same locality, no attempt is made to distinguish between them.
p	as in English.	
q	should never be employed; <i>qu</i> is given as <i>kw</i>	Kwangtung.
r	} As in English.	
s		
t		
v		
w		
x		
y	is always a consonant, as in <i>yard</i> , and therefore should never be used as a terminal, <i>i</i> or <i>e</i> being substituted.	Sawákin.
	Thus, not <i>Mikindány</i> , but	Kikúyu.
	not <i>Kwaly</i> , but	Mikindáni.
z	English <i>z</i>	Kwale.
	Accents should not generally be used, but where there is a very decided emphatic syllable or stress, which affects the sound of the word, it should be marked by an <i>acute</i> accent.	Zulu.
		Tongatábu, Galápagos, Paláwan, Saráwak.

Purely Dutch names are retained as in Dutch, but Malay names are written as above.

The Dutch method of spelling the native names is in accordance with their own system of pronunciation of the Roman letters.

Thus the Dutch *oe* is pronounced *u*.

„ „ *j* „ *y*, though not always.
 „ „ *oo* „ the long *o*.

This must be borne in mind when using any Dutch publication; thus, on a Dutch chart *Batu* is spelt *Batoe*, *Ayer* as *Ajer*, &c.

In Malay, the terminal *k* is scarcely sounded; thus *Pcrak* is more nearly *Peráh*, and *Priok*, *Prioh*.

GLOSSARY OF A FEW MALAY WORDS OF FREQUENT OCCURRENCE IN CHARTS AND SAILING DIRECTIONS.

<i>Malay.</i>	<i>English.</i>	<i>Malay.</i>	<i>English.</i>
Ayer	Fresh water.	Lumpur	Mud.
— masin	Salt water.	Merah	Red.
Batu	Rock, stone.	Nangka	Jack fruit.
— brani	Loadstone.	Padang	Plain, open space.
Bender	Port for trade.	Panjang	Long, tall.
Besar	Large, great.	Pinang	Betel nut.
Beting	Sandbank.	Pisang	Banana.
Buaya	Alligator.	Ponchak	Peak of a hill.
Búkit	Hill.	Putih	White.
Burong	Bird.	Rantau	Reach of a river.
Dapur	Cooking p'ace.	Salat	Strait, channel.
Gadong	House.	Sungi	River, stream.
Gunong	Mountain.	Tambaga	Copper.
— api	Volcano.	Tanah	Land, country, earth.
Gusong	Shoal.	Tanjong	Cape, point.
Itam	Black.	Tasik	Lake.
Kampung	Enclosure, village.	Teluk, telok	Bay, cove, creek.
Kapal	Ship.	Timor	East.
Karang	Coral reef, rock.	— laut	North-east.
Kwala	Mouth of a river.	Trumbu	Shoal.
Labúan	Anehorage, harbour.	Trusan	Channel passage.
Lampung	Buoy.	Ujong	Cape, point, promontory.
Laut, laut besar	Sea.		
Layar	Sail.		

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**IN THIS WORK THE BEARINGS ARE ALL MAGNETIC,
EXCEPT WHERE MARKED AS TRUE.**

**THE DISTANCES ARE EXPRESSED IN SEA MILES OF
60 TO A DEGREE OF LATITUDE.**

**A CABLE'S LENGTH IS ASSUMED TO BE EQUAL TO
100 FATHOMS.**

Missing Page

INFORMATION RELATING TO CHARTS, SAILING DIRECTIONS, AND THE GENERAL NAVIGATION OF H.M. SHIPS.

ON THE CORRECTION OF CHARTS, LIGHT LISTS, AND SAILING DIRECTIONS.

There are three descriptions of publications as guides to navigation—the charts, the sailing directions, and the light lists—which are all affected by the continual changes and alterations that take place.

Of these the charts should always be, so far as our knowledge permits, absolutely correct to date; and the light lists should be noted for the recent alterations, though space will not permit of full details being always inserted; the sailing directions, however, cannot, from their nature, be so corrected, and *in all cases where they differ from charts, the charts must be taken as the guide.*

Charts.—When issued to a ship on commissioning, the charts have received all necessary corrections to date. As sent from the Hydrographic Office they are, as a rule, fresh from the plates. They then receive such corrections by hand in the depôts as are required, and are so issued to the ships.

All small but important corrections that can be made by hand are notified by Notices to Mariners, and should at once be placed on the charts to which they refer.

Large corrections that cannot be conveniently thus made are put upon the plates, and fresh copies are issued to the ships to replace the others, which are directed to be destroyed to prevent the possibility of their being used in the navigation of the ship.

The dates on which these large corrections are made are noted on the chart plates in the middle of the lower edge; those of the smaller corrections at the left-hand lower corners.

In all cases of quotations of charts, these dates of corrections should be given, as well as the number of the chart, in order that

at the Admiralty it may be known what edition of the chart is referred to.

The Light Lists, annually published at the beginning of each year, are not corrected in the depôts before issue, but appendices are issued every two months, giving the alterations that have taken place, copies of which are put into the chart boxes.

It is the duty of the navigating officer when he receives the set of charts to make notations in the light lists from these appendices, and from the Notices to Mariners in the box; and to keep them so corrected from time to time.

The Sailing Directions are not corrected before issue, except occasionally for very important new rocks or dangers. Hydrographic Notices and Supplements referring to each volume are published from time to time.

Supplements contain all the information received up to date since the publication of the volume to which they refer, and cancel all previous Hydrographic Notices.

Hydrographic Notices contain all information up to date since the publication of the volume, or since the last Supplement or Hydrographic Notice, but endeavour is made to issue no more than one of these affecting each volume, and, on the collection of fresh information, to include the former Notice in a Supplement.

The existence of Supplement or Hydrographic Notices is to be noted, in the tabulated form now being placed for the purpose inside the cover of each volume, in cases when such notations have not been made before issue, and also on receipt of further Notices after commission.

Notes should be made in the margin of the volume of sailing directions affected, as references to the Supplements or Hydrographic Notices when the latter are printed on both sides.

To enable the books to be more conveniently corrected, however, such Supplements and Hydrographic Notices as are of moderate size are now being printed on one side only, and two copies are issued to each ship; one to cut up, the slips being pasted in at the appropriate place; the other to retain intact for reference.

To make these notations or paste in these slips is one of the early duties of a navigating officer after drawing his box of charts and

books, and similar notes are to be made from Notices to Mariners that may thereafter be received.

It must, however, be thoroughly understood that sailing directions will never be correct in all details, except up to the date of the last Hydrographic Notice or Supplement, and that, as already stated, when differences exist, the chart, which should be corrected from the most recent information, should be taken as the guide ; for which purpose, for ordinary navigation, they are sufficient.

THE USE OF CHARTS AS NAVIGATIONAL AIDS.

Accuracy of a Chart.—The value of a chart must manifestly depend upon the accuracy of the survey on which it is based, and this becomes more important the larger is the scale of the chart.

To estimate this, the date of the survey, which is always given in the title, is a good guide. Besides the changes that, in waters where sand or mud prevails, may have taken place since the date of the survey, the earlier surveys were mostly made under circumstances that precluded great accuracy of detail, and, until a plan founded on such a survey is tested, it should be regarded with caution. It may, indeed, be said that, except in well-frequented harbours and their approaches, no surveys yet made have been so minute in their examination of the bottom as to make it certain that all dangers have been found. The fullness or scantiness of the soundings is another method of estimating the completeness of a chart. When the soundings are sparse or unevenly distributed, it may be taken for granted that the survey was not in great detail.

Blank spaces among soundings mean that no soundings have been obtained in these spots. When the surrounding soundings are deep it may with fairness be assumed that in the blanks the water is also deep ; but when they are shallow, or it can be seen from the rest of the chart that reefs or banks are present, such blanks should be regarded with suspicion. This is especially the case in coral regions and off rocky coasts, and it should be remembered that in waters where rocks abound it is always possible that a survey, however complete and detailed, may have failed to find every small patch.

A wide berth should therefore be given to every rocky shore or patch.

Fathom Lines a Caution.—Except in plans of harbours that have been surveyed in detail, the five-fathom line on most Admiralty charts is to be considered as a caution or danger line against unnecessarily approaching the shore or bank within that line, on account of the possibility of the existence of undiscovered inequalities of the bottom, which nothing but an elaborate detailed survey could reveal. In general surveys of coasts or of little-frequented anchorages, the time required for such a detailed examination does not permit of its execution, nor do the necessities of the case demand it.

The ten-fathom line is, on rocky shores, another warning, especially for ships of heavy draught.

Charts where no fathom lines are marked must be especially regarded with caution, as it generally means that soundings were too scanty and the bottom too uneven to enable them to be drawn with accuracy.

Distortion of Printed Charts.—The paper on which charts are printed has to be damped. On drying distortion takes place, from the inequalities in the paper, which greatly varies with different paper and the amount of the original damping; but it does not affect navigation. It must not be expected that accurate series of angles taken to different points will always exactly agree, when carefully plotted upon the chart, especially if the lines to objects be long. The larger the chart the greater the amount of this distortion.

Chart on largest scale always to be used.—It sometimes happens that, from press of work, only the copper plate of the larger scale chart of a particular locality can at once receive any extensive re-arrangement of coastline or soundings. This is an additional reason, besides the obvious one of the greater detail shown on a larger scale chart, why this largest scale chart should always be used for navigating.

Caution in using small Scale Charts.—In approaching the land or dangerous banks, regard must always be had to the scale of the chart used. A small error in laying down a position means only yards on a large scale chart, whereas on a small scale the same amount of displacement means large fractions of a mile. This is particularly to be observed when coming to an anchor on a narrow ledge of convenient depth at some distance from the shore.

For the same reason bearings to objects near should be used in preference to objects farther off, although the latter may be more

prominent, as a small error in bearing or in laying it down on the chart has a greater effect in misplacing the position the longer the line to be drawn.

Lights.—All the distances given in the Light Lists and on the charts for the visibility of lights are calculated for a height of an observer's eye of 15 feet. The table in the Light List affords a means of ascertaining how much more or less the light is visible should the height of the bridge be more or less. The glare of a powerful light is often seen far beyond the limit of visibility of the actual rays of the light, but this must not be confounded with the true range. Again, refraction may often cause a light to be seen farther than under ordinary circumstances.

When looking out for a light at night, the fact is often forgotten that from aloft the range of vision is much increased. By noting a star immediately over the light a very correct bearing may be afterwards obtained from the standard compass.

Fog Signals.—Sound is conveyed in a very capricious way through the atmosphere. Apart from wind, large areas of silence have been found in different directions and at different distances from the origin of a sound, even in clear weather. Therefore too much confidence should not be felt in hearing a fog signal. The apparatus, moreover, for sounding the signal often requires some time before it is in readiness to act. A fog often creeps imperceptibly towards the land, and is not observed by the people at a lighthouse until it is upon them; whereas a ship may have been for many hours in it, and approaching the land. In such a case no signal may be sounded. Taken together, these facts should induce the utmost caution in closing the land in fogs. The lead is generally the only safe guide.

When sound has to travel against the wind, it may be thrown upwards; in such a case, a man aloft might hear it when it is inaudible on deck.

Tides and Tidal Streams.—In navigating coasts where the tidal range is considerable, caution is always necessary. It should be remembered that there are indraughts to all bays and bights, although the general run of the stream may be parallel to the shore.

The turn of the tidal stream off shore is seldom coincident with the time of high and low water on the shore. In open channels, the tidal stream ordinarily overruns the turn of the vertical movement of the tide by three hours, forming what is usually known as tide and half-tide, the effect of which is that at high and low water by the shore the stream is running at its greatest velocity.

In crossing a bar or shallow flats, the table (B) at page 98 of the Tide Tables will be found of great assistance in calculating how much the water has risen or fallen at any hour of the tide.

On coasts where there is much diurnal inequality in the tides, the amount of rise and fall can never be depended upon, and additional caution is necessary.

It should also be remembered that at times the tide falls below the level of low-water ordinary springs. This always occurs in temperate regions at the equinoxes, but wind may produce it at any time, and the amount varies with locality. When the moon's perigee coincides with the full or new moon the same effect is often produced.

Fixing Position.—The most accurate method of fixing a position relative to the shore is by angles between well-defined objects on the chart. All ships are now being supplied with a station pointer, and this method should be used whenever possible.

Two things are, however, necessary to its successful employment. First, that the objects be well chosen; and second, that the observer is skilful and rapid in his use of the sextant.

For the former, reference can be had to the pamphlet on the use of the station pointer, which is in every chart box.

The latter is only to be obtained by practice.

It will readily be seen that in war time, when the compass may be knocked away, or rifle-fire may make it undesirable to expose the person more than necessary, a sextant offers great advantages, as angles can be obtained from any position whence the objects are visible. It is this contingency that makes it especially desirable that all navigating officers should become expert in this method of fixing a ship's position.

In many narrow waters also, where the objects may yet be at some distance, as in coral harbours or narrow passages among mud banks, navigation by sextant and station-pointer is invaluable, as a true position can only be obtained by its means. A small error in either taking or plotting a bearing under such circumstances may put the ship ashore.

It is not intended that the use of the compass to fix the ship should be given up; there are many circumstances in which it may be usefully employed, but errors more readily creep into a position so fixed.

In all cases where great accuracy of position is desired, angles should invariably be used, such as the fixing of a rock or shoal, or of additions to a chart, as fresh soundings or new buildings. In all such cases angles should be taken to several objects, the more the better, but five objects is a good number, as the four angles thus obtained not only prevent any errors, but they at once furnish a means of checking the accuracy of the chart itself. In the case of ordinary soundings, it is only necessary to take a third angle now and then; firstly, to check the general accuracy of the chart as above stated; secondly, to make certain that the more important soundings, as at the end of a line, are correctly placed.

Sometimes, when only two objects are visible, a compass bearing and sextant angle may be used with advantage.

In passing near a point of land, or an island, the method of fixing by doubling the angle on the bow is invaluable. The ordinary form of it, the so-called "four-point bearing," when the bearing is taken four points on the bow, and on the beam, the distance from the object at the latter position being the distance run between the times of taking the two bearings, gives an excellent fix for a departure, but does not ensure safety, as the point, and probably the rocks off it, are abeam before the position is obtained.

By taking the bearings of two points and four points on the bow, a very good position is obtained before the object is passed; the distance of the latter at the second position being, as before, equal to the distance run in the interval.

The use of a danger angle in passing outlying rocks with land behind should also not be forgotten. In employing this method, however, caution is necessary, as should the chart be not accurate, *i.e.*, should the objects selected be not quite correctly placed, the angle taken off from it may not serve the purpose. It should not, therefore, be employed when the survey is old or manifestly imperfect.

In fixing by the compass, it must always be remembered that two bearings only are liable to error. An absolute error may be made in either bearing observed; errors may be made in applying the deviation; or errors may creep in in laying them on to the chart. For these reasons, a third or check bearing of some other object, should be taken, especially when near the shore or dangers. The coincidence of these three lines will prevent any mistakes.

The tripod now supplied to all ships to hold the lamp over the standard compass will be found of great service in fixing position at night, as by its aid a bearing can be as accurately taken as in

daylight. Its use in connection with ascertaining the change of bearing of an approaching ship's light should not be forgotten.

Amongst astronomical methods of fixing a ship's position, attention is drawn to the great utility of Sumner's method. A Sumner line, that is, a line drawn through the position (obtained by an assumed latitude and longitude by chronometer) at right angles to the bearing of the sun, as obtained from the azimuth tables, gives at times invaluable information, as the ship must be somewhere on that line. A deep cast at the same time may often serve to get an approximate position on the line. An early and very accurate position can be also obtained by Sumner's method, by getting longitude by a bright star at daylight when the horizon is well visible, and another longitude by the sun when a few degrees above the horizon. The Sumner lines drawn through the two positions thus obtained will, if the bearing of sun and star differ three points or more, give an excellent result.

Current Arrows on charts only show the most usual or the mean direction of a tidal stream or current. It must never be assumed that the direction of a stream will not vary from that indicated by the arrow. In the same manner, the rate of a stream constantly varies with circumstances, and the rate given on the chart is merely the mean of those found during the survey, possibly from very few observations.

Change of Variation of the Compass.—The gradual change in the variation must not be forgotten in laying down positions by bearing on charts. The magnetic compasses placed on the charts for the purpose of facilitating plotting become in time slightly in error, and in some cases, such as with small scales, or when the lines are long, the displacement of position from neglect of this change, may be of importance. The compasses are re-engraved when the error amounts to a quarter of a point, but the chart plates cannot be corrected more frequently from the impossibility of making alterations too often on one spot in a copper plate.

The geographical change in the variation is in some parts of the world sufficiently rapid to need consideration. For instance, in approaching Halifax from Newfoundland the variation changes 10° in less than 500 miles. The variation chart should be consulted on this head.

For later information respecting the lights which are described in the China Sea Directory, Vol. I, seamen should consult the Admiralty List of Lights in South Africa, East Indies, China, &c. This Light List is published early in the current year, corrected to the preceding 31st December.

THE CHINA SEA DIRECTORY.

VOL. I.

CHAPTER I. MALACCA STRAIT.

VARIATION 2° 30' East in 1886.

GENERAL REMARKS.—Malacca strait may be considered as limited on the north-west by a line joining Achi (Acheen) head and Salang or Junkseylon island, and on the south-east by a line joining Carimon islands and Tanjong Bulus, at the western entrance of Singapore strait. Within these limits Malacca strait is 550 miles long, in a general south-easterly direction.*

The navigable channel is of considerable width at the north-western part. Abreast Penang it is 120 miles wide, and gradually decreases in width until Aroa islands and North Sands are approached. Here commences a series of long and narrow shoal banks, which extend nearly through the centre of the strait in a north-west and south-east direction, and with little intermission to the south-eastern end of the strait; these narrow the available channel in some parts to 8 or 10 miles. Both shores of the strait are fringed with shallow mud-banks, which on the Sumatra side extend seaward in some places a distance of 18 miles, but from the Malayan side much less; these banks, together with those in the offing, are, as a general rule, steep-to. There are also several detached groups of islands.

The western or Sumatra side of the strait is an alluvial plain, generally only a few feet above the level of the sea, and varying in extent from 60 to 100 miles from the mountain ranges of Sumatra: the low coast is unbroken by any large bays, but forms near the narrowest part of the strait a range of low islands. The coast is intersected by numerous rivers.†

The eastern or Malayan side of the strait is for the most part low and wooded near the coast. A mountain chain traverses the Malay peninsula, and here and there isolated mountains are found within a

* See Admiralty chart: Indian Ocean, northern part, No. 748b., also Index chart.

† For the general description of Sumatra island, see page 10.

few miles of the coast. This chain diminishes in height as it approaches the equator—many of the peaks north of Queda (lat. 6° N.) rise to an elevation of 6,000 feet, while few in the southern part of the peninsula rise above 3,000 feet. Between the mountains and the coast the surface is undulating, covered with dense primeval forest, or interspersed with grassy plains, which are more numerous and extensive in the north.

Many rivers empty themselves upon the Malay coast, and in their progress form marshes and lakes, some of which are of considerable size. The banks of the rivers are generally low and swampy, and covered with mangrove and other thickets. Several of the rivers are broad and moderately deep, but all are barred by banks, which, as a general rule, prevent a vessel drawing more than 8 or 9 feet entering. In the northern part numerous islets stud the coast.

British Settlements.—Part of the Malay coast is occupied by British settlements, namely, Province Wellesley, a strip of coast about 8 miles broad and 35 miles long, adjacent to Pulo Penang (also a British settlement): Pulo Pangkor or Dinding island and the adjacent coast—commencing at Pulo Katta, this strip is 22 miles long in a northerly direction, and 8 miles broad—and the settlement of Malacca, about 40 miles in length and 25 miles in breadth, included on the sea coast between the rivers Lingey and Moar. In addition, the native states of Perak, Selangor, and Sungai Ujong, which occupy the whole coast line between Province Wellesley and Malacca, are under British protection. The ports are all free. For statistics, *see* pages 119–121.

WINDS and WEATHER. — Although Malacca strait is within the limits of the north-east and south-west monsoons of the Indian ocean, yet on account of the high land on either side of the strait the winds are variable; but land and sea breezes are regular on both coasts. In the offing, the monsoons are only regular when they are at their height in the adjacent seas; even then, however, the wind is moderate in the strait and only lasts during a part of the day. The monsoons become more regular near Singapore.*

South-west Monsoon. — Near Achi head the south-west monsoon commences in the latter part of April or early part of May, and ceases in October; but in November westerly winds frequently prevail.

The south-west monsoon seldom blows far into the strait. In the middle of the strait during this season, variable winds, chiefly those from S.E. and S.W., prevail with long calms. On the Sumatra side light winds and calms prevail, and heavy squalls from the land are experienced during the

* See the Admiralty Wind and Current charts for the Pacific, Atlantic, and Indian oceans, corrected to 1879.

night. On the **Malayan** side there are fewer calms and seldom any squalls; variable winds or land and sea breezes are experienced.

Rain.—During the S.W. monsoon, the weather is generally cloudy and stormy accompanied with rain, especially in July and August, when the monsoon is at its height.

Sumatras, or squalls from the south-west, are more common during the south-west monsoon than in the north-east monsoon. They generally blow during the first part of the night, are sometimes sudden and severe, and are accompanied by thunder, lightning, and rain; they are more frequently met with on the Pedir coast (Sumatra), and on the Malay coast between Parcelar hill and Carimon islands. Here they often blow for six or eight hours at a time as a strong or moderate gale.

North-westers are not so frequently felt as the Sumatras; they are most common during the south-west monsoon and in the north-western part of the strait between Achi head and Aroa islands, but sometimes blow through as far as Singapore strait. These winds are sometimes severe at their commencement, but their strength soon abates. They are generally preceded by a black cloud arch, which rises rapidly from the horizon towards the zenith, often allowing not more than sufficient time to reduce sail after its first appearance. They are sometimes accompanied by lightning, thunder, and heavy rain.

The North-east Monsoon prevails in the western entrance of Malacca strait from November to April, which is the fair season, the weather being then more settled; there are seldom any hard squalls, and there is less thunder, lightning, and rain than in the other season.

In November the winds are variable, frequently from N.W. and West, (extending from as far westward as Ceylon,) although occasionally the N.E. winds set in regularly in November. From this period to March the north-east monsoon is strongest, but at times N.W. and West winds of one or two days duration have been experienced in every month when the north-east monsoon should prevail. Late in March the N.E. and northerly winds become light and variable, with strong land breezes at night. On the Malayan side these breezes commence between 8 and 10 p.m., and last four or five hours, sometimes all night; this is more generally the case between mount Formosa and cape Rachada. There is less calm on the Malayan than on the Sumatra side of the strait.

Cyclones.—Malacca strait is free from cyclones, but in the months of April, May, October, and November vessels crossing the Bay of Bengal and Arabian sea are liable to fall in with them. See Remarks on Revolving Storms, published by the Admiralty, 1883.

CURRENTS and TIDES.—In the approach to Malacca strait, between Achi head and Nicobar islands, the current generally runs with

the wind. This, however, is not always the case, for at times the current is found to run obliquely and even contrary to the wind.*

Between the western entrance of Malacca strait and Aroa islands the general set of the current is to the north-west all the year round, but near the Malay coast regular tides mostly prevail, except occasionally during the north-east monsoon, when the current sets to the south-east along the Malay coast. During the south-west monsoon the current runs to the westward along the coast of Pedir, whilst it is setting to the north-eastward between Pulo Rondo and Salang (Junkseylon) island; at times, when the monsoon is light, and veers to the westward, the current between Pulo Rondo and Juukseylon sets to the southward. Between Diamond point and the eastern entrance of the strait a tidal influence prevails close inshore.

From Aroa islands to Carimon islands regular tides prevail throughout the strait; the flood sets to the south-east, and the ebb to the north-west, from 2 to 3½ miles an hour; the ebb running longer and stronger than the flood. Near Aroa islands the flood is often weak, and during neaps there is a constant current setting north-westward.

Near cape Rachada, where the strait suddenly becomes narrowed to 20 miles, the tides run strong, and with eddies during springs. In the offing between Water islands and Carimon islands the tides set fair through the strait, except near Pulo Pisang, when the flood sometimes sets a vessel towards Carimon islands.

The flood setting south-eastward past Carimon islands, meets the flood setting from the China sea through Singapore strait, between the north end of Little Carimon and Tree island; after this junction the flood usually sets to the southward through Durian strait, but sometimes to the northward towards Old Strait. See page 107.

In most parts of Malacca strait the streams run from 2 to 3 hours after high and low water by the shore. The greatest rise and fall is 15 feet.

GENERAL DIRECTIONS.—The navigation of Malacca strait is, with ordinary caution, not dangerous, the channels are mostly spacious and have good anchorage, but due attention to the set of the currents and tides is requisite. The sailing passage is much facilitated by keeping under way at night, for steady breezes then often prevail, calms and faint airs being experienced during the day; passages are thus made without anchoring more than once or twice. The passage to the north-west is generally made in less time than the one to the south-east. Vessels which

* In July and August, a south-westerly current running in the teeth of the monsoon at the rate of one to two knots per hour, between Achi head and Great Nicobar, has been reported by several vessels. H.M.S. *Rifeman* in August 1878, experienced a set of 2 knots an hour, the wind being S.E., and with a force of 2 to 3.

sail well, will, by taking every advantage of the favourable shifts of wind, gain ground during neaps against the tide or current, with a moderate working wind, except in the narrow parts, where the tide runs strong. A stream anchor ready for tidal use will be found convenient in most parts of the strait.

DIRECTIONS FOR PROCEEDING EASTWARD.

Direct track.—**Steam vessels** from the westward, in either monsoon, should first sight Pulo Rondo, 426 feet high, or Pulo Brasse light off Achi head, visible in clear weather about 30 miles; thence steering to pass between Diamond point and Pulo Pera. (Pulo Pera is an islet 394 feet high, steep to, and lies directly in the fairway of vessels coming from the northward, and is often the first land seen by those entering the strait in the thick weather of the south-west monsoon period.) From Pulo Pera, course should be steered for Pulo Jarra, distant 125 miles, also high and steep-to; thence to pass midway between Aroa islands, and North Sands and One-fathom bank, a further distance of about 65 miles. Having passed One-fathom bank, vessels should approach the coast in the vicinity of Parcelar hill to a distance of 6 or 7 miles, to depths of 17 to 20 fathoms. When abreast of the hill steer to pass 5 miles outside cape Rachada, which in the distance appears like an island. Cape Rachada light is visible 26 miles, and should be approached between the bearings of E. $\frac{1}{2}$ S. and S.E. by E. $\frac{1}{2}$ E. From cape Rachada steer to pass 4 or 5 miles outside Pulo Undan light, visible 20 miles, on the outer Water island, and in soundings of 20 to 26 fathoms; this course will lead 7 miles north-eastward of Raleigh shoal, and about 10 miles north-eastward of Rob Roy bank. From Water islands steer to pass 5 miles outside Formosa bank light vessel, between Long and Fair channel banks; thence 5 miles outside Pulo Pisang light and through Singapore strait, passing northward of Tree island. See p. 107.

S.W. Monsoon.—Sailing vessels from Ceylon during the south-west monsoon should steer so as to pass between Pulo Rondo and the south end of Great Nicobar island, carefully taking every opportunity of verifying their position, as the currents during this season are strong and uncertain. Vessels set to the southward, which is not an uncommon occurrence when there is much westing in the monsoon, may pass between Achi islands, by one of the passages herein-after mentioned, but with a steady and commanding breeze Bengal passage is the best.

Vessels bound to Achi should in this season keep well to the southward to make Achi head, thence proceeding through Surat, or Cedar passage (see page 14).

When to the eastward of Pulo Wai the monsoon will most likely fail, but vessels should endeavour, by the aid of the variable winds, to sight

Pulo Butong and then keep on the Malayan side of the channel, where, as already stated, a tidal influence prevails, and where there is less calm, but generally variable winds, or land and sea breezes. Sometimes a brisk westerly wind will be carried as far as Penang. When once the islands on the Malay coast are sighted there will be no difficulty in getting to the south-eastward.

In the entrance of Malacca strait near the Nicobar and Achi islands, and between them and Salang (Junkseylon), there are often strong and noisy rippings, particularly in the south-west monsoon. These rippings occur when there is no perceptible current, and in calm weather are seen approaching from a considerable distance; in the night their noise gives warning of their approach; the spray sometimes breaks on a vessel's deck.

After passing from 10 to 20 miles westward of Pulo Butong, and not being bound to Penang, a course should be steered to pass nearly midway between Sambalang islands and Pulo Jarra. With a working wind the west side of Penang may be approached to soundings of 10 or 12 fathoms; Great Kra flat and the bank which skirts the coast to Pulo Dinding, and extends seaward 10 or 12 miles, may be approached to the same depths, guarding against the indraft of the rivers on the flood tide when near the bank. Under 15 fathoms the water shoals rapidly to the edge of the bank. Sambalang islands and Pulo Jarra have deep water within a short distance, and may be seen from a distance of 20 miles. In this track soundings of 28 to 34 fathoms will have been found.

After passing Sambalang islands vessels should make for the North Sands and steer a course to pass 5 or 6 miles to the westward of the north extreme; the soundings will then decrease from 28 or 30 fathoms to 10 or 15 fathoms. In this depth during daylight, Aroa islands will probably be sighted. Round Aroa island, having trees on its summit, may be seen a distance of 15 miles, when, guided by the bearing of these islands and the soundings, the vessel may pass along the west side of the sands until One-fathom bank lighthouse be sighted, when course should be shaped to pass 2 miles westward of it.

When the winds incline from East or E.S.E., keep near the Malay coast in from 20 to 30 fathoms, until 25 or 30 miles past Sambalang islands, then steer more southerly to get soundings of 16 or 18 fathoms on the north-west edge of North Sands; keep in these soundings, rounding the edge to the south-west until Aroa islands and Parcelar hill are sighted; from the mast-head both may be seen when on the north-west edge of North Sands.

Working to the eastward in the north-west west part of Malacca strait, requires no special directions, (beyond those referred to in the sailing passage during south-west monsoon, *namely*, to make for the Malay coast and work along it), the strait being wide and clear, until the North sands

and Aroa islands are approached, and which are situated about 130 miles southward of Penang. When approaching the North Sands it is advisable to keep near their western edge, making short tacks and approaching the Sands to 10 or 11 fathoms. One-fathom bank light, which is visible 13 miles, may be brought to bear as far southward as S.E. by S., until within a distance of 4 miles, when this bearing is no longer available, as One-fathom bank with its outlying shoal-head of $4\frac{1}{2}$ fathoms extends $3\frac{1}{2}$ miles north-west of the light. By keeping near the edge of the sands more moderate depths will be found for anchoring, and more regular tides; to the westward a north-westerly current often prevails, especially during neaps. On the North Sands, during springs, the flood sets S.E. and the ebb N.W. at the rate of 3 to $3\frac{1}{2}$ miles an hour, and run two or three hours after the times of high and low water. During neaps the tides are weak and irregular. Caution is requisite in navigating this part. Vessels drawing less than 20 feet may work across the sands which lie between Blenheim shoal and One-fathom bank, by keeping Parcelar hill between the bearings of E.S.E. and E. $\frac{3}{4}$ S., bearing in mind when near Blenheim shoal that the clearing mark is 30 miles distant.

When to windward of One-fathom bank, vessels should stand over to the Malay coast, which in the neighbourhood of Parcelar hill may be approached to one or two miles, guarding against the indraught into Klang strait on the ebb; thence working down the coast and not standing farther off than 10 miles in order to give a berth to South Sands which are steep-to. North-eastward of Bambek shoal the shore may also be approached to one or 2 miles. Cape Rachada light, kept between the bearings of S.E. by E. $\frac{1}{2}$ E. and E. $\frac{1}{2}$ S. will lead clear of Bambek and Pyramid shoals.

After passing Water island and Rob Roy bank there may be said to be no danger in the channel, until Formosa bank, marked by a light vessel, is approached. Vessels may stand safely over towards the Sumatra shore to a distance of 15 or 16 miles from the Malay coast; by keeping the lead going, sufficient warning is given of approach to the mud-flat skirting the Malay coast. Pulo Benkalis is low and woody, and near Tanjong Parit, its north-east point, may be approached to 4 or 5 miles, the lead being here also, a sufficient guide when to tack.

Abreast Long bank the channel for large vessels is narrowed to 11 miles. If Pulo Pisang be seen, keep it between the bearings of E. by S. and S.E. by E. $\frac{1}{2}$ E. In standing towards the Malay coast, the soundings on Fair-channel bank are a good guide, and on a nearer approach to Pulo Pisang, vessels may, guided by the soundings on the ridges, stand farther over towards the Sumatra shore. From Pulo Pisang to Tanjong Bulus the channel is comparatively clear, and guided by the soundings vessels may safely approach either side, taking care to avoid the spit extending

5 miles south-east of Pulo Pisang, and which is steep-to. The mud bank between Pulo Cocob and Tanjong Bulus, entrance to Singapore strait, is also steep-to, and the shore should not be approached within $2\frac{1}{2}$ miles, or to a less depth than 17 fathoms. *Directions continued on page 108.*

N.E. Monsoon.—**Sailing vessels** from Ceylon are recommended to pass close to the south end of Great Nicobar island if the wind permit. Those from Madras should pass through Sombrero channel (Nicobar islands). When within the strait they should endeavour to get near the Malay coast as soon as possible, where there are tidal streams and more favourable winds. If necessary to work through, proceed as before directed. A heavy swell rolls on the Sumatra coast during the N.E. monsoon.

DIRECTIONS FOR PROCEEDING WESTWARD.

Steam vessels proceeding westward through Malacca strait, in either monsoon, should take the direct track, (*see page 5*) reversed; and when clear of the strait full powered vessels may make straight for the desired port.

Small powered steam vessels bound to Aden during the south-west monsoon will find it their interest to gain the equator as early as possible, without too great sacrifice of westing; say on a S.W. course, which course should be continued until in latitude 1° S. Then steer W. by S. to cross the meridian of long. 80° E. on the parallel of 3° S. From this position steer West until the long. of 60° E. be reached; then steer to cross the equator in about 56° E., and proceed for Ras Hafún, the east point of Africa. By keeping to the southward of the equator the strength of the current is lessened, and the vessel will pass through a large extent of calm. By recrossing the equator so far west the vessel will be in a favourable position to avail herself of both wind and current in entering the bad weather of the south-west monsoon.*

S.W. Monsoon.—**Sailing vessels** bound westward through Malacca strait during the south-west monsoon should, with a favourable wind, keep a mid-channel course until Aroa islands are passed, they should then keep a good offing from the Sumatra shore in order to avail themselves of the prevailing north-westerly current and to be out of the tidal influence eastward of Diamond point. From Diamond point to Achi head, the Pedir coast (north-coast of Sumatra) should be approached

* See Wind and Current charts for the Pacific, Atlantic, and Indian oceans, published by the Admiralty, corrected to 1879. See also p. 222 for proceeding to Red Sea from Sunda strait.

in order to benefit by the westerly current adjacent to it. Steer through Bengal passage, keeping close to the north-east side of Pulo Brasse. From a good berth off Achi islands, vessels must endeavour to cross the equator and pass into the region of the south-east trade wind, a westerly course should then be pursued until on the meridian of the intended port, then a north course may be followed, making the land to the westward of Point de Galle, if bound there, for strong westerly winds and easterly currents prevail along the south coast of Ceylon during the south-west monsoon. If bound to Aden continue in the south-east trade, passing north-eastward of the Seychelles; thence to Ras Asir.

Some vessels have made the passage from Achi head to Madras in fourteen or fifteen days during the strength of the south-west monsoon, by taking advantage of every favourable change of wind to obtain westing, and tacking as most convenient. This passage, however, may sometimes be found impracticable by those which sail indifferently by the wind.

N.E. Monsoon.—Vessels bound westward through Malacca strait during the N.E. monsoon usually experience favourable weather and a fair wind. They may pass on either side of Pulo Pera and borrow towards Pulo Rondo or towards the south end of Great Nicobar island as convenient. If bound to Point de Galle the land should be made to the northward of Little Basses.

If bound to Madras, or other part of the Coromandel coast, vessels should keep the Malay coast and its adjacent islands until Salang (Junkseylon) island is reached, which may be rounded at a convenient distance. Thence, if early in the season, a course should be steered to pass through Ten-degree channel, between Car-Nicobar and Little Andaman islands, or the Sombrero channel may be chosen at discretion if not bound to the northward of Madras. In December and January care must be taken to make the land a little to the northward of the intended port.

Caution when approaching Ras Asir.—As many large and valuable vessels have from time to time been wrecked with loss of life on the coast southward of Ras Asir (cape Guardafui), when bound round this headland from the south-eastward; seamen should use the utmost caution not only in making the land, but also in verifying the vessel's position by soundings, more especially at night or during the south-west monsoon, when the weather is hazy.

As soundings extend from 10 to 12 miles from the coast, the deep-sea lead should frequently be used, and the vessel's course altered to N. by E. or N. by E. $\frac{1}{2}$ E., or if necessary more to the eastward, immediately soundings are struck, or the land sighted in dark or hazy weather. By steering to the northward as above, and by not standing into less than 35 fathoms water, the vessel's safety will be ensured, and as the water rapidly

deepens northward of the parallel of the cape, the 100 fathoms line of soundings being only $2\frac{1}{2}$ miles from it, there will be no difficulty as to the time when the course should be again altered to W.N.W. During day a gradual change will probably be seen in the colour of the water from blue to dark green. Attention should also be paid to the alteration in the direction of the swell caused by the promontory of Ras Hafún; the water gets smoother and the swell alters its direction to the eastward of south, when the meridian of that cape is passed.

During the south-west monsoon; the current sets up the coast strong to the northward and close round the cape to the westward; but at a short distance off shore, the current continues its course to the northward and eastward.

These directions derived from experience extending over many years—cannot be too earnestly recommended to seamen.*

SUMATRA COAST.†

SUMATRA ISLAND.—General Description.—Sumatra was first visited in 1509 by the Portuguese; by the Dutch in 1600; and by the British two years afterwards. The latter continued to establish factories and form settlements in the island during the 17th century. These settlements were retained by the British until 1825, when they were ceded to the Dutch in exchange for Malacca.

Sumatra is about 960 miles long in a north-west and south-east direction, and its greatest breadth is about 220 miles. Its area is about 128,000 square miles; thus it is the largest of the islands of the Malay archipelago except Borneo, and is about three times the size of Java. The equator passes nearly through the centre of the island.

A chain of mountains extends the whole length of Sumatra, the ranges being in many parts, double and treble, but in general situated much nearer to the western than to the eastern coast. Some of the mountains rise to the height of 10,000 and 11,000 feet above the level of the sea; of these, five situated near the centre of the island, are volcanic. The great alluvial plain on the eastern side of the island, generally only a few feet above the level of the sea, is 600 miles in length and from 60 to 110 miles in width: this, with the rare exception of a few patches on the river banks, and usually beyond the reach of the tide, is covered with stupendous forest of primeval origin. The south-eastern extremity of the island is little better than a forest of mangrove growing out of a morass. The

* Directions for approaching this part of the coast of Africa, will be found in *Gulf of Aden Pilot*, and *Africa Pilot*, Part III.

† See Admiralty chart:—Achi (Acheen) head to Diamond point, No. 219; scale, $m = 0.2$ of an inch.

greater part of the island is a sterile or intractable wilderness, and considering its size the country is thinly populated.

The principal rivers of Sumatra are those on its eastern side. On the western coast there are many small rivers, but the only considerable stream is the Singkel. All the Sumatran rivers have bars of mud or sand at their mouths, which forbid their navigation by vessels of much draught, and the greater number of the rivers on the eastern coast are subject to the bore or tidal wave. The finest rivers of Sumatra are those of Siak and Palembang, on the east coast; these are navigable by vessels of considerable draught.

The Population of Sumatra, estimated at two and a half millions, consists of fifteen different nations speaking as many different languages. Six of these nations have made some progress in civilization, being possessed of the art of writing and of some of the mechanical arts. These are the Malays, the conquerors of the island, estimated at 900,000; the Achinese, at the north end of the island, 450,000; the Battahs, or Batak, 300,000; the Palembangs, 200,000; the Rejang, 70,000; and the Sarawi, 160,000; others, chiefly those living in the mountainous regions of the island, are but little removed from the savage state. The north end of the island belongs to the Rajah of Achi, the Batak nation next to the south-eastward, then the Siak state. The most civilized of the populations are of the Mahomedan religion.

The villages are invariably built on the banks of some river or lake, and consist of houses built chiefly of bamboo raised off the ground.

On the west side of the island the Dutch territories are divided into the Residentie van Tapanuli, the country of the Battahs, extending from 30 miles S.E. of Singkel to 18 miles southward of Natal, the residence of the governor being at Siboga in Tapanuli bay; the Residentie van Padang, extending from the above to lat. $2^{\circ} 29' S.$, the chief place of the Dutch possessions being Padang, in lat. $0^{\circ} 58' S.$; and the territory round Benkulen, the resident of which occupies fort Marlborough.

The Climate is very unhealthy. The principal scourge is tropical fever, which never ceases to work havoc among Europeans and natives alike; the attacks are sudden, lasting about a week, and sometimes fatal. Outbreaks of cholera occur at times, as in all other places in the East. It is necessary therefore to use every precaution to preserve the health of the crew, should any stay be made on the coast. Landing, or sleeping on shore, or on deck at night, should be avoided. The water from ponds or wells near the shore is very bad, and running water should be procured if possible.

Produce.—Buffaloes are the most important live stock. The breed of horses is small, but well-made and hardy. Sheep also are small. The hog and goat are both domestic and wild. Elephants, and many species of

deer abound. Tigers, rhinoceroses, hippopotami, ourang-outangs, and bears are met with, besides other animals in great variety.

Sumatra has been in all ages famous for gold, which with copper, iron, sulphur, saltpetre, coal of indifferent quality, and naphtha appear to be the chief mineral products. Among the vegetable products the most important is pepper, the average product of which in 1883, amounted to 122,000 piculs (of $133\frac{1}{3}$ lbs.); the principal pepper ports being on the west coast. The camphor tree grows in the north-west of Sumatra, but not south of the parallel of 3° N. Rice is the chief species of grain grown. Sago is common in Sumatra, and is occasionally used as food, though not an article of general use; millet is cultivated in small quantities. The cocoa-nut, betel, bamboo, sugar cane, various palms, and an abundance of tropical fruits, are indigenous. Ratan producing dragons blood is peculiar to Sumatra.

The articles of export are coral, pepper, rice, camphor, and other native products. The imports are chiefly Indian piece goods, salt, silks, opium, coarse porcelain, gold thread, striped cottons, weapons, metals, hardware, utlery, and broad cloth.

PULO RONDO, or Tepurong, is the northernmost of the islands lying off Achi head, the north-west point of Sumatra, distant about 30 miles. The island is 426 feet high, dark-coloured, 2 cables in diameter, and steep-to; rocky islets from 60 to 120 feet high, extend to the distance of one mile from its south side.

PULO BRASSE, north-west end, lying 20 miles S. by W. $\frac{1}{2}$ W. from Pulo Rondo, is the westernmost of the islands off Achi head; it is $9\frac{1}{2}$ miles long in a north-west and south-east direction, high and level. Off the north end are four rocky islets, the northern (N.W. islet) is 25 feet high and about $3\frac{1}{2}$ miles distant, with soundings of 25 to 28 fathoms within one mile. The other islets lie within $1\frac{1}{4}$ miles of Pulo Brasse, and the sea breaks heavily on them even in moderate weather. There is a passage between the N.W. islet and the three inner islets, but vessels are recommended to pass outside.

Soundings of 15 to 20 fathoms, sand, will be found within one mile of the north-east and south sides of Pulo Brasse, where vessels may occasionally anchor.

Fleurs rock, a small rock having a depth of about 6 feet, lies about $1\frac{1}{2}$ miles from the west point of Pulo Brasse, and nearly in line with two small rocks above water off the north point of that island. The water in the vicinity of the rock is discoloured, and breaks when there is any wind.

LIGHTS.—On the north-east point of Pulo Brasse stands a tower, 120 feet high, which is painted white to a height of 98 feet and red the remainder; from the tower is exhibited at an elevation of 525 feet above

the level of the sea a *revolving* white light which attains its greatest brilliancy *every minute*; the light is visible between the bearings of E. $\frac{3}{4}$ N. (through south and west) and N.W. $\frac{1}{2}$ W., and in clear weather should be seen from a distance of 30 miles; within a distance of 12 miles a faint continuous light is seen. North-eastward of Pulo Wai the light is obscured by that island.

From the same tower, at a height of 26 feet above the ground, and 430 feet above the sea, is exhibited a *fixed red* light visible between the bearings of S. by E. $\frac{1}{2}$ E. and E. by N. $\frac{1}{2}$ N., or over N.W. islet; the light is intended to warn vessels of their approach to this islet, and in clear weather is visible from a distance of 8 to 12 miles.

The lighthouse is considered to be in lat. $5^{\circ} 45' N.$, long. $95^{\circ} 4\frac{1}{4}' E.$

Lembalei bay, on the north-east side of Pulo Brasse, is about $1\frac{1}{2}$ miles broad, half a mile deep, and has 19 fathoms water in the entrance, thence shoaling gradually to the shore. There is anchorage in the north-west part in 9 fathoms, 3 cables distant from the village.*

Coal may be obtained here from the Dutch Government depôt. It is brought alongside in lighters. During the N.E. monsoon a heavy sea sometimes sets into the bay, which renders it doubtful as to the time a vessel may have to wait to fill up with coal.

PULO NANCI (Nassie), nearly joins the south-east point of Pulo Brasse, being separated by a narrow rocky channel of irregular depth, and in which the tides run with great strength. Pulo Nanci is saddle-shaped, and about 4 miles long north and south. About one mile S.S.W. from the south-west point is a rock which breaks at half tide, and between the rock and the shore there are depths of 10 to 12 fathoms, outside there is 16 fathoms. From the rock the south extreme of Middle island is in line with the northern of the small islets south of Middle island, bearing W.N.W. About $2\frac{1}{2}$ miles eastward of this rock and about half-a-mile off shore is a rock of 3 feet depth, with 6 and 8 fathoms close-to. From this rock, the south extreme of the islet off the west end of Stony islet is in line with a red mark in the cliff near King point. The south-east point of Pulo Nanci is skirted by rocks.

There is anchorage in 6 or 7 fathoms in the bay on the south side of Pulo Nanci island, about one mile eastward of the west point. Fresh water and firewood may be procured on the west side of the bay.

Rots bay, on the north-east side of Pulo Nanci, is about 4 cables broad and 4 cables deep. Off the south point of the bay is Rots island, small and nearly circular. There is anchorage in Rots bay in 6 fathoms at 3 cables from the shore.*

* See plan on Admiralty chart, No. 219; scale, $m = 3$ inches.

Middle island, or Pulo Nassie Kechil, lies off the south side of Pulo Brasse, between the latter and Pulo Nanci; off the south side of Middle island, one mile distant, is a group of small islets, with from 9 to 12 fathoms water between them and Pulo Nanci.

Pulo Gomez (Klappa) is about 2 miles in length, and lies between Cedar and Surat passages. Its western point is low, and breakers extend about half-a-mile to the westward of it. The south side of Pulo Gomez is safe to approach.

CEDAR PASSAGE (Sawang Harus Besar) is formed between Pulo Nanci island on the north, and Pulo Gomez and Stony island on the south. The channel which lies to the southward of the rocks off Pulo Nanci is about one mile wide at its narrowest part, and has from 15 to 20 fathoms water.

Cedar passage is much wider than Surat passage, more free from eddies, and safer for a vessel proceeding to the westward with a foul wind, as she can drift with the tide under sail, taking care to avoid the rocks off Pulo Nanci. Stony island may be approached on its north-west side to within a quarter of a cable.

A patch of $4\frac{1}{2}$ fathoms lie midway between Stony island and Pulo Gomez.*

SURAT PASSAGE (Sawang Harus Kechil) is formed by Pulo Gomez (Klappa), Stony island, and Pulo Angkasa on the north-west, and the promontory of Achi on the south-east. Between Pulo Angkasa and Achi head at the eastern end, the passage is only 150 yards wide, but has from 12 to 14 fathoms water. Between Pulo Gomez and the mainland the passage is $1\frac{1}{2}$ miles wide with 12 to 16 fathoms water. Near the east side of Pulo Gomez there is a rock one cable distant from the shore.†

Directions.—In approaching Surat passage from the south-west no opening is perceived, the adjacent islands Gomez, Nanci, and Brasse appearing to join the mainland when seen from that direction. South-eastward of King point, at the distance of 5 miles, and on the south side of a low green point there is a sandy bay, named Krang Baba, which at a considerable distance may be mistaken for Surat passage, the adjacent land being low near the sea, and covered with trees.

* The rocky patch of 4 fathoms formerly shown on the charts, W. by S. distant 8 miles from the west end of Pulo Gomez island, and the narrow ridge of soundings of 7 to 10 fathoms (and possibly less), reported to extend 40 miles in a S. by E. $\frac{1}{2}$ E. direction from it, are said not to exist.

† See also plan of Surat passage on Admiralty chart, No. 2,760 (similar to that on chart No. 219).

Steering for Surat passage, vessels should keep nearer to Achi head than to the opposite side of the channel, as Achi head is bold, with regular soundings of 12 to 14 fathoms, sand, at a moderate distance, and temporary anchorage may be found near the shore in from 7 to 10 fathoms. The south side of Pulo Gomez island is also safe to approach, there being 18 fathoms within half a mile of its south point. If the tide be unfavourable the vessel should anchor near Achi head until the flood stream makes; the flood sets north-eastward directly through the passage, the ebb in the opposite direction at the rate of 5 to 7 miles an hour at springs in the narrowest part of the passage; the eddies caused by the rapid tides render steering in this part very difficult for sailing vessels during light winds, and for large vessels is attended with some risk.

PULO WAI, the north-easternmost and largest of the islands off Achi head, lies about 13 miles north-east of the head and 10 miles south-east of Pulo Rondo. Pulo Wai is about 11 miles long, from 2 to 6 miles broad, and high and mountainous; the summit being 1,360 feet above the sea may be seen from a distance of 36 miles in clear weather. Its south side is steep-to in most places, there being no change in colour from the deep ocean blue of the water at 2 cables from the shore, but at other parts of the south side there are soundings near the shore. Berduri rock, dry at low water, lies about half a mile distant from the south point, with a depth of 13 fathoms in the channel between; vessels should pass outside the rock.

In Balohan bay, about one mile deep on the south-east side of the island, there are depths from 20 to 60 fathoms, sand, where possibly anchorage may be obtained. Fresh water may be procured at the head of the bay near a sandy beach. There is a sulphur mine in the vicinity.

Coal.—In Prialaut bay on the north side of the island, there is a land-locked harbour, with anchorage in 12 fathoms. It is proposed to establish a coaling station there.*

Pulo Wai is under cultivation, and there are said to be 300 or 400 inhabitants on the island.

Bengal Passage, formed between Pulo Brasse and Pulo Wai, is about 11 miles wide, and convenient for vessels sailing from Achi head to the north-westward, as the current generally sets out in that direction, but vessels bound into Achi road seldom proceed through Bengal passage unless with a steady commanding breeze, there being no anchorage in the passage except near Pulo Brasse. During the south-west monsoon the current sets round Pulo Brasse to the westward frequently at the rate of one to 2 miles an hour.

* Navigating Lieutenant Pritchard, H.M.S. *Fly*, 1883.

ACHI (ACHEEN) HEAD is a bluff promontory, 1,675 feet high, forming the north-west extremity of Sumatra. At a considerable distance Achi head appears like a steep hill, Pulo Gomez then resembles two paps, its western point being very low.

King point (Ujong Rajah) is the south-west extremity of the promontory of Achi head, and lies about 3 miles to the south-west of the head.

Tides.—It is high water, full and change, at 10h. ; springs rise 5 feet, neaps 3½ feet.

ACHI (ACHEEN) BAY and RIVER.—Achi bay is formed between the eastern part of Achi head and the entrance of Achi river. The shores are low and wooded and skirted by a bank on which depths of 5 fathoms are found at about 5 cables from the shore. In the western part of the bay is Pulo Tuan, a small island joined to Achi head by a rocky ridge 6 cables long.*

It is contemplated to connect Pulo Tuan with the shore, by a causeway, to form a harbour for Oléhleh.

Achi river falls into the sea by several mouths, separating the low country into islands, which are inundated during the rainy season. The principal mouth, situated about 5 miles to the eastward of Achi head, is about 100 yards wide, and has a depth of one foot on the bar at low water, and 6 feet at high water.

There is a pyramid beacon on the west point of entrance to the river, and a remarkable tree on the shore at 1½ miles eastward of the flagstaff at Oléhleh.

Anchorage.—The usual anchorage, is off the town of Oléhleh, in from 4½ to 5 fathoms, at about half a mile off shore. The holding ground is bad.

The anchorage off Achi river is in from 7 to 9 fathoms, with the entrance bearing from S. ½ E. to S.S.E., distant one mile. During the south-west monsoon, which prevails from May to October, a good scope of cable is necessary in these anchorages as the squalls are severe. During the north-east monsoon the winds are seldom strong, but N.W. winds sometimes blow with great force through Bengal passage, and render the anchorage insecure. Land and sea breezes often blow during both seasons, but the land breezes do not extend beyond the islands. The bay is infested with sharks.

Towns.—Kotta Rajah, the Dutch capital of Achi, is situated on both banks of Achi river, and connected by a wooden bridge, situated about 3 miles from the entrance. The Dutch governor resides here.

* See plan of Achi bay and river on Admiralty chart No. 219 ; scale, $m = 2$ inches.

Oléhleh, situated on the shore of Achi bay, is connected with Kotta Rajah by a railway $3\frac{1}{2}$ miles in length, and which further extends to Lambaru, the Dutch advance post 3 miles beyond Kotta Rajah. The British consul resides at Oléhleh. There are three landing piers.

Supplies.—Fresh beef, poultry, vegetables, bread and water, are to be obtained, and fruit when in season.

Coal.—There is no coal at Oléhleh, but it may be obtained from the Government dépôt at Lembalei bay, Pulo Brasse, about 15 miles distant, where it is brought alongside in lighters.

Trade.—The exports are pepper, betel nuts, gutta percha and other gums, rattans, and cocoa-nuts. The imports are cattle (from India), haberdashery, and all descriptions of provisions. Most of the exports and imports on the north coast are collected and distributed at Oléhleh.

In 1883, the exports, principally pepper and betel nuts, amounted to 31,000*l.*; the imports to 265,000*l.*, a large portion of the latter being for the Dutch troops stationed there.

For the northern ports of Achi; the exports and imports for Segli (about 50 miles eastward of Oléhleh) were 45,000*l.* and 54,000*l.*; Salamanga, 5,600*l.* and 13,000*l.*; and Telok Samoi, 35,000*l.* and 35,000*l.*; conducted principally by schooners.

Shipping.—In 1884, 189 Dutch steamers visited Oléhleh, and 14 English; 19 sailing vessels also entered and cleared.

In 1883, the number of English steamers was 130; the falling off being caused by an order to convey all Government goods in Dutch vessels.

A monthly steamer has taken the place of the former weekly one to Penang.

MALACCA PASSAGE formed between Pulo Wai and the Sumatra coast, is 7 miles broad, and the best channel when approaching Achi from the northward.

Pulo Buru (Malor island) is situated in Malacca passage at about $2\frac{1}{2}$ miles from the Sumatra coast. The islet is fringed by a reef to the distance of about 3 cables, beyond which there are no dangers.

Light.—A *fixed* white light is exhibited on Pulo Buru from an iron standard, 62 feet above high water, visible in clear weather from a distance of 10 miles.

The PEDIR COAST extends from Pedro point in a general E. by S. direction for about 120 miles to Diamond point, its eastern boundary. This coast is low in several places close to the sea, but the country a little inland is all very high.

During the months of December, February, and part of March, the weather is generally fine, with little or no rain, the winds varying from N.E. to E.S.E. and S.E., and the thermometer ranging from 79° to 82°.

It may be generally remarked during this season that if the canoes are not seen out fishing before 7 or 8 a.m. that a fresh breeze may be expected during the day.

Supplies.—The villages along the coast are small, generally containing sixty to eighty huts, which are constructed of bamboos and mats. The men are mostly well dressed, and carry a knife, or kris, in their waist. They are not to be trusted much if any temptation be in the way. Great numbers of the natives go out daily to fish, and the entrances to the different creeks leading to the villages, which are not perceptible from the anchorage, may be found by observing the canoes enter on their return from fishing.

On this part of the coast, supplies, such as fowls, eggs, and fruit, are scarce, but goats may be procured. Large herds of cattle may be seen grazing on the plain, but the natives have an objection to part with them.

Water.—Fresh water may be procured in most of the creeks between Sawang, Enjung creek, and Telok Samoi, but to the westward of Sawang the creeks are all salt water.

Pedro Point (Tanjong Batu), the north point of Sumatra, is situated 13 miles E.N.E. from Achi head, and may be approached to a depth of 9 or 10 fathoms at the distance of one mile. The point is low, terminating in a green slope with a few trees, and is fringed by a rocky shoal which extends a quarter of a mile seaward. A bluff formed by high land is situated $1\frac{1}{2}$ miles westward of Pedro point. The bottom in this vicinity is rocky, and the soundings do not extend more than $1\frac{1}{2}$ or 2 miles from the shore.

A reef with a depth of $2\frac{1}{2}$ fathoms, lies half a mile off the shore, westward of Krang Rajah bay, at $3\frac{1}{2}$ miles eastward of Pedro point.

Tanjong Batu Putih, or White cliff, lies 12 miles eastward of Pedro point, and may be known by a tree and a ruin near its extremity; it is conspicuous when seen from the eastward. Between Pedro point and Tanjong Batu Putih is formed Krang Rajah or Deep Water bay, at the bottom of which is Rajah village, with depth of 20 fathoms within a quarter of a mile from the shore.

Batu Pedir, situated 18 miles eastward of Tanjong Batu Putih, may be known by some bushy trees on its summit and by Golden mountain which bears from the point W. by S. $\frac{1}{2}$ S.

DIRECTIONS.—In sailing from Achi along this part of the coast a vessel should keep near the shore, as in most parts anchorage may, if necessary, be found, and there is seldom any hidden danger more than half a mile from the shore. Also the bank of soundings is steep-to, with westerly and variable currents outside its limits, and calms are more prevalent in the offing than when the vessel is in soundings. Every advantage

should be taken of the land wind which sets in about 8 or 9 p.m. and continues through the night. Batu Pedir may be approached to a depth of 10 fathoms at the distance of half a mile. The tides near the shore are regular, but not very strong.

Golden mountain (Ya Mura), W. by S. $\frac{1}{2}$ S. 14 miles from Batu Pedir, is a regular cone 5,663 feet high. The smaller mountain about 5 miles to the eastward of Golden mountain, is the Orphan (Ya Muree), or mount Pedir, having green sides and darkly-wooded summit. The surrounding country appears well cultivated. These two mountains are useful landmarks. Golden mountain has been seen at a distance of 88 miles.

Batu creek.—From Batu Pedir the coast trends south-eastward to Batu creek, 4 miles distant, off which the depth is only 2 fathoms, at half a mile distant. Bungala creek lies 6 miles eastward of Batu creek, and may be known by a few tall casuarina trees near its entrance.

Pedir creek is situated 8 miles south-eastward of Batu Pedir. The entrance dries at low water, and is not easily discovered, but it may be found by steering from the eastward towards mount Pedir until a large village, which is 2 miles south-east of the creek, is seen in a gap in the trees which line the coast. From the entrance the creek winds for a mile and a half, when it becomes so narrow that there is hardly room for a boat. About a quarter of a mile further up is a village and an old Portuguese fort.* The exports of Pedir are betel-nut and pepper.

There is good anchorage near the coast in the neighbourhood of Pedir creek at about one mile from the shore.

Burong creek.—The entrance of this creek, which is situated 4 miles to the south-east of Pedir creek, may be known by a flagstaff in the centre of the village. The creek is very narrow, and the bar at its entrance is passable by boats at high water only. Burong has become a chief place for trade on this coast, and much frequented by vessels from the Coromandel coast.

Two and a half miles south-eastward of Burong creek is Ayer-Labu creek.

Enjung creek.—The entrance to this creek is situated 17 miles south-eastward of Batu Pedir, and may be known by two groves of coconut trees situated near the entrance. The bar has a depth of 4 feet at low water, the bottom seaward deepening gradually to 10 or 12 fathoms at half a mile off shore. A long spit extends from the north point of the entrance and dries at half ebb. The rise and fall of tide is 7 feet.

* Navigating Lieutenant F. J. Gray, H.M.S. *Nassau*, 1872.

Sawang village, consisting of 200 houses, is situated nearly 2 miles from the bar of the creek, and like other Malay villages is built in a swamp. Small supplies of provisions may be procured.

Merdu point, lying 23 miles east-south-eastward of Batu Pedir, is low and sandy with a few small trees; a run of water, resembling when at a distance a path in the valley, is conspicuous during the rainy season. A grove of trees is situated $1\frac{1}{2}$ miles to the westward of the point.

Merdu village is half a mile from the sea on the banks of a small river. The anchorage off Merdu is in 18 fathoms at one mile from the shore, with the village bearing South. The water shoals suddenly from 10 to 2 fathoms.

Samalangan creek is situated $7\frac{1}{2}$ miles eastward of Merdu point. The entrance cannot be distinguished from the sea, but it lies $1\frac{1}{2}$ miles westward of two large trees which are near the beach. On either side of the entrance there is a small fort.

The anchorage off Samalangan is in 12 to 15 fathoms at one mile off shore, with Merdu point bearing W. by N. $\frac{1}{4}$ N., and Rajah point E. $\frac{1}{2}$ N.

Rajah point having a high grove of trees near its extremity, forms with Merdu point a bight, which off Samalangan creek is $1\frac{3}{4}$ miles deep, and has a depth of 24 fathoms decreasing gradually towards the shore. Rajah point may be approached to a depth of 10 fathoms.

Banks.—At $2\frac{1}{2}$ miles east of Rajah point, is a rocky patch of 6 fathoms, about $1\frac{1}{2}$ miles off shore; also at 7 miles east of the point, between Pedada and Jimpa creeks, at $1\frac{1}{2}$ miles off shore, is another patch of 6 fathoms, shoaling quickly towards the shore. On the north side, these banks are steep-to.

Elephant mountain or Friar's hood, distant $15\frac{1}{2}$ miles S.E. $\frac{1}{2}$ S. from Rajah point, is an isolated and conspicuous landmark, visible nearly 40 miles in clear weather.

Passangan point, situated 22 miles eastward of Rajah point, is low and sandy, with a few cocoa-nut trees near its extreme. Between Rajah and Passangan points the shore may be approached to a depth of 14 fathoms. Passangan point is steep, there being 30 fathoms within half a mile of the beach.

There are two entrances to Passangan creek; the principal one is situated 4 miles westward of the point, the other half a mile eastward of the point; both entrances are passable by boats at high water only.

Five miles eastward of Passangan point there is a high square grove of trees situated near the entrance of Klumpang Dna creek.

Goma-Goma or **Agun-Agun** point lies 9 miles eastward of Passangan point, the coast between forming a bight. Goma-Goma point is low with a little jungle, and vessels should not shoal less than 14 or

12 fathoms in approaching it. A reef with patches of 6 feet extends one mile W. by N. $\frac{3}{4}$ N., with a depth of 4 fathoms close to its edge.

At about $2\frac{1}{2}$ miles eastward of Goma-Goma point a belt of high casuarina trees commences and continues nearly as far as Telok Samoi, which is distant 13 miles from Goma-Goma point.

Krang Guku is a village near a creek situated 5 miles to the eastward of Goma-Goma point. There is good anchorage westward of the village in 10 fathoms, mud, and depths of 4 fathoms close to the breakers.

TELOK SAMOI is situated in a bay about 20 miles to the westward of Diamond point and contains about sixty huts, and a mud fort having a few old guns.* The village in which the Rajal's flag is hoisted is on the south side of Telok Samoi creek, the entrance of which is dry at low water. Telok Samoi may easily be recognised after a first visit by a remarkable ridge of hills at about 2 miles West of the village, which is 4 miles long, and from 300 to 500 feet high; these hills are cleared of trees and the light green grass renders them distinguishable. Telok Samoi point is marked by a clump of tall casuarina trees; there is a pier abreast the village.

Entering the bay from the north-west the shore may be approached to any convenient distance, as there are soundings of 7 and 10 fathoms within 100 yards of the beach. There is good holding ground in 10 fathoms, stiff blue mud, about half a mile from the north-western shore of the bay; but the anchorage is exposed during the north-east monsoon and there is no shelter from the sea breeze; there is shelter for small coasting craft inside the spit.

Supplies.—Water and provisions may be obtained at Telok Samoi. For trade, *see* Oleh-leh page 17.

Coast Banks.—The coast from Telok Samoi extends in an E.N.E. direction for 20 miles to Diamond point; the intervening coast is low, flat covered with trees and skirted by a shoal bank on which at about midway, depths of 3 fathoms will be obtained at 2 miles from the shore.

A patch of 10 feet lies just with the edge of this bank, with Kertoy river entrance bearing S. by W. $\frac{1}{2}$ W., distant 2 miles. A patch of 5 fathoms lies $2\frac{1}{2}$ miles N. by W. $\frac{1}{4}$ W. of this position, and a patch, the depth of which is not given, lies W. by N., distant $3\frac{1}{2}$ miles from the same position.

Several streams fall into the sea between Telok Samoi and Diamond point, the bars of which are passable only by very small craft.

Karang Timan, which dries 5 feet and is steep-to, lies with Diamond point bearing E. $\frac{1}{4}$ S. distant 4 miles.

* H.M.S. *Nassau*, 1872.

Caution must be exercised in approaching the coast between Telok Samoi and Diamond point.

DIAMOND POINT or **Jambu Ayer**.—The trees on Diamond point are of unequal height and higher than those on the adjacent land, thus making the point appear like a low sloping island when seen at a considerable distance, although the ground is very little elevated above the level of high-water spring tides. A high table mountain visible from the offing in clear weather is situated south-south-westward from Diamond point. The extreme of the point is in lat. $5^{\circ} 16' 0''$ N., long. $97^{\circ} 30' 0''$ E.

A spit extends off from Diamond point about three-quarters of a mile in a northerly direction, with a depth of 18 feet on its edge, and is steep-to. Vessels should not shoal less than 10 fathoms in approaching the spit, especially during the north-east monsoon, when a heavy swell will be experienced.

TIDES.—It is high water, full and change, at Diamond point at Noon; spring rise 9 feet. The flood sets to S.E., the ebb to the N.W. Between Diamond point and the Aroa islands the set varies a point or two according to the direction of the coast. At springs the tides set at the rate of 2 or 3 knots, greatly influenced by the prevailing winds. The ebb is generally stronger and of longer duration than the flood, but, when the distance from the shore is considerable, seldom exceeds $1\frac{1}{2}$ knots. On the coast westward of Diamond point, as before remarked, the tidal streams are not strong.

The COAST.—From Diamond point to Aroa islands the coast is low and woody, and has several rivers, towns, and villages scattered along it. From 40 to 50 miles in the interior is a high chain of mountains, which may occasionally been seen in clear weather. The principal towns are Edie, Prauhilah, Lanksa, Sampai, Lankat, Dehli, Batu Barra, and Asahan, but some of these places are but collections of miserable huts, and their inhabitants remarkable neither for industry nor honesty.*

The shore is often difficult of approach on account of shoals, which in some places extend a distance of 8 or 9 miles to seaward. Near these shoals, however, the soundings are generally a guide; the bottom consists of mud, sand, or sand and mud mixed.

Winds.—Regular land and sea breezes are experienced on this part of the coast in February, March, and April.

During the strength of the north-east monsoon this coast ought not to be approached, there being a heavy swell rolling on it at that time.

* See Admiralty chart: Diamond point to the North sands, No. 1,353; scale, $m = 0.15$ of an inch.

Simpang Olim river, situated 8 miles south-eastward of Diamond point, is almost closed by a bar of sand; the entrance is about $1\frac{1}{2}$ cables in width. A narrow channel marked by stakes leads into the river, which has from 9 to 15 feet water inside.*

Arakun Dur river, 4 miles south-eastward of Simpang Olim is similar to the latter, the entrance having about 3 feet at low water.†

EDIE-BESAR, a small river 23 miles south-eastward of Diamond point, has a depth of 6 feet on its bar at low water; the channel is marked by stakes.‡

Trade.—Edie is an open port, and represents the centre of the east coast trade, which is almost entirely in the hands of Penang merchants. The exports are pepper, gutta percha, wax, rattans, and hides. The imports are provisions, petroleum, hardware, and agricultural implements. The exports in 1884 amounted to 168,000*l.*; imports 50,000*l.*; a falling off in imports of about 50,000*l.*, owing to exceptional circumstances.

Shipping.—364 steamers visited the port in 1884, of which 228 were British; also 23 sailing vessels. Dutch mail steamers call here.

Anchorage.—There is anchorage in 5 fathoms, sand and mud, at about 2 miles off Edie river.

Ujong Prauhilah or Perlak is situated 9 miles south-eastward of Edie Besar river.§

The coast between Diamond and Prauhilah (Perlak) points is safe to approach to soundings of 10 fathoms, which depth will be found at a distance of 2 miles from the shore, except near Prauhilah point, from which a reef, with from one to 3 fathoms, extends in a N. by W. direction a distance of 4 miles. There is a depth of 10 fathoms at 5 miles North and 4 miles N.N.E. from the point, outside which the water deepens quickly to 20 and 25 fathoms. At about $1\frac{1}{2}$ miles north-eastward of the point there is a bank which dries.

The entrance to Prauhilah river, on the north side of Prauhilah point, is almost dry at low water, but inside there is a depth of 12 feet for several miles up, and it is said to have communication with Kwala Lagot. A fishing village is situated at a considerable distance from the entrance of the river.

* See plan of Simpang-Olim river on Admiralty chart No. 219; scale, $m = 1$ inch.

† See plan of Arakun Dur river on Admiralty chart No. 219; scale, $m = 2 \cdot 2$ inches.

‡ See plan of Edie-Besar river on Admiralty chart No. 219; scale, $m = 4$ inches.

§ The steamship *Cleveland*, Commander A. Ponsonby, passed over the position of a rock reported in lat. $5^{\circ} 0' N.$, long. $98^{\circ} 18' E.$, or about 25 miles E. by N. $\frac{1}{2}$ N., from Ujong Prauhilah, without seeing any danger or discoloured water. It is therefore considered that no rock exists in that position.

Rajah river, 10 miles south-eastward of Ujong Prauhilah, has an entrance $2\frac{1}{2}$ cables wide, with a depth of 4 feet on the bar at low water and 22 feet inside.*

LANKSA BAY.—The coast to the southward of Ujong Prauhilah, as far as Rajah river, is safe to approach to a depth of 5 fathoms at a distance of $1\frac{1}{2}$ miles from the shore; thence to Ujong Prolin or Byan, the north-west point of Lanksa bay, vessels should not shoal less than 16 or 20 fathoms, as reefs, on which the sea breaks heavily, project from Ujong Prolin a distance of 4 miles to the northward and eastward. Prolin point is low, but can be distinguished when bearing southward of S.W. by S. The eastern part of the reef should not be approached nearer than depths of 19 fathoms.

Lanksa bay is formed between Ujong Prolin on the north-west side and Ujong Lanksa on the south-east; the distance between these points is $4\frac{1}{2}$ miles, and the depth of the bay is also about $4\frac{1}{2}$ miles. The bay contains numerous shoals, between which there are narrow boat channels leading into the various rivers that discharge into it. Near Ujong Lanksa, but separated by a channel 300 yards wide and 5 fathoms deep, lies Pulo Laga Toju, a small island about a mile in extent, and having a reef which extends three-quarters of a mile to the northward and eastward. This island can only be distinguished from the mainland in coming from the south-east.

The entrance to Lanksa river lies southward of Pulo Laga Toju; there is a narrow channel on the north-west side of that island, but the best channel to the river is south of Pulo Laga Toju and has 9 feet least water. These channels, however, are only practicable for vessels of small draught, and, as there are no leading marks, boats should be kept ahead sounding. In the entrance of the river lies Pulo Rawa, an island about half a mile in extent, westward of which the river is only 300 or 400 yards wide. The town is about $12\frac{1}{2}$ miles from the entrance of the river; the inhabitants cultivate rice, pepper, and rattans.

A vessel intending to send her boats to Lanksa should anchor in 9 or 10 fathoms water, with Ujong Lanksa bearing S.W. by W. distant $2\frac{1}{2}$ miles.

Pulo Rokit.—From Ujong Lanksa the coast trends east south-eastward 15 miles to Ujong Tamian; midway there is an island named Pulo Rokit, which is safe to approach on the north-eastern side to depths of 10 or 12 fathoms. Between Pulo Rokit and Ujong Lanksa the shore is skirted by a bank, which extends from one to 2 miles off shore, with from 12 to 18 feet on its edge; the soundings decrease very gradually

* See plan of Rajah river on Admiralty chart No. 219; scale, $m = 0.8$ of an inch.

towards the bank. South-eastward of Pulo Rokit vessels should not approach the shore with less depths than 17 fathoms, and off Tamian to 20 fathoms, as the bank is steep-to.

UJONG TAMIAN or SURUWI.—A reef projects from Ujong Tamian in a N.N.E. direction nearly one mile, thence continues along shore to the north-westward at about one mile distant, with 18 or 20 fathoms close to its edge. The point should not be approached nearer than 2 miles on account of the strong undercurrents, which are liable to set the vessel into the small bay to the westward.

A bank, of small extent lies E.N.E. distant $4\frac{3}{4}$ miles from Ujong Tamian. The least water found was 13 fathoms, with 20 and 23 fathoms close-to.

Tamian river, about 2 miles southward of Ujong Tamian, has a depth of 4 feet on its bar at low water. The town of Tamian or Suruwi is situated about 10 miles up the river, which has a rise of 2 feet off the town. There is a dangerous reef off the point to the southward of the entrance.*

Tides.—It is high water, full and change, off Ujong Tamian at 0h. 30m., rise of tide 6 to 9 feet.

The coast between Ujong Tamian and Pulo Lankat-tuah forms a bay about 30 miles broad and 9 miles deep. At the head of the bay are two large islands: the northern one is Pulo Kampi, on the south extreme of which is a small town of the same name belonging to the Rajah of Achi. This bay is fronted by mud-banks which extend in places from 5 to 7 miles off shore, towards which the soundings decrease very gradually; the banks may be safely approached to 6 fathoms, excepting near Tamian point and to the northward of Lankat river.

Pulo Kampi (Sampai).—Leading to Pulo Kampi there is a safe channel, at the entrance of which, bearing N.E. $\frac{1}{2}$ E. $6\frac{1}{2}$ miles from the south extreme of Pulo Sampai, there is a depth of 9 feet least water. Thence the channel, nearly straight to Kampi, is about half a mile in breadth, with deeper water. The channel is said to continue to Kanya-lapun river.

LANKAT RIVER.—From the entrance of Lankat river, situated about 18 miles south-eastward of Kampi island, a bank which dries in patches extends north and north-eastward for 5 or 6 miles. A vessel should not approach this bank to a less depth than 12 or 14 fathoms, as the soundings decrease very suddenly inshore of those depths, and are irregular. From the town of Chambia, on Lankat river, large quantities of tobacco are exported. For trade, *see* Delhi.

* See plan of Tamian river on Admiralty chart, No. 219; scale, $m = 0\cdot8$ of an inch.

Pulo Lankat-tuah, is a small islet covered with trees off the mouth of Lankat-tuah river, and 3 miles eastward of Lankat river.

The coast from Pulo Lankat-tuah to Ujong Beitin Chama forms a slight bay and is fronted by extensive banks; it may be safely approached to depths of 10 fathoms. Tapakuda river lies at the head of the bay.

Ujong Beitin Chama, forms the northern extreme of the bay in which Delhi river is situated and bears from Lankat-tuah island S.E. by E. distant $11\frac{1}{2}$ miles. The point should not be approached nearer than the depth of 10 fathoms.

DEHLI RIVER lies about 5 miles southward of Ujong Beitin Chama, and has two entrances. The northern mouth is named the Balawan, and the southern mouth the Dehli; the latter is not navigable, there being only 4 feet at high water on the bar in some places. The entrances are separated by Balawan, or Bagan island (a flat island covered with trees), and an extensive sand bank nearly dry at low water. This bank within a depth of 3 fathoms extends about 4 miles off shore, thence deepening gradually.

Outer anchorage.—Vessels should anchor in 9 fathoms, with the entrance of Dehli river in line with a gap in the mountains, bearing S.W. $\frac{1}{2}$ W., about 6 miles from the entrance.

Balawan entrance has a depth of 15 feet on the bar at high water springs, over soft mud, with deeper water inside.* A Herbert beacon buoy lies N.N.E. of the entrance, in about $4\frac{1}{2}$ fathoms water, and about 4 miles south-eastward of Ujong Beitin Chama. The channel is marked by fishing stakes and beacons (in a dilapidated state), on either side; by keeping the white beacons about a cable distant on the starboard hand the passage is easy, and there are no dangers in the river up to the anchorage except one shoal on the port hand, on the outer edge of which there is a beacon. The best anchorage is in the fork of the river, on the west side of Balawan island, in about 21 feet water, and where two store ships lie moored for trade purposes. Here the Balawan river turns to the westward.

Above this anchorage the Dehli river is narrow, and only navigable by small craft; a wooden bridge spans it.

Towns.—The town of Dehli is about 2 miles above the store ships; Meidan, the principal town, is beyond it.

Above Dehli the river deepens and is said to be navigable for large boats for many miles.*

* See plan of Dehli (Balawan) river on Admiralty chart, No. 1,353; scale, $m = 0.75$ of an inch.—Remarks on Dehli from Consular Reports, 1885; and from Austrian Gun-boat *Nautilus*, 1886.

A Dutch assistant resident lives at Meidan.

A railway is in course of construction from abreast the anchorage, to Meidan, and to Deli Jua, 2 miles beyond, with a branch to Binji connecting the Langkat district.

Dehli (Deli) district is made up of three states; Dehli in the centre under a sultau; Langkat to the northward under a native chief or Pangherau; and Sirdang to the southward also under a sultan; the whole forming part of the residency of Siak, the seat of Government being at Benkalis island, further down the coast, where the Dutch resident for the east coast has his head-quarters.

There is a German consul at Dehli, and a branch of the Chartered Bank of India, Australia, and China. Population about 12,000.

Trade.—Dehli district has rapidly increased in importance in the last 15 years on account of its extensive tobacco plantations. Several large companies have been formed, mostly Dutch; the principal English firm is the Langkat Plantation Company. The whole of the carrying trade is in the hands of Messrs. Holt's line. In 1873, the value of tobacco exported amounted to 208,000*l.*; and in 1884, to 2,000,000*l.* It is shipped from Clambia on the Langkat river, Dehli, and from Sirdang river. There is no coal here, the small river steamers using wood for fuel.

Climate.—The health of the country may be considered good, though unseasonable weather often brings epidemics of fever and berri-berri, especially among new comers. Isolated cases of cholera occur.

Tides.—It is high water, full and change, in Dehli river at 3h.; rise of tide 7 to 10 feet. The tidal streams run from one to two hours later.

Ujong Sabunja Bunja.—From Dehli river the coast extends in an E.S.E. direction 17 miles to Ujong Sabunja Bunja, and may be approached to the depth of 6 fathoms. Ujong Sabunja Bunja may be known from the offing by its grove of high trees, the third grove from Dehli river.

DEHLI BANKS are about 23 miles in length north-west and south-east, and from 2 to 4½ miles in breadth. The south-east extreme lies with the following bearings:—Pulo Varela (Barhela) peak E. by N.; a high tree on the northern extreme of a long straggling grove to the south-east of Ujong Sabunja Bunja S. by E. ¼ E.; the grove on Sabunja Bunja S.W. by W. ¾ W. The north-west extreme of the banks has from 7 to 10 fathoms, with Beitin Chama point W. by S. ¾ S. about 12 miles.

Bunja shoals, which form the dangerous part of Dehli banks, are situated on the southern extreme of the banks, and consist of two narrow ridges of sand, which are 3 to 4 miles long in a north-west and south-east

direction, half a mile broad, lie nearly abreast of each other, and are separated by a channel which is 2 miles wide, with depths of from 6 to 9 fathoms.

The least water on the western ridge is 6 feet, from which spot the high tree of the grove south-east of Ujong Sabunja Bunja bears S.E. by S. 13 miles, and the grove on Sabunja Bunja S.W., $6\frac{1}{2}$ miles.

On the shoalest part of the eastern ridge there is a depth of 9 feet, from which the high tree of the grove south-east of Sabunja Bunja, S.S.E. $\frac{1}{3}$ E. $14\frac{1}{4}$ miles; and the grove on Sabunja Bunja, S.W. $\frac{1}{2}$ S. 9 miles.

Pulo Varela peak bearing E. $\frac{1}{4}$ S. leads to the northward of Bunja shoals, and the same object bearing E. by N. $\frac{1}{4}$ N. leads to the southward of them. The high tree* on the north extreme of a long straggling grove of trees to the south-east of Ujong Sabunja Bunja, bearing S. by E. $\frac{3}{4}$ E., leads to the eastward, but this tree can only be seen in clear weather. The centre of the grove on Sabunja Bunja bearing S. by W. will lead in 5 fathoms north-westward of Bunja shoals, and clear of all dangers on Dehli banks. It is not advisable to shoal to less than 18 fathoms in passing these banks at night.

There is a clear channel, $3\frac{1}{2}$ miles wide and having depths of from $5\frac{1}{2}$ to 10 fathoms between Bunja shoals and the coast, but the shore to the southward of Ujong Sabunja Bunja should not be approached nearer than 3 miles, as there is a bank having from 9 to 12 feet water extending parallel to the shore for $5\frac{1}{2}$ miles; there is deep water between this bank and the shore.

From Ujong Sabunja Bunja the coast extends east-south-eastward 35 miles to Mattie point, and may in most places be approached to 2 or 3 miles in from $4\frac{1}{2}$ to 7 fathoms water, but the soundings outside are very irregular, with overfalls. There are several rivers in this part of the coast, the entrances to which are passable only by boats.

Sirdang river lies to the westward of Ujong Sabunja Bunja, in one of the Dehli tobacco growing districts, already described.

THE COAST.—Mattie Point.—The north-east extreme of this point, forms the northern extreme of Batu Barra bay, and may easily be known by its high grove of trees. Five miles northward of Mattie point the depths are from 12 to 14 fathoms, with occasional patches of 10 fathoms; thence to the southward it shoals suddenly to 5 and 2 fathoms to the sandy spit dry at low water, which extends one mile north and north-eastward from Mattie point.

* The high tree is among a small cluster, and is very little higher than the adjacent trees. The foreshore is low and deceptive in appearance, being backed by a range of mountains which have many peculiarly-shaped peaks.—H.M.S. *Midge*, 1873.

Tides.—It is high water, full and change, off Mattie point at 3 h. ; springs rise 7 to 10 feet. The tidal streams run from one to two hours later, and set at the rate of 2 to 3 miles an hour at springs.

Mattie Shoal is a dangerous sand bank 6 miles long, in an E.S.E. and W.N.W. direction, one mile broad, and having depths of from one to 2 fathoms. There is a safe channel between the shoal and the mainland, the narrowest part, $1\frac{1}{4}$ miles, being off Mattie point. From the north-west extreme of Mattie shoal, Pulo Varela peak bears N. $\frac{1}{4}$ W., Mattie point S.S.W. $\frac{1}{8}$ W., and Pulo Pandan E. by N.

At one mile southward of the south-east extreme of Mattie shoal is a small patch having 16 feet water, easily cleared by attending to the bearings of Pulo Salanama and a remarkable single high tree near Batu Barra.

BATU BARRA RIVER.—The entrance to this river, situated $9\frac{1}{2}$ miles south-eastward from Mattie point, is fronted by a mud-flat which extends a considerable distance along the coast, and, within a depth of 18 feet, is from 3 to 5 miles off shore ; this flat has regular depths, and extends to within 4 miles of Pulo Salanama. A wide spreading remarkable tree is situated about $1\frac{1}{4}$ miles westward of the river entrance.

Batu Barra river is about 300 yards wide, with regular depths to the dry banks at its mouth. At a short distance from the entrance the river divides into two creeks, which are almost dry at low water. About a mile up the western branch is a town where the chief rajah resides ; on the banks of the eastern branch is another town, and there are said to be other towns farther up the river. The people cultivate rice and rattans. Elephants abound inland, horses are also plentiful. Goats and poultry may be procured at reasonable prices.

PULO VARELA, a small island, with a peak about 600 feet high, is situated 22 miles from the nearest coast of Sumatra, nearly north of Mattie point, and may be seen in clear weather at a distance of 28 miles.* An islet lies off the north-west point, and another close off the south end. In a little cove at the south end of Pulo Varela water may be procured from a small run, and there is anchorage at one mile off the south-east part of the island in 12 to 18 fathoms.

Firewood and good pine spars may be cut here, but boats landing should be on their guard against natives from the adjacent coast, who frequent the island.

Banks.—Northward of Pulo Varela is a bank having depths of 5 to 10 fathoms ; its south extreme bears N. by W. $\frac{3}{4}$ W. 7 miles from Pulo Varela,

* See also Admiralty chart, No. 793 b.

the bank thence extends in a N.W. by W. direction for 7 miles, and is from one to two miles broad.*

A bank about 5 miles long, having 8 to 10 fathoms, lies 4 miles southward of Pulo Varela.

A third bank lies with its north extreme nearly midway between Pulo Varela and Mattie point, thence extending about 15 miles south-eastward, with a breadth of 4 miles, and about 9 miles off shore. Five fathoms was the least water found on this bank, between which and Mattie shoal the depths are from 12 to 20 fathoms.

The BROTHERS are two small wooded islands lying 5 miles N.N.E. and S.S.W. from each other, and may be seen from a distance of 15 miles. The northernmost, Pulo Pandan, bears about S.E. $\frac{1}{2}$ S. distant $25\frac{1}{2}$ miles from Pulo Varela, and is encircled by rocky ground to the distance of half a mile. Rocks extend a quarter of a mile from the north end of Pulo Salanama, the southern island, and off the south-east end there is a small islet having a remarkable single tree.

The COAST.—**Sungi Asahan**, situated 20 miles south-eastward of Batu Barra, has a mud-flat extending 7 miles north-east from its entrance, the depths upon which decrease from 3 fathoms on its edge regularly towards the shore. This flat is a continuation of that already mentioned as extending a considerable distance along the shore from Batu Barra river.†

At its mouth, Asahan river is 1,600 yards wide, but 7 miles further up, where it receives a tributary named the Silau, it narrows to one-third of this breadth. At low-water the depth in the channel of the river is about 12 feet; there probably is not so much water in the channel leading to it over the mud-flat.

LIDUNG BAY.—From Tanjong Jumpal, the east point of Asahan river, the coast trends south-eastward for 9 miles to Tanjong Se Api-api, the west point of Lidung bay. This bay is about 15 miles across; the shore mud bank fills nearly the whole of it, and extends nearly 3 miles seaward of a line joining the points, and being steep to the approach by the lead gives little warning.

Sungi Kewalu and **Sungi Panei**, two considerable rivers, empty themselves into the bay.

* It has been stated that there is a depth of only 2 fathoms on some part of this bank, but 6 fathoms was the least water found by the officers of the *Krishna* during their survey in 1860. The Messageries steamer *Djemmah*, reports a depth of 5 fathoms (using Thomson's sounding machine), with Pulo Varela bearing S.E. $\frac{1}{4}$ S., distant 12 miles.

† See Admiralty chart:—North Sands to Singapore, No, 1,355, $m=0.15$ of an inch.

Sungi Kewalu is about one mile wide in the entrance, and has a least depth of one fathom for about 15 miles.

Sungi Paniyng, between Kewalu, and Tanjong Muara the east point of Lidung bay, is nearly 2 miles wide in the entrance, and one mile wide for a distance of 10 miles, where it divides into two branches. The depth in the river is from $1\frac{1}{2}$ to 4 fathoms, and the channel over the bar, which lies N.E. from Tanjong Muara, has about $1\frac{1}{4}$ fathoms, with hard ground nearly dry at low water bordering the north side of it.

Caution.—The coast from Tanjong Pasir, the easternmost point of Lidung bay, trends south-eastward about 45 miles to the entrance to Sungi Rokan. It is fronted by extensive flats and mud banks reaching off nearly to Aroa islands, and extending eastward past Rokan river to Pulo Rupert, nearly filling the space between that island and South Sands. This coast has not been surveyed, but being far out of the track of vessels proceeding through Malacca strait, should be avoided. Vessels finding themselves in this neighbourhood must therefore trust to a good look-out aloft, as the shoals can generally be seen in clear weather, and to the slight information to be derived from the chart. The lead is not of much use, as the shoals are said to be steep-to, but its use must not on that account be neglected.

SUNGI ROKAN, one of the largest rivers of Sumatra, has off its entrance two low wooded islands, Pulo Halang Besar and Pulo Halang Kechil. The former is, as its name implies, the larger of the two islands, and lies 3 miles northward of the other. There is a passage of $1\frac{1}{2}$ to 2 fathoms water between them leading into the river, and a passage with about the same depth lying due north of Tanjong Perbabuan, the eastern point of the entrance.

Rokan river is about 4 miles broad just within Pulo Halang Kechil, decreasing in breadth to 2 miles at Pulo Beting, which lies in mid-channel at about 14 miles from the entrance; thence the river gradually decreases in width to half a mile at Pulo Papan, about 35 miles from the entrance, beyond which little is known. The village of Tanah Putih is about 3 miles below Pulo Papan, on the left bank.

Southward of Pulo Papan, it appears to trend with numerous windings to its source in the mountains, a distance of 100 miles or more. Several large villages subject to the Rajah of Siak are said to exist on its banks.

Tides.—It is high water, full and change, at the entrance of the river, at 5h., springs rise 12 feet. The tides are said to run in the river at the rate of $5\frac{1}{2}$ miles an hour at springs, producing a bore.

PULO RUPAT and **PULO MEDANG**, lying northward of it, form a circle of about 25 miles in diameter; they are separated by a narrow strait named Salat Morong. North-westward of these islands

in the direction of South Sands, are the extensive banks already referred to; and south-eastward, inside a line joining Pulo Medang and the east point of Pulo Benkalis, are also extensive mud banks. A patch of $3\frac{1}{2}$ fathoms lies on the outer edge of this bank, E. by S. $\frac{3}{4}$ S. distant 8 miles from the eastern entrance to Salat Morong, and about 10 miles westward of Rob Roy bank. The north-east shore of Pulo Medang is bold to approach, there being from 15 to 20 fathoms at the distance of one mile; Raleigh shoal of $3\frac{1}{2}$ fathoms lies nearly 10 miles off this shore.

Salat Rupert, separating Pulo Rupert from the main, is about 35 miles in length, and 2 miles broad in its narrowest part. Several islands lie near the centre of the strait, the largest of which is named Pulo Pajung. There appears to be not less than 3 fathoms water through this strait by keeping near the Sumatra shore until southward of the islands, thence the water deepens towards Brewer strait.

SALAT PANJANG or Brewer Strait.—The west approach to this strait is between Pulo Rupert and Pulo Benkalis. The strait is formed by the coast of Sumatra and the large islands Pulo Benkalis, Padang, and Rantau, and is about 90 miles in length, 5 miles broad abreast of Pulo Benkalis, and $1\frac{1}{2}$ miles in breadth in its narrowest parts. The eastern approach is westward of Great Carimon and Pulo Papan, and eastward of Pulo Rangsang. Neither of the approaches have been surveyed, but soundings have been taken in the western portion of the strait as far as Siak river; the water is deep as far east as Pulo Panjang, beyond which there appears to be not more than 2 fathoms in places.

Mud banks occupy a large portion of the approach to the western entrance of Brewer strait, but there appears to be a channel of deep water leading from about one mile eastward of Pulo Medang in a S. by E. direction, to the centre of the strait. A long bank of 2 fathoms lies near the entrance, about 7 miles westward of Tanjong Jati the east point, and nearly 3 miles off the shore abreast Sungi Menambang.

Also, Siak sandbank of $1\frac{1}{2}$ fathoms lies about $3\frac{1}{4}$ miles off the south-east coast of Pulo Rupert, with Tanjong Jering bearing N. $\frac{1}{2}$ E.; Tanjong Tego W. by S. $\frac{1}{2}$ S.; and the river abreast, N.W. by W. $\frac{3}{4}$ W.

From the west extreme of Pulo Padang a shoal of $1\frac{1}{2}$ fathoms extends half way across the strait, abreast which, the Sumatra shore should be kept. Shoal water extends some distance also off Siak river. From Pulo Panjang, towards the eastern end of the strait, shoal water extends about 2 miles east and west, and about half a mile south of it, and from the island lying 4 miles east of Pulo Panjang a shoal extends one mile southward. The Sumatra shore should be kept when passing these islands.

Bukit Batu is a village built on piles, situated on the Sumatra shore of Brewer strait, at the mouth of a small river of the same name, at about

9 miles within the west entrance. It is the principal station of the war proas of the Rajah of Siak.

There is anchorage abreast of the river in 12 fathoms, with the town bearing W.S.W. and Tanjong Jati bearing N. by W. $\frac{1}{2}$ W.

Pulo Benkalis is the large island forming the north side of Brewer strait. The town of Benkalis is on the south side of the island, nearly abreast of Bukit Batu.

Residency.—The seat of the Government of the residency of Siak is on Benkalis island. Here also is the head-quarters of the Dutch resident for the east coast of Sumatra.

Salat Padang, the channel leading out of Brewer strait, between Pulo Benkalis and Pulo Padang, is about one mile wide. Its western entrance, with a depth of about 5 fathoms, lies 10 miles eastward of Bukit Batu.

Siak river enters Brewer strait at about 8 miles southward of Tanjong Balei or 18 miles south-eastward of Bukit Batu. The river is about half a mile wide at its entrance, fronted by sandy spits, with a narrow channel between them having a depth of about 19 feet.*

The town of Siak, the residence of the Rajah, appears to be about 40 miles from the entrance.

H.M.S. *Vixen*, drawing 14 feet, entered this river and proceeded to Siak.† A depth of 15 feet was found over the bar, deepening within; the east side of the river was kept aboard until above the second island, off which a shoal extends to the eastward; thence the river was clear to the town of Siak. Off the town and for 6 miles beyond, depths of 12 to 15 fathoms were found. For vessels of about 200 tons the river Siak is said to be navigable for 20 miles beyond the town of Siak; including boat navigation its navigable course has been estimated at 150 miles.

Salat Ringit is the passage leading out between Pulo Padang and Pulo Rantau, southward of Pulo Merbau. It is stated to have from 4 to 6 fathoms water. Salat Asam leads from Salat Ringit, westward of Pulo Merbau.

Salat Ayer Itam is the continuation of Salat Ringit along the north side of Pulo Rantau, and between that island and Pulo Rangsang. It is about one mile wide, but the depth is not known.

Campore river, situated in the bight southward of the east entrance to Brewer strait, is fronted by an extensive mud-flat almost dry at low water. It is little frequented on account of its rapid tides and bore.

Tides.—At the mouth of Siak river it is high water, full and change, at 9h.; tides rise 12 feet, and set at the rate of $2\frac{1}{2}$ miles an hour. Off the

* See sketch of entrance to Siak river on Admiralty chart No. 1,355.

† Commander George Giffard, R.N., H.M.S. *Vixen*, 1845.

town of Siak the tide rises 11 feet. At the southern entrance of Brewer strait the rise is about 15 feet, with a velocity of $3\frac{1}{2}$ miles an hour, but much greater when nearer the entrance of Campore river. The tides off the southern entrance are greatly influenced by this river producing a strong eddy round some of the islands, so that while the tide is running to the southward on one side of an island, it may often be found running to the northward on the other.

The COAST.—Caution.—The space between the islands of Benkalis and Rangsang, into which debouch the straits of Padang, Asam, Ringit, and Ayer Itam; also between Pulo Rangsang and the islands of Great Carimon and Pulo Pappan, should be approached with caution, as they contain and are fronted by extensive mud-banks, and dangerous sand-banks, the positions of which have not been determined.

Salat Sabong and Mendol, situated within the last mentioned space, are intricate, and never used by European navigators. The former is contiguous to the western side of Sabong and Great Carimon islands; that of Mendol is along the Sumatra coast, westward of Pulo Mendol.

GREAT CARIMON (KRIMON) ISLAND is 11 miles long in a north and south direction; near its north end are two peaked hills, 1,376 feet, and 1,474 feet high; the remainder of the island is principally low barren land. Its southern end is separated from Sabong island by Glam strait, $2\frac{1}{2}$ miles wide. Its east side, as far south as Two-tree point, is fronted by a shallow mud-bank, which extends $1\frac{1}{2}$ miles seaward.

Abreast Two-tree point a bank having a depth of $2\frac{3}{4}$ to $4\frac{1}{2}$ fathoms extends 6 miles in a S.E. by S. direction, with its outer edge distant $2\frac{1}{2}$ miles from the island.

Little Carimon separated from the north-east end of Great Carimon island by a deep channel half a mile wide, is a high bold island $2\frac{1}{2}$ miles long, with two peaks covered with trees, the northern being 1,067 feet, and the southern 1,026 feet high. The north-east side is steep-to, but from its south point a spit extends $4\frac{1}{2}$ miles south-eastward, with a least depth of $3\frac{3}{4}$ fathoms.

Anchorage.—There is good anchorage south-east of Little Carimon island during the south-west monsoon.

The Brothers are round islets, the two outermost of which lie near each other about $2\frac{1}{2}$ miles north-westward of Little Carimon; the other of similar appearance is within a mile of that island, and is not so soon discerned as the outer ones. About 2 miles southward of the Brothers, and one mile from Great Carimon, is White rock, above water. Seal rock, surrounded by foul ground, is situated about $2\frac{1}{2}$ miles westward of White rock.

Southward of Seal rock are several small islands; Oxscar, the outer one is 3 miles distant from Great Carimon. The ground is foul for one mile north-westward of them. The space southward of the islands, as also the west side of Great Carimon, is but little known.

The north side of Malacca strait will now be described.

THE MALAY COAST.

SALANG (Thalang) or Junkseylon island, occupied by the Siamese of Ligor, is separated from the Malay peninsula by Papra (or Pak-Phra) strait, and extends between lat. $8^{\circ} 10'$ N. and $7^{\circ} 46'$ N.; it is about 24 miles long, 9 miles broad, and divided into two Rajahships of about equal size; the northern being named Thalang, and the southern Puket. The population of Junkseylon, composed of Malays, Chinese, and Siamese (in 1879), was about 32,500. The principal towns are Bandon, Puket, Katha, and Tharūa the old capital. The north coast of Papra strait is under the Rajah of Takuatung.

Junkseylon is rich in tin mines, which appear to have been worked by Chinese miners for centuries back. The mines employed (in 1872) nearly 35,000 Chinese, but since then there has been a steady decrease in the number, owing to the depreciation in the value of the metal. The mining is worked in the primitive manner the Chinese adopt, the result being that during the dry season all operations are stopped for three months for want of water.

The West coast trends nearly north and south, and has several large bays, with deep water, but none affording any protection against the south-west monsoon. The northern half of this coast is low wooded land, with the exception of one piece of high land at 8 miles from the north point of the island. The southern half is a range of mountains 1,000 to 1,750 feet high, thickly wooded, sloping gradually to the northward and southward, and visible at a distance of 30 miles. This side of the island is steep-to, with 10 or 12 fathoms close to the shore. Off the west coast are two small islands, named Goh Gata (Gavai), one of which is 50 feet high, the other low; they lie close together S.W. by W. $\frac{1}{2}$ W. one mile from Lem Són, and have deep water around them.

Bandon river lies just south of Lem Són; on it is the town of Bandon, which contains about 100 houses, and the residence of the Rajah of Thalang.

* See Admiralty charts:—Bassein river to Pulo Penang, No. 830; Sayer islands and adjacent coast, including Junkseylon, No. 842. Remarks (amended) of Commander A. de Richelieu, Siamese gunboat *Coronation*. 1876. Lem (Siamese), means point or cape; and Goh, an island.

Papra or Pak-Phra strait, separates Salang (Junkseylon) from the Malay peninsula, and is about 14 miles long. The natives are very superstitious about this strait, which they have named Pak-Phra or Lord's mouth; the passage is much used by junks. The land on both sides is mostly low and wooded, but the capes or lems are high. Along both shores of the strait are several villages where provisions and water may be obtained.

Bar.—Directions.—Outside the western entrance are large sand-banks, which are continually shifting; it is not prudent to attempt to enter without a pilot. Close to the entrance, which is about half a mile broad, there is a reef of rocks lying along the mainland and only visible at low water; but the reef does not extend far.

In the south-west monsoon the sea breaks entirely across the channel, but in the north-east monsoon the bar is generally smooth.

In January, 1877, the channel was close to the northern shore; and then straight to seaward in a W.S.W. direction, and the depth, which was 7 feet in 1875, was then 3 fathoms.

Inside the bar there is good anchorage in 5 or 6 fathoms.

From the west entrance of Papra strait to Lem Khun, there is a good channel with 4, 5, and 6 fathoms at low water.

The narrowest part of Papra strait is between two points, Lem Hin on the continent and Lem Khun on Junkseylon, $4\frac{1}{2}$ miles from the west entrance, to the eastward of which there is a sand-bank dry at low water; to the southward of this bank the depths are 9 feet at low water, whilst 4 and 5 fathoms are to be found on the north, west, and east sides of the bank. Another large sand-bank extends from the west side of Lem Asam, between which bank and the aforesaid bank lies the channel.

Between the dry sand-bank situated in the middle of the strait and Goh Galah, a small white rocky island situated $1\frac{1}{2}$ miles to the south-east of Lem Khun, there is a broad channel with 4 and 5 fathoms water. Goh Janak is a small island lying a quarter of a mile to the south-west of Goh Galah. To the south-west of Goh Janak there are extensive sand-banks dry at low water, and to the south is Tamaprau river, on the banks of which at 2 miles from the mouth the town of the same name stands, and again $1\frac{1}{2}$ miles further is another larger town, Muang Mai, but boats cannot go beyond Tamaprau.

To the eastward of Goh Janak and Goh Galah there is good anchorage in 4 or 5 fathoms.

Pass on the north-east side of Goh Galah at 2 cables distant, and then steer S.E. to pass Lem Sai (on Junkseylon) one or $1\frac{1}{2}$ cables distant; in this part there are depths of 4 and 5 fathoms. Thence steer E. by S. to pass about 2 cables north of Goh Rangam Jai or Passage island of old English navigators, a round island, like all the rest in this locality, covered

with trees ; between these two places the channel, which is formed between the fringing sand-banks, is little more than a cable wide, has 12 feet at low-water springs, and is composed of soft mud. From Passage island steer East to pass about 3 or 4 cables southward of Goh Rangam Noi the water gradually deepening as the latter is approached, pass Lam Lem or cape Three points the north-east point of Junkseylon at 3 or 4 cables distant, and with 7 fathoms water. Thence E. $\frac{1}{2}$ N. to pass 5 cables south of Goh Leng and 3 cables north of Goh Thanan or Pulo Chupa, a small round island one mile east of Lam Lem. Pass one mile eastward of Goh Thanan and then, if bound to Tharūa harbour, steer between Goh Ret and Goh Naka Joi in about 6 fathoms water.

Tides.—The tides in Papra strait are very irregular. At the bar the times of high and low water seem to correspond nearly with those at Puket. In the strait the flood stream sets in from both sides at the same time and meet at the sand bank of Lem Khun. The ebb stream also runs out of both entrances to the strait at the same time. In the middle of the strait there is hardly any tidal stream, but the water rises and falls from 6 to 8 feet. At the west entrance of the strait the tidal stream sometimes runs at the rate of 6 knots ; at the east entrance it generally attains only half that velocity.

The South coast forms a large bay (Khelong bay) with shallow water, the south-west point of which is Lem Voalan. At nearly three-quarters of a mile to the southward of this point lies Goh Keo-jai or Pagoda island, on the north-west point of which there are two white pagodas. Between this island and Voalan point there is a safe passage having 8 to 10 fathoms water. To the southward of Goh Keo-jai stands another island, Goh Keo-noi, smaller than the former, but of equal height and covered with trees. Besides these two islands there are five others along the south coast of Junkseylon, all high and wooded ; with depths of 5 to 10 fathoms round them, except along the north side of Goh Khalom. The inner passage round the south coast is deep ; it runs between Lem Voalan and Goh Keo-jai, to the southward of Goh Aà and Goh Khalom, and northward of Goh Hee and Goh Bon.

Khelong bay.—During the south-west monsoon the best anchorage is in 5 fathoms, at about 3 cables northward of Goh Aà. In the north part of Khelong bay are two small rivers, Reusong and Mudong, both leading to large villages where water and provisions may be had in abundance at reasonable rates.

In the inner passage the flood streams set to the eastward, and the ebb to the westward, at the rate of from one to 3 miles an hour.

The East coast trends north and south, is fronted with numerous islands, and has two harbours, namely, Puket or Tonkah, and Tharūa.

Between the east coast and Pulo Panjang there is a broad channel in which the flood stream sets to the northward and the ebb stream to the southward, at the rate of 2 to 3 knots an hour.

PUKET HARBOUR (generally known as Tonkah), lies northward of Kelong bay. Puket is the principal place in Junkseylon, the residence of the Rajah, and the only port frequented by coasting steam vessels. The only export is tin, of which about 6,000 tons leave Puket every year.*

Pulo Siri (Cirie), an island only separated from the shore by a narrow creek, which at low water is impassable even for boats, forms the north-east extreme of Puket harbour; its south-east point is named Lem Atpa.

Town.—The town of Puket lies about one mile up a small creek. At high water boats can ascend to the town, but at low water they can only reach the stone pier by the harbour master's office, from which a road leads to the town. The buildings in Puket are mostly wooden houses with thatched roofs, but there are a few brick buildings. The principal are, the Government house, the residence of the Siamese Royal Commissioner, the stamp office for tin, the barracks and Commandant's house, and several tin-smelting houses.

Mails.—There is a weekly mail service between Puket and Penang, and a fortnightly mail to Rangoon and intermediate ports.

Supplies.—Fresh beef is difficult to procure, but poultry and vegetables are plentiful and can be obtained at reasonable prices. Water (not very good) is brought alongside at 4 dollars per 1,000 gallons. Coal cannot be procured, but firewood can be purchased at 8 dollars per 1,000 pieces. Good fresh water can be taken from two wells, one on Goh Tapau-jai (Pulo Kapal Besar), the other on the north side of Nambo point, the point to the north-west of that island.

Six miles west of Puket is the town of Kathu, containing about 8,000 inhabitants, principally Chinese miners. There is a good road between Puket and Kathu.

Anchorage.—The harbour is divided into two anchorages by a sandy flat, over which there is only from 6 to 9 feet at low-water spring tides, therefore, only small vessels can go into the inner harbour. Large vessels should anchor in from 4 to 5 fathoms, about 2 or 3 cables southward of the black buoy which marks the south side of the sandy flat. A red buoy marks the north side of the flat, and small vessels may anchor in $2\frac{1}{4}$ fathoms at low water about 3 cables to the northward of this buoy.

Tides.—It is high water, full and change, in Puket harbour at 10h. 10m., springs rise 9 feet, neaps 7 feet; during the south-west monsoon

* See Admiralty plan:—Puket harbour, No. 843; scale, $m = 1.95$ inches.

the day tides are higher than the night tides. In the north-east monsoon the night tides and the day tides are equal. Very little tidal stream is felt in the harbour.

Directions.—Lem Phan-Va, the south-east point of Junkseylon, is steep-to; a shoal on which stands a group of rocks awash at high water extends from the point nearly one mile to the south-west. Vessels proceeding to Puket, when off this point, should steer north-eastward until Tonkah hill is seen bearing N.N.W. between Tapau-noi and Tapau-jai islands, when it should be steered for, passing between these islands in a depth of 4 fathoms.

After passing between them, steer N. by W. if intending to anchor in the outer harbour. If bound to the inner harbour steer to pass close to the westward of the black buoy, and to the eastward of the red buoy.

Vessels from the eastward may enter the harbour by passing northward of Pulo Kapal Kechil, and north of a red buoy which marks a coral reef extending one cable from the north end of the island. Between Pulo Kapal Kechil and Lem Atpha (the north-east point of the harbour), there is a sand-bank having only 6 or 7 feet at low-water spring tides. From the south side of Pulo Kapal Besar a rocky reef, with a small islet and sand-banks, extends to a distance of one mile southward.

The bottom, at both inner and outer anchorages, is mud. The harbour is open to east, and south-east winds, during the prevalence of which there is a little swell.

Winds and Weather.—*January.*—Steady north-east monsoon; wind generally more to the E.N.E. and sometimes East. The wind is generally stronger in the evening and night than in the daytime. Temperature between 60° and 80°. No rain.

February.—Steady north-east monsoon the first half of the month with no rain, and generally blowing fresh. In the latter part of the month the north-east monsoon becomes weaker and is squally every three or four days, generally in the evening and from the northward. In this month fresh water is very scarce, there is also much fever and other sickness amongst the natives.

March.—North-east monsoon very weak, generally from North, and sometimes N.W. with occasional squalls from the N.E. Temperature between 75° and 90°. Great scarcity of water and much sickness on shore.

April.—Change of monsoon, winds from West to North; heavy squalls from the north-eastward generally occur with high water in the afternoon or evening. The night tides are very low. There is much sickness.

May.—The burst of the south-west monsoon occurs in the first week of May, after which the wind seldom blows from the east quarter. The heavy rains now commence, and squalls are frequent. On the west shore of Junkseylon the swell is heavy, but Puket harbour is well sheltered.

June.—South-west monsoon fairly set in, with heavy squalls from the S.W. and N.W. When rainy weather sets in it usually lasts for five days, after that there is generally fine weather (without rain) for about a week, and sometimes for a fortnight. Temperature between 60° and 80°. Day tides higher than night tides.

July.—South-west monsoon, with squalls and heavy showers; generally the weather is rainy for five days and then fine again for five days. When the wind is due S.W., there is rain; when West and N.W., fine weather.

August.—Strong south-west monsoon the entire month, with squalls and heavy rain, much the same as July, but in August the rain sometimes continues for ten and fifteen days, and is usually followed by the same period of fine weather. Heaviest squalls generally at night-time. Mean temperature 82°. This is the hottest month, and the greatest rainfall occurs, the average number of rainy days being from eighteen to twenty.

September.—Strong south-west monsoon, but the wind more from westward. Fewer squalls, but heavier and longer showers of rain than in August. Rainy days about eighteen. Fine weather generally lasts but one or two days at a time.

October.—During the first half of month south-west monsoon is steady; towards end of the month the wind is very unsteady; Westerly and S.W. still prevailing. Showers not so heavy as in September. Rainy days about fourteen. Weather cloudy. Mean temperature 80°. Day tides still higher than night tides.

November.—Weather variable. West and S.W. winds still prevailing, but often veering to the northward and eastward; heavy squalls from all quarters, but heaviest from S.W. Rainy days about fourteen. Weather very cloudy the whole month, generally three or four days fine at a time.

December.—North-east monsoon setting in strong and with heavy squalls from N.E., wind generally to the eastward of N.E.; sometimes heavy squalls from the north-west accompanied with lightning. Average number of rainy days six or eight. Mean temperature 80°. Towards the end of this month mostly clear weather. Day tides and night tides of equal height.

Goh Khai Nok is a small, low, sandy island, lying in the channel between Pulo Panjang and Junkseylon, about 5 miles E.N.E. from Lem Apha, with a bluff on the south side, covered with trees; it is surrounded with rocks to a distance of about three-quarters of a mile, of which two patches are visible, the one north-westward, the other south-eastward of the island.

Goh Khai Noi is smaller and lower than Khai Nok, from which it is separated by a channel, $2\frac{1}{4}$ miles broad, with depths of 10 and 12

fathoms. This island is surrounded by rocks, which do not, however, extend far out.

Goh Sob (*Sisters'*) are two small, high perpendicular rocks, about $3\frac{1}{2}$ miles N. by E. from Goh Lipe (a conical rock more than 100 feet high), and about one mile off the coast of Goh Jao Jai (Pulo Panjang); there is deep water all around them.

Tharūa harbour is in the next large bay to the north of Puket. The town of Tharūa, which is situated $1\frac{1}{2}$ miles up a small river of the same name, was formerly the residence of the Rajah of Puket, who in 1859 removed to Puket; previous to 1796 (when Tharūa was demolished by the Burmese) it was a town of considerable importance. At that time there was a large Portuguese settlement here, and the harbour was frequented by numbers of European vessels; there is however, no trade at Tharūa. The ruins of a fine market street, composed of large brick buildings, and the spacious houses belonging to the Europeans who once resided here are still to be seen; an evidence of its former importance.

There are two entrances to the harbour, the better one being to the northward of Alang Noi; the other to the southward of Alang Jai and passing to the northward of Goh Mali and Goh Cap.

Directions.—Entering the bay steer W. by S. to pass about half a mile northward of Alang Noi in 8 fathoms, after passing which the water will shoal gradually towards the anchorage, where there is a depth of 3 fathoms, mud bottom, with Alang Noi bearing E. by N., and the middle of Goh Maprau about South. There appears to be a shoal about half a mile to westward of Alang-jai; and vessels should not attempt to pass between Maprau and that island, as the channel is foul. Farther northward are three other islands, Goh Peh, Goh Naka Noi, and Goh Naka Jai; patches of rocks extend for $1\frac{1}{2}$ miles north-westward of Naka Noi. Between these last three islands and Junkseylon there is a good channel with 4 and 5 fathoms of water.

Klang Bangkrong, westward of Goh Naka Noi, is a river leading to the old residence of the Rajah of Thalang, who lives now at Bandon, up a river of the same name, on the west coast of Junkseylon.

GOH JAO JAI (PULO PANJANG) is a large island, 7 miles eastward of Junkseylon, belonging to the Rajah of Panga.*

The west coast of this island, which trends in a N. by W. direction, is of moderate height, and has in the middle a large bay named Au Lubo, in which there are depths of 2 and 3 fathoms. In this bay are two large villages, and in the entrance lies a small island with a group of rocks northward of it, some of which are above water. The north part of the

* See Admiralty chart :—Sayer island and adjacent coast, No. 842.

bay is clear of rocks. Close to the shore along this coast there are depths of from 4 to 6 fathoms. Lem Ngia or Nia, the north-west point of Pulo Panjang, is a high bluff, steep-to.

The south coast forms a deep shallow bay (Au Lubaling); in the north part is a small river (Klang Lubaloi), one mile up which is a village of the same name. Goh Musang forms at low-water the south-west point of the bay; it is connected with the main island by sand-banks and rocks, over which there is depth of about 3 feet at high tide. About 2 or 3 cables south-east from this island are some rocks about 30 feet high, and there is broken ground about one mile off, with depths of from 3 to 6 fathoms. Outside are depths of 10, 14, and 16 fathoms.

The east coast of Goh Jao Jai is high and bold with deep water close to the shore; it takes a nearly north and south direction as far as Goh Rang Nok (Bird's-nest island), and thence trends N.N.W. and is low and sandy as far as Lem Sam, the north-east point of Goh Jao Jai. About 3 miles N.E. by E. $\frac{1}{4}$ E. from Lem Hualan, is a group of rocks, of which at high-water only one small point is visible about 2 feet above water; between the rocks and the main island are depths of 8 and 9 fathoms, and one mile outside the rocks the depth is 14 fathoms.

The north coast of Goh Jao Jai takes a W.N.W. direction, and is mostly low and sandy; the water along this coast is shallow, the north-west point excepted, where there is 5 and 6 fathoms close to the shore. The mountains on Goh Jao Jai form one long range, from 500 to 1,000 feet in height, extending from the north-west to the south-east point of the island.

Lem Hualan, the south-east point of Goh Jao Jai, is a high, bold point, with deep water close to the shore. At $5\frac{1}{2}$ miles S. by E. $\frac{3}{4}$ E., from the point, is a small pointed rock, about 5 feet high, with deep water round it, and $3\frac{1}{2}$ miles S. by W. from this rock is Goh Gai, a round island 100 feet high covered with trees, with deep water around it.

About 8 miles W. $\frac{1}{2}$ N. from Goh Gai and 4 miles S.E. by E. $\frac{1}{2}$ E. from the south-east point of Junkseylon, is Goh Mai Tan (*Malay* Pulo Bambo); a narrow island, $1\frac{1}{2}$ miles long, of moderate height and covered with trees. At one cable off its south point lies a group of rocks partly visible, with deep water close to them. The north-east coast of this island forms a sandy bay, which affords some shelter in the south-west monsoon, in depths of 6 and 7 fathoms. The north point is low and sandy having a rock, which is always visible, off the extreme. Within half a mile of this island are depths of from 10 to 15 fathoms all round it.

Goh Dakmai, a high, square, almost perpendicular island, lies N.E. by E. $\frac{1}{2}$ E. from the north point of Goh Mai Tan, and there is deep water round it. There is a safe channel for vessels coming from the south-east and bound to Puket, to the south of Goh Gai, and then in between

Goh Mai Tan and Goh Dakmai: When about one mile off the north point of Goh Mai Tan, a N.W. by W. course will lead up to the entrance of Puket harbour.

GOH JAO NOI is about 500 feet high, and thickly wooded, lying to the northward of Goh Jao Jai, from which it is separated by a channel a quarter to $1\frac{1}{4}$ miles in breadth. In the western part of the channel are depths of 3, 4, and 5 fathoms along the Goh Jao Jai shore; towards the middle of the channel the water shoals to 2 and $1\frac{1}{2}$ fathoms, and in the eastern part it deepens again to 4 and 5 fathoms. About half a mile north-west from Lem Sam is a rock about 10 feet high, to the south of which are depths of 5 and 6 fathoms. Lem Sam is a very low sandy point, with a bank extending from it in a north-easterly direction; to the northward of the bank is a depth of 5 fathoms, and to the eastward of it 7 and 8 fathoms for about half a mile; it then shoals to 2 and 3 fathoms, filling up the space between Goh Rang Nok and Goh Deng (two small islands about $1\frac{1}{4}$ miles to the northward of Goh Rang Nak); about one mile east of these islands are depths of 6 and 7 fathoms.

The east coast extends north and south and nearly in a line with the east coast of Goh Jao Jai. About 3 cables off the south-east point (Lem Sai) are two small islands (Goh Deng), surrounded by sandbanks and connected with the main island by a reef. To the north of these islands the coast is perfectly clear, with 5 and 6 fathoms close to the shore, and from 9 to 10 fathoms about one mile off. About 2 miles off the coast is an extensive group of islands, all very high and bold, and almost without exception steep-to. The southernmost of the group is named Goh Gaman. Between these islands and Goh Jao Jai is a safe channel with depths of 10 and 12 fathoms. The flood-stream in this channel sets to the northward, the ebb to the southward, at the rate of about 2 or 3 miles an hour.

The south coast trends in a W.N.W. direction; it is mostly low and wooded, and there are large sand and mud banks extending along the whole length of it. The west point is connected by a reef with a small island (Goh Jung), to the north-west of which is a large high island, Goh Boi Jai, with deep water on its west side; between this island and Goh Jung there is a depth of $1\frac{1}{2}$ fathoms and the bottom is rocky.

Goh Boi Nai, two small, round islands, about half a mile north of Goh Boi Jai, are surrounded by shallow water, and between them there is a depth of $1\frac{1}{2}$ fathoms.

Goh Bantan, a larger island, about one mile north of Goh Boi Jai, is about 200 feet high, and has deep water on its west and north sides.

Goh Plong, about one mile north from the west point of Goh Jao Noi, is surrounded by rocks and sand-banks.

Lem Dakmai, the north point of Goh Jao Noi, has several islands off it; immediately to the northward are two high, perpendicular islands (Goh Doda) which can be passed on both sides, but the channel north of them is generally used, as it is the broader; in it the depth is 7 fathoms. About one mile East from Goh Doda are two high, perpendicular rocks named Goh Thalu; between Lem Dakmai and Doda is a depth of 7 fathoms.

Goh Broi and Goh Batang are two high, bold islands north-west of Lem Dakmai; Goh Broi has deep water on its north and east sides, Goh Batang on its south and east sides; on the other sides of both are extensive sand-banks with shallow water. Northward of Goh Doda lies a group of islands, the principal of which are Goh Bantae, Goh Klui, Goh Tyung Lat, and Goh Fai Mai. Goh Bantae and Tyung Lat are small, rocky islands; Goh Klui and Goh Fai Mai are large, high islands, bold and steep-to. Westward of this group is a good channel with from 7 to 10 fathoms water, leading between Goh Ganam and Goh Klui; this channel runs nearly N.W. by N., and is the usual passage up to Goh Mak.

Goh Mak (*Betelnut island*), is a low, wooded island, about $1\frac{1}{2}$ miles long, and three-quarters of a mile broad, in latitude $8^{\circ} 16' N.$ It is surrounded on the north, west, and south sides by extensive sand-banks, but has deep water on the east side where vessels may anchor within a cable or two from the island in from 6 to 10 fathoms. The Rajah of Panga has a house here, and good water is plentiful. The best water is to be obtained on the north-east side of the island, and at high water boats can go close up to the well. Poultry, vegetables, and fruit can also be procured.

The whole space between Goh Mak, Goh Jao Noi, and Goh Boi is full of sandbanks and rocks, parts of which are visible only at low water. From the northern point of Goh Bantan (an island to the northward of Goh Boi Jai) there is a channel to the eastward, in which the depth is $1\frac{1}{2}$ fathoms at low-water springs. This channel is not often used; vessels generally go round the east coast of Goh Jao Jai and to the northward of Goh Jao Noi.

In the bay northward of Goh Jao Noi, besides many small there are three tolerably large rivers: the Takuatung, the Panga, and the Paklan rivers.

THE COAST.—**Takuatung river** lies near the head of the deep bay, lying to the north-eastward of Junkseylon. It may be approached from the southward to within 2 miles of its mouth, by passing between several islands, Goh Boi Jai and Goh Bantan on the one side, and on the other side an extensive group of very high, bold islands, 500 to 1,000 feet in height, lying along the coast of the mainland. The largest of these islands, Goh Tyanak, about $2\frac{1}{4}$ miles westward of Goh Bantan, is

about 2 miles long and 500 feet high. The space between this group of islands and the mainland is encumbered with rocks and sand-banks, some of which are visible at low water.

Vessels from Puket bound to Takuatung should, after passing Lem Nga at about one mile off, keep in about mid-channel between Goh Tyanak and Goh Bantao, where there is a depth of 10 fathoms; from here a North course leads up to the entrance to the river, the water shoaling gradually. Vessels may anchor in from 3 to 4 fathoms, at low water at 2 miles from the mouth. Both outside and in the mouth of the river are large sandbanks, between which there is a channel with from 2 to 3 fathoms water. The channel takes a N.N.E. direction as far as, and close to, two small islands (Goh Nam Sao), the only islands on the starboard side going in. Thence the channel trends N.N.W. and is narrow. At 4 miles up the river is the town of Kasom, where the Rajah of Takuatung resides, and whence a large quantity of tin is exported. At the mouth of the river is the high, bold island Goh Panji, and for a short distance up are depths of 3 or 4 fathoms.

Panga river is situated 3 miles eastward of Takuatung river. The channel entrance is marked by stakes; at 4 miles within is the custom house and landing place. Supplies can be procured.

Paklan river lies 4 miles eastward of Panga river, and in the north-east corner of the bay; between this river and Goh Mak there is a good channel with deep water. From Goh Mak steer to pass eastward of a small rock 20 feet high, which lies $1\frac{1}{2}$ miles north-east from Goh Mak, after passing which borrow on the mainland side to avoid the sandbanks extending southward from the westernmost of two high, bold islands (Goh Song Phi Nong), which lie about 2 miles south-west from the mouth of the river. Pass between the islands and then steer straight for the river. Outside the river there is a bar with a depth of 2 fathoms at low water in the fairway, but inside there are depths of 5, 4, and 3 fathoms for a considerable distance. Ban Paklan, the Rajah of Paklan's residence, is situated 6 miles up the river.

Lem Sak, about 5 miles northward of Goh Jao Noi, is high, bold land, but the point itself is low, sandy, and covered with trees. Reefs and sandbanks, partly visible at low-water, extend about one mile from the point; between this point and Lem Deng is a large but shallow bay.

Lem Deng is a high, bold point to the south-east of Lem Sak; eastward of it is a bay partly filled with high rocky islands. From Lem Deng the coast of the mainland takes a S.S.E. direction for about 11 or 12 miles to Lem Hua Nak. In the middle of this coast is Lem Din Deng, a point from which rocks extend to some distance. North-west of Lem Din Deng are large groups of high, bold islands, between which and the mainland is

shallow water of from one to 2 fathoms. On these islands the natives collect edible birds' nests. From Lem Din Deng towards Lem Hua Nak the coast is clear, and the water deepens gradually from 3 fathoms at one mile south of Lem Din Deng, to 10 fathoms off Lem Hua Nak.

KORBIE BAY.—To the southward of Lem Hua Nak is a group of small islands, the largest of which are Goh Damhok and Goh Damgoa, both high and bold. To the south-eastward of the point the coast forms Korbie bay, the entrance to which is between Lem Hua Nak and Goh Damhok and Damgoa; the water shoals gradually from the entrance, to 3 fathoms at about 2 miles W.S.W. from the mouth of Korbie river.

Korbie river is the middle one of three in the north part of the bay; it leads up to a town of the same name, the residence of a rajah. South-east of Korbie river is Pakasi, another large river, in the mouth of which are depths of 4 or 5 fathoms, but there are large sand-banks outside. A channel in which is a depth of 2 fathoms runs from the mouth of the river straight to the westward.

Supplies.—Coal.—There is a large export of poultry and vegetables from Korbie, and coal in considerable quantities is found here.

Goh Luang.—Lem Luang is the north-west point of a large island of the same name, situate about 13 miles south-eastward of Lem Hua Nak; it is separated from the mainland by a broad but shallow strait, at the entrance to which is a small island. To the westward of Lem Luang there is deep water, 10 to 20 fathoms, but to the north and south there are sand-banks. Goh Luang is mostly low, but the cape is high and pointed. Between Goh Luang and Goh Pipidon there are said to be some rocks just covered at low-water spring tides.

Goh Ladujang is a large square island to the east and south-east of Goh Luang, being separated from the latter and the mainland by a channel, one to 2 miles broad, with from one to 3 fathoms of water. Goh Ladujang is mostly low land, covered with jungle, and with but few inhabitants.

VOGEL ISLANDS.—The Vogels are a group of islands lying to the south-west of Korbie bay. The group consists of one large, and five small islands. To the northward of the large island are two small islands, Goh Jung and Goh Mapai, and to the southward a long high island, Goh Pipithall; besides these there are two small islands.

Goh Pipidon, the largest of the Vogels, is a high, wooded island, 4 miles long, 2 miles broad, and steep close to the west side, the south end of which is highest and forms a deep bay with 6 to 7 fathoms close in shore. Extending about half a mile from the south-east point there is a reef surrounded by a large sand-bank; this reef is always visible. Between Goh Pipidon and Goh Pipithall there is a channel with 10 to 12 fathoms water. At 8 miles S.E. by S. of Goh Pipidon there

lies a small round island, Goh Ma; and from one to 4 miles W.N.W. from this island there are two large groups of rocks covered at high water.

PILGRIMS are a group of five islands lying 13 miles S. by E. from Goh Ma; they are all small, whitish-looking islands, bold and steep-to, having from 20 to 24 fathoms within one mile. They are not visible at night as clearly as the other islands along this coast on account of their white colour. The largest of the Pilgrims is called Goh Hadji.

PULO RAJAH (Saya).—This island, situated 5 miles N. by E. $\frac{3}{4}$ E. from North Brother island, rises to a height of 1,064 feet in the south-western parts, while the north-east side is low.*

Gulnare cove, at the north-west point is about half a mile deep by a quarter of a mile wide, having 9 fathoms sandy bottom in the centre. There is another small inlet on the north side of Pulo Rajah, where a stream empties itself.

Overfalls.—There are heavy overfalls between Pulo Rajah and the Brothers islands.

BROTHERS ISLANDS, situated about 15 miles southward of Junkseyon, are densely wooded, steep-to, and nearly connected by a reef. The northern island, 517 feet high, has a detached rock lying $3\frac{1}{2}$ cables off the north extreme. The southern island, 239 feet high, is of nearly a uniform height on the summit, and a reef extends about one cable from the south point.

Currents.—Southward of Junkseyon during the north-east monsoon the current sets N.W.; during the south-west monsoon it sets S.E., but if the wind has been strong from west or W.N.W., the current will run nearly east, southward of the Brothers islands.

KLAT DUJANG—Goh Tingsing, to the southward of Goh Ladujang, is separated from it by a channel nearly one mile broad named Klat Dujang in which there are said to be depths of 3 to 4 fathoms. Goh Tingsing is higher than Goh Ladujang and also densely wooded.

In the eastern entrance to this channel lies a group of islands, the largest of which is Goh Krapu, high and steep-to; the deepest channel runs close along the west side of the island, then round the north point between it and a small island to the north; and then, close along the east side of Goh Krapu; this channel has 2 to 4 fathoms at low water.

At the west entrance of Klat Dujang channel lies an extensive sandbank, partly dry, on the south side of which there is a passage out to sea with $1\frac{1}{2}$ or 2 fathoms at low water.

* Information relating to the outlying islands of Malacca strait from Pulo Rajah to Pulo Penang is from Commander Hon. F. C. P. Vereker, H.M. Surveying Vessel *Magpie*, 1883-4.

PULO LANTAR is a large high island to the southward of Goh Tingsing, and only separated from it by a narrow creek running in a north-west direction, but with very little water. The west sides of these islands and Ladujang, extend in a line nearly north and south. From seaward they appear as one island, the creek just described not being visible, and the sand-banks in the entrance of Klat Dujang filling up the whole entrance of the channel. The west coast of Pulo Lantar is steep-to, and between this island and Vogels and Pilgrims there is a channel with from 16 to 24 fathoms water.

Along the east sides of Pulo Lantar and Goh Tingsing are several small, high, and wooded islands. To the south-east of Goh Rekam, the middle island of the group, lies a rock about one mile distant which is always visible, looking like two square sails standing out of the water. Between these islands and the sand-banks extending from the mainland, is a channel with depths shoaling gradually from 8 fathoms at the south point of Pulo Lantar, to 3 fathoms eastward of Klat Dujang.

Goh Khai, Goh Ganja, and Goh Libsig, with several other small islands form a group to the eastward of Pulo Lantar, and close to the mainland. South-eastward of Lantar lies a group of islands, the largest of which are Goh Ngai, Goh Muk, and Goh Kadan.

Goh Ngai is a long and high island with soundings of 10 fathoms within one mile; reefs extend from its north and south points, but only to a short distance.

Goh Muk is a square high island to the eastward of Goh Ngai, and its eastern side has a low and sandy shore. From the mainland opposite large sand-banks extend, and between these and Goh Muk, close to the island, is a channel having, in the shallowest part, $1\frac{3}{4}$ fathoms at low-water spring tides. With Goh Muk bearing West, distant one mile, vessels may anchor in 3 fathoms, sand.

Goh Ma (Horse island), Goh Kram, and Goh Kleing are small high islands between Goh Ngai and Goh Muk.

Goh Kadan, a long, narrow, and high island southward of Goh Ma (Horse), has deep water on its north and west sides. From the south point of Goh Kadan reefs extend for several miles; they are partly covered at low water, and are all covered at half tide.

GOH LIBONG (Pulo Telibon) is a large triangular island about 20 miles south-eastward of Pulo Lantar. The west and south sides of Libong are high, but the north and east sides very low. To the northward it is separated from the mainland by a channel one or 2 miles broad. In the western half of this channel there is a passage with 3, 4, and 5 fathoms on the Libong side; but in the eastern half the passage is narrow and runs between large sand-banks; the deepest water, namely,

2 to 3 fathoms, runs also close along the Libong side. When the north-east point of Libong is passed, the passage runs nearly E. by N. between two large sand-banks, the one extending from the north-east point of Libong, the other from a small island which lies $1\frac{1}{2}$ miles to the north-east of Goh Nak; these banks are both dry at low-water spring tides, and the depth in the channel is then $1\frac{3}{4}$ fathoms.*

Goh Kung, a small rocky island off the south-west point of Goh Libong, is connected with that island by a reef, which dries at low water.

Banks.—Between the bearings of W.S.W. and W.N.W., from the south point of Goh Libong, and from 3 to 5 miles off, there lies a group of rocks said to be dry, or visible at low-water spring tides, and to have deep water around. Other groups of rocks are said to lie between Goh Libong and Goh Kadan; and at low-water springs, if there be a little swell, a needle-shaped rock is said to be visible, lying due West 5 miles distant from the middle of Libong.

Directions.—Anchorage.—Approaching Goh Libong from the northward, pass in between Goh Muk and Kadan, thence for the north-west point of Goh Libong; and when at $1\frac{1}{2}$ miles distant from that point in 4 fathoms of water, steer South:—this will take a vessel along the west coast of Libong in 7 fathoms. When past Goh Kung, steer round the south point of Libong keeping in 7 fathoms water at about one mile off the point, when having passed it, close the south shore of the island to half a mile, and when Goh Kung comes in line with the south point of Libong, anchor in from 6 to 8 fathoms. A short distance farther in, the water shoals suddenly to 3 and 2 fathoms.

Vessels coming from the southward should, when about 10 miles distant, bring the south point of Libong (the highest peak on the island) to bear N. by E., and then steer straight for it; and when going out should steer the opposite course for about 10 miles, in order to clear all the rocks and broken ground to the southward of Goh Kadan.

There is also anchorage in 4 or 5 fathoms in a small bay on the western side of Libong, but care is requisite in entering. Supplies may be obtained here.

TRANG RIVER.—On the mainland, abreast the east coast of Goh Libong, there is a large bay, into which two rivers flow; this bay is almost filled with rocks and sand-banks, of which the greater part are visible at low water. Trang river, the northern of these, has two entrances; the eastern one is broad and shallow, the western entrance is narrower, but deeper. Approaching Trang river from the southward, pass

* Information is much wanted on the coast lying between Korbie bay and Parlis river; the charts and directions therefore must be used with caution. Ed.

close along the west shore of Libong, thence between a large sand-flat extending off that island and a group of rocks and sand-banks in the bay, to Goh Muk; in this channel there are depths of from 2 to 5 fathoms at low water. With Goh Muk bearing West, distant one mile, vessels may anchor in 3 fathoms at low water, sandy bottom.*

From the anchorage off Goh Muk, the channel lies between sand-banks in a N. by W. direction, and has from $1\frac{1}{2}$ to 3 fathoms at low water. On the west side of the river-mouth there is a small fishing village, where good river pilots may be obtained. Trang river runs up in a general north and south direction, and is said to extend upwards of 50 miles inland; it is narrow and has from $1\frac{1}{2}$ to 3 or 4 fathoms at low-water spring tides.

Trang town, where the Governor resides, is 13 miles up the river, and as far as that place, the river was ascended by His Siamese Majesty's ship *Regent* in September 1875, drawing $10\frac{1}{2}$ feet. At 3 miles above Trang town is the Chinese town of Kintain, to which vessels it is said drawing 12 feet can navigate.

Plieng river empties into the bay, eastward of Libong; at its entrance, and for some distance up it has depths of 5, 4, and 3 fathoms in it. The Rajah's residence is about 7 miles up the river. Tin and pepper is exported, and coal is found in considerable quantities; several other minerals are also found here.†

Between Plieng river and Pulo Trotan are many dangerous rocks and islets, of which little is known.

PULO MOHEA, a group consisting of two large and one small island lying close together about 17 miles south-east from the Pilgrims, are high-wooded islands, with deep water around them. The east side of these islands is high and steep-to, and on this side of the southern island is a waterfall, the water falling almost from the top of the island into the sea. On the west side the islands slope gradually, and on this side they form a sandy bay, with good anchorage and gradually shoaling water; vessels may find good shelter here in the south-west monsoon.‡

The south point of Pulo Mohea is high, bold, and steep-to.

Sangald (Guilder) Rocks, are situated 14 miles W. by S. $\frac{1}{4}$ S. from the south point of Pulo Mohea and S. by W. from the largest of the Pilgrims, forming a group, of which only two small points are above water. The south rock is about 8 feet, the north rock about 4 feet above high-water, and there is from 30 to 35 fathoms water round them. These rocks

* See note on page 49.

† This river is probably a mouth of the Trang.

‡ The Brothers, Pulo Mohea, Butong group and Lankawi, from remarks and surveys of the Hon. F. C. Vereker, H.M.S. *Magpie*, 1884.

are dangerous, being hardly visible in the south-west monsoon, and there is often a very strong tide running past them.

DIRECTIONS.—Steam vessels from Penang and bound for Puket should pass between Sangald rocks and Pulo Mohea, this being a clear channel with 25 to 30 fathoms water. When about one mile off the south point of Mohea, a course N.W. will lead up to the north point of Goh Mai Tan, passing about 4 miles west of the Pilgrims. In this part the flood-stream sets to the northward, the ebb to the southward or S.S.E.

Vessels proceeding in the reverse direction, may from off the south point of Pulo Mohea, shape course to pass eastward of the Butong group. Pulo Tengah, 654 feet high, lies in this channel nearly midway between the Butongs and Pulo Trotau. By passing westward of Pulo Tengah, and between it and Pin islet or reef which is always above water, all danger from the Black rocks reported to lie about 5 miles off the north-west side of Pulo Trotau, as well as any other that may exist in that unsurveyed portion, will be avoided. Thence course may be shaped for Pulo Laddas.

Small vessels bound to Queda may pass between the islands of Trotau and Lankawi, and the mainland; depths of 4 or 5 fathoms are said to be found near the coast and 8 to 10 fathoms near the islands; the shore of the mainland abreast Lankawi island is skirted by a shoal mud-bank, which extends a considerable distance. Avoiding this bank they must steer in 5 or 6 fathoms near the coast of Queda river.

PULO TROTAU is high and mountainous, the ranges rising to about 2,000 feet, and one peak to 2,402 feet in height. The southern extremity, Pyramid point, is a conspicuous hill 839 feet high. Black rock, awash at low-water is reported to lie 4 or 5 miles off the north-west side of the island.

Spire island, situated $2\frac{1}{4}$ miles E. by N. of Pyramid point, has a remarkable spire-shaped peak, 625 feet high.

Sail rock, at one mile South of Spire island, is a square rock 108 feet high, resembling a sail. A rock 30 feet high lies 4 cables N.W. of Sail rock.

BUTONG GROUP.—This group of islands, lying about 20 miles W.N.W. from Lankawi, are well wooded and appear as one large island until within a few miles of them. From the northward, Dome mountain is seen over the eastern part of Rawi island, which is flat-topped, the peak of Pulo Butong showing west of it.

These islands are steep-to, having no anchorage except off the south shores. Water is plentiful on all the larger islands.

Observatory islet, on the south-west side of the group, is 94 feet high and steep-to; the observation spot is on the north side in lat.

6° 29' 52" N., long. 99° 10' 45" E. Between Observatory islet and Pulo Butong are seven small islands from 110 to 200 feet high, having no safe navigable channel between them.

Pulo Butong shows with a sharp summit (928 feet) when seen from the north-east or opposite direction; anchorage may be obtained off the south-west side in 11 fathoms, sand and shells, one-third of a mile off shore.

Pulo Rawi, the eastern mountain of which is 1,594 feet high and flat-topped, is separated from Pulo Butong by a channel a quarter of a mile wide. A small islet is situated close to the north-west point, to which it is joined by a reef at low water.

Water.—A cascade of excellent water will be found on the west coast, half a mile south of the north-west point, and is a convenient watering place.

Pulo Adang, the eastern of the two large islands, has a long sandy beach on the west side, fronted by a coral reef which extends one cable seaward. A small island, 98 feet high, lies 9 cables east from the north-west point of Pulo Adang.

Dome mountain, 2,315 feet high, on the southern part of Pulo Adang, is conspicuous from all directions.

Pulo Nipis is separated from the south side of Pulo Adang by a shallow channel three-quarters of a mile wide; it has two hills, the western, 385 feet high, being the higher.

A rock, 12 feet high, lies one mile east-north-east from Pulo Nipis.

Pulo Bisi is a narrow island one mile long and 424 feet high, $1\frac{1}{2}$ miles off the north-east point of Pulo Adang. A rock 60 feet high lies $4\frac{1}{2}$ cables south-eastward from the south point of Pulo Bisi, and another $1\frac{1}{2}$ cables southward from the same point.

Pin reef is a narrow ledge of coral, steep-to, one cable long, and has a rock 7 feet above high water near its centre.

Pulo Tengah or Half-way island, situated midway between Pulo Adang and Pulo Trotau, are two islands nearly joined by boulders at low water. The highest part, 654 feet, is near the north end of the south island, and shows as a cone from the south-west.

PULO LANKAWI (LANCAVA), separated from Pulo Trotau by a channel 3 miles wide, is mountainous and thickly wooded.*

Gunong Raya, 2,952 feet, the highest and most conspicuous mountain, is situated near the middle of the island; viewed from the westward, it makes as three peaks.

* See Admiralty chart:—Bass harbour to Paracel hill, with Bass harbour on enlarged scale, No. 793a.

Gunong Chinchang, or serrated mountains, rise abruptly from the western coast, the summit being precipitous and rocky. The highest peak of the ridge is 2,443 feet in height, and another conspicuous round-topped mountain, 2,348 feet high, rises immediately over Dolphin Nose.

Pulo Lankawi and the adjacent islands are subject to the Rajah of Queda. The valleys and plains are well cultivated with rice, sugar, &c. The natives are peaceable and friendly, and there are numerous villages, the principal of which is situated about half a mile from the mouth of a small stream which empties at the north-east corner of Kwala Malacca, and is said to contain 4,000 inhabitants, many of whom are Chinese; it is also the residence of the Chief or Datu.

Trade is carried on with Penang and the adjacent coasts by junks. Siamese gunboats occasionally visit the island.

Supplies.—Fowls, eggs, and other small supplies can be obtained for silver dollars. Wild pigs are numerous, and the Argus pheasant is occasionally seen.

Kwala Malacca.—From the north-west point of Lankawi, the coast trends South 5 miles to Dolphin Nose; it is rocky with a few sandy beaches, backed by precipitous mountains covered with jungle. Between Dolphin Nose and Pulo Obah, is Kwala Malacca, protected from S.S.E. round by east to North, and affords good anchorage for small craft. The north coast of the bay is rocky. At one mile eastward from Dolphin Nose is a small island, connected with the shore by a reef.

At the head of the bay is a long sandy beach, fronted by a bank of soft mud, rendering landing impracticable at low water except off the mouths of the two streams. The beach is backed by a fringe of jungle, behind which are several villages surrounded by cultivated land.

Pulo Obah is a flat-topped island 551 feet high, having a conspicuous red landslip on its north-west side. A rock which uncovers at low water lies about half a cable from the north-west point of the island, and a reef extends the same distance south of the south-west point of the island.

A small island, 235 feet high, lies off the east side of Pulo Obah, having a reef extending $2\frac{1}{2}$ cables from its western point. A rock, 57 feet high, lies between this island and Pulo Obah.

From abreast of Pulo Obah, a sandy beach trends to the southward $2\frac{1}{2}$ miles to Tanjong Sawa, in the centre of which is a conspicuous bluff fronted by a low spur of the hills behind. An island with two rocks off its north-west point lies close to this coast.

Bass harbour, between the south coast of Pulo Lankawi and the north coast of Pulo Tubah, affords anchorage with complete protection. It is 7 miles long, with an average width of $1\frac{1}{2}$ miles, and a general depth of 3 to 4 fathoms, mud bottom.

From Tanjong Sawa the coast trends north-eastward for $6\frac{1}{2}$ miles to a long sandy beach, being a succession of rocky points with sandy bays between them, and backed by hills rising to the height of 716 feet. Along this coast are a few villages.

The south east coast of Bass harbour is bold; some of the cliffs are broken and irregular, rising abruptly from the water.

Within one mile eastward of Tanjong Sawa are three small islands, and a reef about one foot above high water.

Pulo Kintút, lies south-westward of Sawa point, is 397 feet high, and has a double hill.

Pulo Bassa has a sharp well-defined summit 828 feet high, and at $1\frac{1}{2}$ cables east of the south point of the island lies a rock which uncovers at half tide.

Pulo Laddas, the south-western island of the group, is hilly and covered with thick jungle. The highest peak, 1,006 feet, situated near the southern end, is well defined.

The east coast of the island is indented with bays, blocked by reefs extending about one cable off shore.

Pulo Chupa, a small wooded islet, 100 feet high, lies 4 cables S.E. from the south point of Laddas island, having 11 fathoms in the channel between.

Pulo Tubah is mountainous, with many rugged and peculiar limestone peaks, the highest of which is 1,571 feet high; near the western coast are several steep rocky islets near the shore, and the coast is formed of high perpendicular cliffs, which in common with most of the islands off this coast are undermined below high-water mark for some distance.

Tyson strait, between Palo Laddas and Pulo Tubah, is the southern entrance to Bass harbour. In the middle of the strait is a mud bank, one mile in extent, under the depth of 3 fathoms; the least water being 13 feet.

Junk rock, 188 feet high, in the north part of the strait at its junction with Bass harbour, is square-shaped and precipitous.

Canister rock, a small square-shaped rock, 68 feet high, is the outer of the group of islands in the south-east part of Tyson strait.

TIDES.—It is high water, full and change, at the Butong group at 10h. 34m. Springs rise 9 feet. The tidal streams are irregular and much influenced by winds and local causes.

It is high water, full and change, in Tyson strait at noon. Springs rise 8 feet. The flood tide runs to the southward out of Bass harbour from one-half to one knot, and the ebb stream the reverse way.

Currents.—In the offing the currents generally set to the northward during the south-west monsoon, and the southward during the north-east monsoon.

QUEDA RIVER.—The entrance of this river is in lat. $6^{\circ} 6' N.$, and at low water has a depth of 3 feet on its bar ; there are fishing stakes on either side of the entrance, and a remarkable clump of trees is situated on the right bank. Vessels drawing 8 feet, and having a pilot, can proceed up to the river, which is about 70 yards wide, but with very sharp turnings, to the town of Queda, 7 miles from the sea ; but it is necessary to moor head and stern there. Inside the bar the depths vary from 2 to 5 fathoms. Provisions may be obtained at Queda.*

A small light is exhibited from a wooden structure at the river entrance for the benefit of small craft trading to Penang.

There is anchorage in about 4 fathoms at 3 miles off Queda river, with the entrance bearing E. by N. and Bunting island S.S.E.

Tides.—It is high water, full and change, at noon ; rise 9 feet.

Elephant mountain, 780 feet high, is an isolated and remarkable object, situated 5 miles northward of Queda river entrance, and is a good mark for making that river. It is well named, as it has the appearance of an elephant kneeling, with its head to the southward. There is a smaller hill to the northward of the Elephant.

Parlis river entrance is 20 miles to the northward of Queda river ; coasting vessels anchor off there in 3 fathoms, south-westward of a group of four islands named Pulo Panjang, Pulo Kunit, Pulo Korap, Pulo Brasmana, which lie near the main on a mud-flat, and with a haycock-shaped mount bearing N.N.E. ; the mud-bank fronting the coast here is very flat.

PULO SEGUNTUNG (Rat Island), a high rock, lies S.E. 10 miles from the south extreme of Pulo Tubah, Lankawi islands. There are depths of 16 fathoms close to its north and east sides, and 19 fathoms 2 miles to the south-west of it.

Pulo Payer, lying 6 miles eastward from Pulo Seguntung, is high, about a mile long, and 3 cables broad ; it is steep-to, with the exception of part of the north-east side. At one mile south-west of the island there is a 5-fathoms patch, and at one mile from the north-west side there is another patch of 5 fathoms.

* The province of Queda is bounded on the north by the Siamese territory of Ligor, to the east by the Malay state of Patani, and to the south by the state of Perak. The island of Penang formerly belonged to the state of Queda. *Crawford*, 1856.—Information on river verified by H.M.S. *Modeste*, 1879 ; and *Kestrel*, 1880.

Pulo Lambu, separated from the north-east end of Pulo Payer by a channel half a mile wide, is about a quarter of a mile in extent, high, and foul on its north side to the extent of 2 cables. In the channel, and about a quarter of a mile from the west end of Pulo Lambu, is Pulo Katcha, a small rock about 3 feet high. The entrance of Queda river bears about E. by N. distant 14 miles from Pulo Lambu.

Near the islands of Payer and Lambu there are, with the exceptions mentioned, soundings of 13 to 16 fathoms within half a mile of the islands. Soundings of 10 to 14 fathoms will be found until within 5 miles of the entrance of Queda river.

PULO PERA, or Silver island, is a peaked, barren, white rock, 394 feet high, entirely devoid of trees, and the resort of numerous sea-birds; it lies nearly midway between Diamond point and Queda river. The island is steep-to, there being 40 or 50 fathoms water near it.

Pulo Pera is often taken as a point of departure, and when the weather is cloudy during the south-west monsoon it is not unfrequently the first land seen after entering Malacca strait. Sailing vessels should then give it a wide berth, for at that time calms and light airs are likely to prevail in its neighbourhood, during which vessels have been carried by the current towards it, and have been obliged to anchor in deep water to prevent being driven against the steep rock.

The **COAST** from Queda river extends in a southerly direction 25 miles to the entrance of Marbu river, and continues low and woody till within 8 or 9 miles of Marbu river, where Gunong Jurrai or Queda peak is situated at a distance of 4 miles from the coast. North-eastward of Pulo Bunting at 7 miles from the coast is situated Bukit Choreh or False Elephant hill; the head of the animal it represents is situated to the westward and the hump to the eastward. Southward of Marbu river, as far as the north entrance to Penang, the coast continues low.

Rocks.—At $5\frac{1}{2}$ miles southward of Queda river and at $2\frac{1}{2}$ miles off shore, there is a rock with a less depth than 6 feet, with 4 fathoms close-to. Also a rock awash at low water, lies $2\frac{1}{2}$ miles northward of Pulo Bunting, and $1\frac{1}{2}$ miles from the shore.

A mud-flat skirts the shore between Queda and Marbu rivers, with depths of 12 to 13 fathoms at from one to 2 miles off shore, until abreast of Pulo Beedan and Marbu river, where the edge of the bank is $4\frac{1}{2}$ miles off; thence it gradually approaches the shore till abreast the north end of Pulo Penang, where it is one mile distant.

Bunting islands consist of Pulo Bunting, Pulo Songson, Pulo Tolo, and Pulo Beedan; the whole of which are barren. Depths of 10 to 12 fathoms will be found 3 miles seaward of them. Pulo Bunting is 610 feet high, $1\frac{1}{4}$ miles long, half a mile wide, and separated from the main-

land by a channel one mile wide, having from 6 to 9 feet water. It is situated about midway between Queda and Marbu rivers.

Pulo Songson, lying 4 miles south-westward from Pulo Bunting, and $4\frac{1}{4}$ miles from the mainland, is almost circular, and about a quarter of a mile in diameter. There is deep water on the eastern side of the island, but the remaining sides are skirted by a reef which extends one cable to seaward. At one mile south-westward from Pulo Songson are Songson rocks, 25 feet high, and occupying a space of a quarter of a mile. There are depths of 8 to 10 fathoms close to the rocks.

Pulo Tolo lies $2\frac{1}{4}$ miles southward from Pulo Songson, and is skirted by a reef. Depths of 7 fathoms are found between the two islands, and the water shoals gradually towards the shore.

Pulo Beedan lies one mile south of Pulo Tolo, and is two-thirds of a mile long, by a quarter of a mile broad. The island is almost encircled by a reef, and has a narrow channel between it and the shore bank to the south-eastward.

Marbu river.—The entrance of this river, formed between the low coast on the north and Marbu hills on the south, is almost closed by a mud-flat which has 4 to 6 feet water, and extends nearly 3 miles to seaward. Off the south side of the entrance is situated the small island of Pulo Sayer.

Muda river, situated about 6 miles southward of the Marbu, had a depth of 10 feet on the bar at high water, when crossed by the steam cutter of H.M.S. *Charybdis* in 1877. A village stands on either point of the entrance, and a larger one at about 7 miles up the river, on the right bank.

Caution.—In passing between Queda river and Penang during the night, care must be taken to keep clear of the numerous fishing stakes which are moored some 6 or 7 miles from the land.

PULO PENANG, or Prince of Wales island, a British settlement lying between the parallels of $50^{\circ} 28' N.$ and $5^{\circ} 15' N.$, is nearly 14 miles long in a north and south direction, by 8 miles broad, and has an area of 164 square miles; it is separated from the mainland by a strait $1\frac{1}{2}$ to 7 miles broad, and affords sheltered anchorage for all classes of vessels.* On the shore of the mainland Province Wellesley, a strip of territory about 35 miles long, and averaging 8 miles in width, also forms part of the settlement; this territory extends from Muda river to a position 10 miles south of Kreelin river. Also the Dinding islands, and a small portion of the mainland opposite.

* See Admiralty chart:—Penang, or Prince of Wales island, No. 1,366; scale, $m = 1.4$ inches.

The north part of Pulo Penang is mountainous, and through the centre of the island runs a range of hills, declining in height as it approaches the south-west extremity, but two-thirds of the whole surface of Penang are level and of gentle inclination, and, like the hills, are covered with woods. West hill, the highest point of the island, is 2,735 feet high; at a short distance to the eastward is Government hill, on which stands a signal flag-staff 2,550 feet above the sea. The western side of the island is low and wooded. The climate of the high lands is said to resemble that of Funchal in Maderia; the thermometer in the plains ranges between 76° and 90° , and on the mountains 65° to 75° . Rain falls throughout the year. Excepting in a few places, Penang is considered to be very healthy. The soil is favourable to the growth of spices; the chief cultivation is in sugar, rice, and cocoa-nuts. Tin ore is found at the base of the mountains.

Georgetown, the capital, is situated at the north-east extremity of Penang, and has a population of about 13,000. It is built on level ground, clean and well supplied with water. It has a handsome church, an Armenian chapel, two Roman Catholic chapels, a court house, gaol, public school, poorhouse, the government offices, and the civil and military hospitals. A few shops are kept by Europeans, but the greater number by Chinese.

Fort Cornwallis is built on the north-east point of the island, close to the town. There are cantonments for troops near the town.

The fort signal staff is in lat. $5^{\circ} 24' 30''$ N., long. $100^{\circ} 20' 38''$ E., assuming Fullerton battery observation spot to be in long. $103^{\circ} 51' 15''$ E.

In 1881 the population of Penang was 90,751, who are almost entirely engaged in agriculture and mining. Of this number 45,135 are Malays; 29,474 Chinese; 15,730 natives of India; and 612 Europeans; Wellesley province numbers 97,324.

Telegraph Cables.—Penang has telegraphic communication by sub-marine cable with Madras, Rangoon, Malacca and Singapore, thence to all parts of the world.

These cables are landed at a cable house on the north shore of Georgetown, about one mile northward of the fort. A telephoⁿe cable spans the North channel, leading from the cable house to the harbour mark obelisk on the main; a cone buoy marked "Cable" lies one mile E. by N. of Klawi obelisk, and anchorage near it is prohibited. Wellesley province is in connexion with Thaiping and other places in Perak state. Peninsular and Oriental mail steamers call every fortnight; Austrian Lloyd's monthly; there is also constant communication with the Strait Settlements.

Trade.—The exports comprise tin, sugar, spices, sago, rice, buffalo hides, and horns, rattans, gum, coffee and opium, and amounted in 1884 to about 7,000,000*l.*; the imports amounted to about 6,000,000*l.*

Supplies.—The island produces fine timber, which is well adapted for spars and shipbuilding; also fine fruits. All kinds of supplies may be procured. Water is conveyed to the shipping in tanks. There is a good general hospital 3 miles from the town, and a quarantine station on Pulo Jerajah.

Coal, to the amount of 2,000 tons is usually kept in stock. Vessels are coaled by lighters.

Docks.—At the entrance to Pry river, on the mainland, is a dock 250 feet in length, 50 feet in width at entrance, with a depth of 14 feet on the sill, and will take a vessel of 13 feet draught. A vessel of 1,000 tons has been docked here. There is also a patent slip capable of taking a vessel 820 feet in length. At the foundry repairs to engines are undertaken.

BANKS.—A bank fronts Pulo Penang on the north side extending in a circular form from Georgetown, passing Tokong point at the distance of one mile, and attaining a distance of 2 miles from the shore in places between that point and Tanjong Puchut Muka, the north-west point of Penang, where it again joins the shore. On the west side of the island the same depth of 3 fathoms will be found at a distance of 3 miles: the edge of the shoal bank gradually approaches the south-west point of the island, at which place it is only a quarter of a mile distant. On the south side of the island the edge of the bank is found at a distance of $3\frac{1}{2}$ miles. An extensive series of shoal banks skirts the eastern side of the island, leaving a narrow channel between them and Great Kra flat.

Great Kra Flat.—This flat extends along shore from abreast Pry river to Pulo Tallong, a distance of 60 miles and has a breadth of 10 to 12 miles. This flat, dry in places at low water, nearly fills the channel between the south part of Penang island and the main. From abreast Remo island the flat is 4 miles broad, from thence it tapers to a point situated about 2 miles south-eastward of Georgetown; the South channel to Penang lies on the west side of the point of this flat, and a channel of 6 to 8 fathoms leading to the Pry, Juru, and Batucawan rivers, lies eastward of it. Southward of these rivers and of the Pra islands, Pra flat joins the shore banks, and there is no channel for vessels in that direction.

Batuma flat.—Between the south end of Pulo Jerajah and Batumu point, Penang, is Batumu flat, $1\frac{1}{2}$ miles long, three-quarters of a mile broad, and dry in patches at low water. In the narrow channel between the flat and Penang there is a rock 2 feet high, at one cable northward of Batumu point; and between the two northern prongs of Batuma flat is a rock which dries 8 feet.

Middle bank on the east side of Penang island, stretches northward from Pulo Jerajah for a distance of $4\frac{1}{2}$ miles, and is dry at low water to within a quarter of a mile of its north extreme, where it is connected with the bank which fringes the eastern side of Penang by a bar, with a least depth of

$3\frac{1}{4}$ fathoms. Between Middle bank and Penang island, the depths are from $3\frac{1}{2}$ to 5 fathoms water. On its eastern edge is Syrang bank, a narrow ridge one mile in length, the southern half of which dries. The eastern side of Middle bank is marked by red buoys.

Islands.—Pulo Kandy.—Two miles off the south-west point of Penang is Pulo Kandy or Saddle island, high, about half a mile long and a quarter of a mile broad. Separated from the south-east point of Penang by a passage of 4 cables in width is Remo island, steep-to on its south-east side, and on which there is a lighthouse. From Remo island a shoal bank extends in a circular form to Tanjong Garetah Sangul, the south-west point of Penang.

Pulo Jerajah, 741 feet high, lying 5 miles southward from Georgetown, is a bold island 2 miles in length, and from a quarter to three-quarters of a mile in breadth, rising in a pyramidal form; with Middle bank it forms the western side of South channel, which abreast the island is three-quarters of a mile wide, with depths of $3\frac{1}{2}$ to 4 fathoms. Between the island and Batumu flat to the westward, the depth is $5\frac{1}{2}$ fathoms, but this channel is barred by a bank of $2\frac{1}{2}$ fathoms, extending from the west side of the island.

Siek quarters and a leper hospital are established on the island under the care of the colonial surgeon.

LIGHTS.—On the summit of Muka head (the north-west point of Penang) from a gray lighthouse 45 feet high, is exhibited at an elevation of 795 feet above the sea, a *flashing* light, visible in clear weather for a distance of 30 miles.

On Remo island, off the south-east point of Penang island, from an iron lighthouse erected on its south-east extreme, is exhibited a *fixed* light, showing *red* in the channel to the southward, and *white* over the shoal ground.

On fort Cornwallis, from a white flagstaff erected about 20 yards westward of the position of the former lighthouse, is exhibited at an elevation of 107 feet above high water, a *revolving* white light, attaining its greatest brilliancy *every thirty seconds*, and should be visible in clear weather from a distance of 15 miles.

Two *red* lights, placed horizontally, mark the northern mole head, and two *green* lights, placed vertically, mark the southern mole head.

In South channel a *green* light is exhibited from No. 4 beacon buoy, and a *red* light from No. 5 beacon buoy, each visible about 2 miles.

Tides.—It is high water, full and change, at Georgetown at noon; springs rise 9 feet, neaps 7 feet. At springs the tides run at the rate of 3 miles an hour. During the N.E. monsoon the tidal streams are regular, and run about 2 hours after high and low water by the shore. At Pulo Remo it is about three-quarters of an hour later.

At the change of the monsoon in May, the tides at full moon have less range than at new moon; the lowest day tides occur in February and March.

In November the current formed by the S.W. monsoon rounds Muka head and overcomes the ebb stream, sometimes for 2 or 3 days.

In the offing between Penang and Parcelar hill the tides during springs are regular, the flood setting to the south-east, the ebb north-west, at the rate of $2\frac{1}{2}$ or 3 miles an hour. During neaps there is no perceptible tide.

Pilots are stationed at Pulo Remo and will board vessels on the proper signals being made. Pilotage for South channel is compulsory, for the North channel it is optional. Pilots for Larüt river may be obtained at Penang.

The best time to leave the harbour of Penang during the north-east monsoon is just before sunset.

CHANNELS.—The approach to the anchorage of Georgetown is by either the North or the South channels. North channel is at all times preferable for large vessels, as the water is deeper; South channel ought not to be taken by a large vessel without the assistance of a pilot.

North Channel is formed between the mud-flats which skirt the shore of the mainland and of Penang, and has 4 fathoms water in its shoalest part, the channel of deep water lying midway. The shores of the mainland, being low and covered with trees, are not so conspicuous as the high land of the island; consequently the latter will generally appear nearer when the vessel is in mid-channel between them. From abreast of Tikus islet the water in the fairway deepens gradually to 8 or 9 fathoms in the harbour of Georgetown.

Directions.—The fishing stakes which are situated from 3 to 4 miles north-westward from Tikus islet, and nearly 3 miles from the nearest part of the shore, are a guide to the deep-water channel; these extend into 4 fathoms water, but a good berth should be given to them as there are many old stakes broken off 2 or 3 feet under water. Pass one mile to the northward and eastward of these stakes and steer for fort Cornwallis when bearing S.S.E., altering course as requisite when nearing the anchorage.*

Tikus, a small islet surrounded by rocks, with an obelisk as a harbour mark, lies on the mud bank fronting the island at half a mile off-shore, and 4 miles north-westward of Fort point.

Vessels entering at night, should observe that Muka head kept southward of S.W., leads northward of the fishing stakes, and that fort Cornwallis kept southward of S.S.E. leads eastward of them.

* A wreck lies in 6 fathoms about half a mile northward of the fort; and another, marked by a buoy, lies N. $\frac{3}{4}$ E. distant $1\frac{2}{10}$ miles from the fort flagstaff.

These lights afford sufficient guide to the anchorage.

In tacking, the lead is a sufficient guide.

Anchorage.—The anchorage off Georgetown is situated in the narrowest part of the strait, which is here $1\frac{1}{2}$ miles broad; it is well sheltered and capable of accommodating a large number of vessels. There is deep water close to Fort point, and the water shoals gradually from half a mile eastward of the fort towards the main land; the best berth for a large vessel is about a quarter of a mile south-eastward of the Fort point in 10 or 11 fathoms, and for small vessels closer to the town, subject to the harbour regulations. It is necessary to moor as the tides run very strong. Vessels are prohibited from anchoring in the fairways.

A space is reserved for vessels of war about half a mile northward of fort Cornwallis, in which there is anchorage in from 6 to 10 fathoms, and is recommended in preference to the crowded anchorage southward of the fort.

A mooring buoy, painted black and white, lies in $4\frac{1}{2}$ fathoms, with the fort light bearing S. by E. $\frac{3}{4}$ E., distant about $3\frac{1}{2}$ cables.

A Shoal of 11 feet water has formed over a wreck lying in the anchorage south of the port. It is about a cable in extent and marked by a wreck buoy placed on its centre, with the landing pier bearing N. $\frac{1}{4}$ E., distant $6\frac{1}{2}$ cables.

SOUTH CHANNEL.—The South channel to Georgetown is between Jerajah island, Syrang sand and Middlebank on the west side, and Great Kra flat on the east side. The deep-water channel varies in width from half a cable to one mile, and has 19 feet least water.

Buoys.—The South channel is marked by red buoys on the western side numbered odd from the anchorage, and by white buoys on the eastern side, numbered even. There is no buoy No. 7, but a beacon with disc on the Kra flat, east side of the channel, abreast Jerajah island, bears that number. Buoys No. 9 and 10 lie about 2 miles south-westward of Remo island at the entrance to South channel.*

Fishing stakes extend a considerable distance into the fairway, and it is necessary to exercise caution to prevent their fouling the screws of steamers.

Directions.—From the southward a vessel should not bring Pulo Kandy to bear westward of N. by W. until Remo island lighthouse bears N.E. $\frac{1}{2}$ N.; course may then be altered for Remo island, passing between Nos. 9 and 10 buoys; thence the vessel will be guided by the buoys, to the anchorage off Georgetown.

Sailing vessels should not enter the South channel without a commanding breeze from the south or south-west, which breeze does not often blow except in the commencement of the rainy season, August and September.

* For lights on buoys, see page 60.

At night.—It is optional with the pilots whether they will take vessels in or out at night, or not.

The COAST.—Pry River.—The rivers Pry, Juru, Batucawan and Kreelin have their exit on the coast abreast Penang.

Pry river is situated on the main, nearly abreast of Georgetown, and eastward of the northern end of Great Kra bank. A mud-flat which dries, extends about 3 cables southward of the northern point of entrance, and about 2 cables off the east point. The channel over the bar has about 9 feet at low water, and is marked by red beacons on the port hand, and a white beacon on the starboard hand. The south point is embanked, and here are situated the workshops, &c., in connexion with the dock mentioned with the account of Georgetown, page 59). The river abreast the dock has from $2\frac{1}{2}$ to $3\frac{1}{2}$ fathoms at low water.

A harbour mark obelisk stands near the south point of the river.

Batucawan (Junjon) river entrance is almost dry at low water; inside the depths are from 2 to 5 fathoms. It joins the Kreelin river on the east side of Batucawan island. The chart will give the best idea of these streams.

Korrow or Knrow river, 3 miles southward of Kreelin river, is navigable for craft drawing $4\frac{1}{2}$ feet for a distance of 40 miles.

Kra islands lie off the entrance of Batucawan river, about a mile distant. North Kra island is one mile long and 337 feet high, and South Kra is three-quarters of a mile long and 270 feet high, separated from North Kra by a passage having 3 feet water. There is a channel of not less than 4 fathoms leading from Georgetown to Kra islands and the coast abreast, eastward of Kra flat. Southward of the islands, Great Kra flat blocks the passage.

The coast from Korrow river takes a southerly direction to Tanjong Plana, a distance of 8 miles, thence south-eastward for 11 miles to Tanjong Pasir, Slingsing bay, beyond which at a further distance of 5 miles is Larut river. This coast forms several bights, is low and thickly wooded, and bordered by Great Kra flat extending 10 miles off shore.*

Fishing stakes.—There are numerous fishing stakes many miles off shore, between Penang and Larut river, on the Great Kra bank, but generally within a depth of 3 fathoms.

The rivers Panjang and Kotah enter the sea between Tanjong Plana and Tanjong Pasir.

* See Admiralty chart :—Malacca strait, No. 793a ; scale, $m = 0.25$ of an inch.

SLINGSING BAY lies at the entrance to Sungai Sengar Besar, on which is Port Weld. Slingsing river also leads to Port Weld, but by a very circuitous route.

The bay has about 7 feet water in the channel of Slingsing river, but a bar of 4 feet, mud, sand and shells, comparatively hard, and $3\frac{1}{2}$ miles wide, lies seaward of it.

Tanjong Pasir, the northern point of the bay, may be recognised by the sandy beaches lying on the north and south sides of the point, the only sand in the neighbourhood. There is also a fishing village on it. The coast from the point, southward to Tanjong Krong, is mangrove jungle, covered for some distance inland at high-water springs.

Tides.—It is high water, full and change, in Slingsing bay at 1h. 58m., and at port Weld at 2h. 26m.; springs rise 8 feet, neaps 6 feet.

At 2 miles off Tanjong Krong the flood runs S.E. and the ebb N.W., at the rate of $1\frac{1}{2}$ miles an hour.

PORT WELD or **SAPETANG** is distant 5 miles from the entrance to Sungai Sengar Besar, at its junction with Sapetang channel leading from Larut river; a somewhat longer route from the sea, to be described hereafter.

The town, the future port of Larut, is building on the point forming the south side of entrance to little Sapetang river. A wharf, 400 feet long, with a depth of 10 feet alongside at low water, is in course of construction; and a railway is nearly completed (1885) to Thaipeng.

Sungi Sengar Besar—Directions.—Approaching Port Weld by Sungai Sengar Besar, and having crossed the bar which has 4 feet at low water, and 12 feet at high water springs, no difficulty will be found in navigating to Pulo Sapetang, situated half a mile below Port Weld, the depths to which are not less than 12 feet at low water. This island is nearly connected at low water to the shore westward of it; the channel therefore is northward of that island, from whence port Weld will be seen south-eastward of it. Immediately eastward of Pulo Sapetang the river is barred by a bank having only 2 to 4 feet at low water, which must be crossed to reach the wharf; it is intended to dredge a channel over this bank. The best water will be found by keeping close down the east side of Pulo Sapetang until abreast its centre, when steer across for the wharf. The depth in the river off the wharf is from 3 to 4 fathoms.

LARUT RIVER.—The entrance of this river lies about 4 miles southward of Sungai Sengar Besar. It is nearly 2 miles wide between Tanjong Krong and Tanjong Burong, but nearly filled by mud flats which dry at low water. A bar nearly two miles in length, with a depth

of 4 feet at low water springs, fronts the entrance, inside which the water deepens.

Telok Kertang, about 7 miles from the entrance of Larüt river, is the present port of Larüt. It has a wharf and custom house; and the river abreast the town is 120 yards wide, with a depth of about 12 feet. A road connects it with Thaipeng and Matang. The shoalest spot in the river is abreast Trusan Siamang just below the police station, where the depth is only 4 feet.

Kwala Sapetang, 4 miles within Tanjong Krong, leads to Port Weld; its entrance has a short bar with 6 feet water.

Sungi Limau is separated from Larüt river by an extensive mud bank which dries in patches, the water deepens inside the bar to about 2 fathoms, the channel being marked by fishing stakes.

Light.—A *red* light is exhibited at an elevation of 30 feet, from a mast erected on Tanjong Krong, north side of entrance to Larüt river, visible about 4 miles.

Beacons with discs, mark the edges of the banks on both sides of Larut river as far up as Trusan Siamang, just below the police station. The discs on these beacons are painted black on one side and white on the other; the black side of discs must be always kept on the starboard hand, and white side of discs on the port hand, both on entering and leaving the river. Two beacons are also placed on the bar fairway, about one mile apart.

Directions.—Vessels should approach Larüt river with the lighthouse bearing East, until the outer beacons are seen, then they should be steered for, passing from one to 2 cables on either side in a depth of 12 feet at high water springs; pass northward of No. 3 beacon (showing the black side of a disc), the other beacons will then be seen, which mark both sides of the channel.

From abreast Kwala Sapetang bound to Telok Kertang, shoot across to the south shore to avoid the bank extending nearly across the channel from the east point of that channel, keeping that shore across the bar of 4 feet off Trusan Siamang, until abreast of the police station. Thence the river is narrow and tortuous, but deeper; the concave side should be kept as far as the last point before reaching Telok Kertang, when haul over for it as soon as the town opens, to avoid a spit off the creek on the north shore.

Proceeding to Port Weld haul into Kwala Sapetang when that channel is well open, the entrance to which has but 6 feet on the bar, thence deepening to Port Weld; when within the bar keep the concave side of the channel.

Pilots for Larüt river should be obtained at Penang.

Communication.—There is a daily steamer between Penang and Larūt, and telegraph communication with other places in Wellesley province. The principal export is tin; the imports are rice and other necessaries for the miners, who are principally Chinese.

THAIPENG (Taipeng) is the seat of government of the state of Perak, and also its largest and principal town. The houses are built of brick, laid out in squares, with streets 70 feet wide, at the foot of the Gunong Topei range, and 8 miles from port Weld. The assistant resident is stationed here, and the residency is built on a hill overlooking the town and mines. The principal buildings are the court-house and police barracks, the latter accommodating over 800 police who are Sikhs. There is a reading room and an hotel under European management. Water is led from the mountains and through the town by pipes.

A railway connects Thaipeng with port Weld. The chief product is tin from the mines in the district, principally worked by the Chinese. Gold is found in some parts, but not in sufficient quantity to pay for working.

Mountains.—Eastward and south-eastward of Thaipeng, and about 15 miles from the coast, mountains rise from the plains, the principal being Gunong Topie and Gunong Bubo; the former is near Thaipeng. Gunong Higa (Higna), a mountain eastward of Gunong Topei, is about 4,000 feet high, and is seen over the latter. Gunong Pondok, 1,800 feet high, a sugarloaf shaped limestone mountain, appears in the pass between Topei and Bubo ranges. It is seen only between the bearing of E. $\frac{1}{4}$ S. and E. by N. $\frac{3}{4}$ N., or when off Larūt river. Except in the rainy season (August to November) the summits are seldom visible.

The COAST.—Between Larut river and Dinding islands the three principal streams are the Trong, Juru Mas, and Bruas, fronted by the mud bank extending about 8 miles off shore. The Trong and Bruas are navigable by canoes for 56 miles. The Juru Mas is merely a tidal estuary.

False Dinding is formed by the two highest peaks of a short range of hills near the coast northward of Pulo Dinding, and by a vessel approaching from the northward are seen before Pulo Dinding, which they much resemble.

Pulo Tallong is a small islet lying a quarter of a mile from the coast near False Dinding, on the edge of a bight in the mud bank. Westward of Pulo Tallong the shore bank again extends seaward a distance of 4 miles, joining the shore 7 miles to the southward at Tanjong Hantu.

PULO PANGKOR or GREAT DINDING ISLAND is 5 miles long in a north and south direction, 2 miles broad, and separated from the mainland by Dinding channel, from one to 2 miles wide, and which affords secure anchorage for vessels of large draught.

The island is mountainous and densely wooded; the highest part is 1,318 feet high, and situated about 2 miles from the north point. On the north and south extremes are two hills, respectively 748 and 992 feet high. Two other mountains rise near the centre of the island, and attain a height of more than 1,000 feet.*

Great Dinding island, and the adjacent coast, commencing at Pulo Katta and extending 22 miles in a northerly direction, is British territory.

The population of the Dindings settlement number 2,322. The island is unhealthy, said to be caused by the bad quality of the water. The ruins of the fort, built by the Dutch in 1670, still exists in Telok Godown.

Supplies.—Poultry, eggs, and pigs occasionally, may be procured at most of the native villages at reasonable prices. Fish are plentiful, and may be caught with the seine in the bays; turtle may also be obtained in the season. Firewood is procurable.

Animal and vegetable life abound, but the density of the jungle renders the animals very difficult of approach. Great Dinding is known to contain the following animals, namely, hogs, deer (moose and other kinds), monkeys, civet cat, boa-constrictors, several kinds of cobra and other deadly snakes, tigers, alligators, guanas, lizards, scorpions, centipedes.

Of birds, cranes and pigeons. Of fruits, durian, pineapple, mango, and pomegranates, in small quantities.

Communication.—Steamers to and from Penang, call at Pangkor and the places along the coast about three times a week.

Telok Nipa (West Anchorage).—The west shore of Great Dinding is deeply indented, the bays however are comparatively shallow. On this side of the island, in Telok Nipa, north of Pulo Bintangan (Long island), there is fair anchorage in 4 fathoms, sand, 2 cables from that island. This anchorage is sheltered from all winds, except those from W.S.W. to North.

Between Pulo Pangkor Laut (Little Dinding island), which is 446 feet high, and one mile in length, and Great Dinding there is good holding ground in $3\frac{1}{2}$ fathoms, at $2\frac{1}{2}$ cables from the main island, and with the north peak of Little Dinding bearing W.S.W.

On the south and west sides of Great Dinding, without entering the bays, deep water will be found within a cable of the shore.

The Mainland.—**Tanjong Hantu**, about 3 miles northward of Great Dinding, is a sloping point whose summit is 757 feet high. It forms the north point of entrance to Dinding channel.

The shore from Tanjong Hantu to Motts point, north entrance point of Dinding river, is skirted by a shoal bank, having a depth of 3 to 12 feet,

* See Admiralty plan of the Dinding islands and channel, No. 792; scale, $m = 3$ inches.

and extending from the shore a distance of 6 to 8 cables; it gradually diminishes its distance from the shore south of Mudge bluff as point Motts is approached, and becoming dry in patches at low water springs at one mile from that point. Lloyd rock, a pinnacle, awash at low water springs, with 6 to 8 fathoms around it, lies 4 cables West of the point.

Dinding River, has a deep and clear entrance, which between Mehegan and Motts points is 8 cables wide. The deep water passage between North and East banks has a depth of about $4\frac{1}{2}$ fathoms at low water, thence a channel 3 cables wide, and having 5 to 9 fathoms, extends 3 miles up the river, the farthest point reached by the surveying parties. Yellow cliff 14 feet high and Red cliff 26 feet high, both on the south bank of the river, are conspicuous.

Pulo Katta, a small wooded islet, 77 feet high, stands on the edge of the bank near Tanjong Katta, south entrance to Dinding channel, and is separated from the mainland by a shallow and rocky passage 3 or 4 cables wide.

Light, building.

The coast between False Dinding and Pulo Katta is rocky with undulating hills close to the sea.

DINDING CHANNEL.—**North bank**, having a depth of 3 to 15 feet, mud and sand, with one patch dry at low water, lies in the north entrance of Dinding channel, and with the shoal bank which skirts the main land adjacent nearly fills the north entrance of that channel. Its southern extreme lies half a mile north-east from Scorpion point, Great Dinding. The southern edge of North bank, trends thence in a north-west direction $2\frac{1}{2}$ miles to the western extremity of the bank, at which part there is a depth of 15 feet.

Wedge rock, 3 feet high, lies on the west edge of North bank, and S.W. by W. $1\frac{1}{10}$ miles from Tanjong Hantu.

An outlying patch of 3 fathoms is situated 7 cables W. by S. from Wedge rock.

Buoys.—A white buoy marks the south edge of North bank, abreast Off-lying islet. A red buoy marks the north extreme of Bower patch. Two white buoys mark the passage to Dinding river, one being placed on the south-east extreme of North bank, the other on the north point of East bank forming the south side of the passage. These buoys are conical and numbered from 1 to 4 from seaward. Too much dependence must not be placed on the buoys maintaining these positions.

Pulo Trendah (north-west islet), 100 feet high, is small, thickly wooded, and lies 5 cables distant from the north-west point of Great Dinding; in the channel between there is a depth of $3\frac{1}{2}$ to 10 fathoms. There is deep water within half a cable of the islet, except on

the west side, where at three-quarters of a cable distant there is a sunken rock having 3 feet water. Pulo Plando, a small islet, 7 feet high, lies nearly midway between North-west islet and Great Dinding.

North Point.—The shore of Great Dinding, between North-west point and North point, is bordered by a shoal flat, which extending from either point forms a tongue, the extremity of which is nearly midway between the two points, and extends off shore a distance of $1\frac{1}{2}$ cables. On the outer end of this tongue is Grasshopper islet, 120 feet high and wooded.

Off-lying rock, 2 feet high, occupying a shoal space of half a cable in extent, east and west, lies East 2 cables from North point. Midway between the rock and the shore there are depths of 5 to 8 fathoms.

Telok Dalam (Shoal bay) is formed between a point which is half a mile south-east of North point, and Scorpion point. At the head of the bay there is a fishing village and a cocoa nut grove. The bay is shoal, having only from 6 to 9 feet water on a line joining the entrance points. A spit extends about 2 cables eastward and northward of Scorpion point.

Charybdis rock, a pinnacle having a depth of 2 feet, lies $1\frac{1}{2}$ cables north from Scorpion point. The ground is foul between.

Bower patch, having a depth of 15 feet, is about half a cable in diameter, marked by a buoy on its north side, and lies N. by W. $\frac{1}{4}$ W., distant 3 cables from Scorpion point. The summit of North-west islet, in line with North point, leads on to Bower patch. The summit midway between North point and off-lying islet, leads north of Bower patch in 4 fathoms least water.

Table rock, 22 feet high, is situated one mile south-east of Scorpion point, and about one cable from the south point of Telok Chumpada, a shallow bay.

The east shore of Great Dinding from Table rock, trends south, and at the distance of one cable outside the small bays formed in its shores not less than 6 fathoms water will be found.

‡ **Port Pangkor.**—The settlement at Port Pangkor, situated one mile southward of Table rock, consists of a police station and a few houses scattered on the beach. The ground in the vicinity is swampy.

Small vessels may be readily and safely grounded for examination or slight repairs between tides. Labour may be obtained.

East bank commences at Mehegan point, and skirting the shore for about one mile to the southward, thence trends to the westward and northward in a long narrow tongue, dry in places; the north point of the tongue of 3 fathoms, immediately in the approach to Dinding river, is marked by a buoy, with Menegan point bearing S.E. by E. distant one mile. East bank skirts the mainland as far as Tanjong Katta; its western edge from

the north extremity of the tongue trending nearly parallel to the adjacent shore of Great Dinding, at distance of 4 or 5 cables. The depths on the western edge of the bank vary from 3 to 15 feet, mud.

Anchorage.—Abreast of port Pangkor there is secure anchorage for vessels of large draught, and sufficient space for several vessels to moor. A good berth is with the mouth of Sungai Penang bearing W.N.W., distant 3 cables, in 8 fathoms, mud, and the same distance from the edge of East bank. The usual anchorage is off the police station, where there is a landing place just southward of it.

Bathing is unsafe on account of numerous alligators.

Tides.—It is high water, full and change, in Dinding channel at 3h. 15m.; springs rise 9 feet, neaps 5 feet. The flood stream in the north entrance sets fairly through the channel. In Dinding channel and south entrance the ebb sets N.N.E., and flood S.S.W., at the rate of 2 to 3 knots at springs. In Dinding river both the flood and ebb set at the rate of $3\frac{1}{2}$ knots at springs, and 2 knots at neaps.

South-westward of Great Dinding the flood sets S.E., and ebb N.W., and through the narrow passage between Pulo Pangkor Laut and Great Dinding at the rate of 2 to $3\frac{1}{2}$ knots at springs.

DIRECTIONS.—North Entrance.—The North entrance is not recommended for vessels of more than 12 feet draught, for although the channel is buoyed, and there is not less than 4 fathoms, yet the passage is narrow, being only 2 cables wide in the narrow parts. As buoys may be out of position, the eye is the surest guide, when the sun is in a favourable position for showing up the shoals; due attention should be paid to the speed of the vessel and to the set of the tide. The saving in distance is only about 5 miles to vessels coming from the northward.

Approaching from this direction, the north peak of Great Dinding should not be brought to bear southward of S.E., which leads well to the westward of North bank. North-west islet will be sighted ahead on this bearing, and passing it on the starboard hand at one cable distant, steer to pass half a cable northward of Off-lying rock, and between it and the buoy on North bank; then bring the summit of North-west islet midway between Off-lying rock and North point. This mark astern will lead one cable north of Bower patch, marked by a buoy, and one cable south of North bank. When Scorpion point bears S.W., or being abreast of the white buoy at south-east end of North bank, alter course to pass about $1\frac{1}{2}$ cables eastward of Table rock, and thence, preserving the same distance from the island, to the anchorage recommended off port Pangkor.

If bound to Dinding river, still keep North-west islet midway between North point and Off-lying islet, and when Scorpion point bears S.W. sheer a little to the southward to give the south-east extreme of North

bank a wider berth, and bring the leading mark on again before the north end of East bank is approached.

There is also a channel eastward of North bank; it may be approached by steering in for Tanjong Hantu bearing E. by S. $\frac{1}{2}$ S., until 3 cables from it, thence S.S.E. $\frac{3}{4}$ E to Dinding river passage. This channel is suitable for vessels of 10 feet draught, but should not be taken without local knowledge.

South entrance.—From the southward, from between Fairway rock and Pulo Katta, steer to bring Table rock nearly in line with Tanjong Hantu bearing N. by W. $\frac{1}{2}$ W.; this mark will lead in mid-channel to the anchorage off port Pangkor.

If wishing to enter Dinding river steer from the anchorage to pass Table rock 2 cables distant, and thence midway between East bank and the island, until the north summit of Great Dinding bears S.W. $\frac{1}{2}$ S.; keep that mark astern until the summit of North-west islet is between North point and Off-lying islet, and proceed with that astern into the river.

Fairway rock, 27 feet high, lies S. by W. $\frac{1}{2}$ W. nearly 4 miles from the south-east point of Great Dinding; a sunken rock, having less than 6 feet water, lies half a cable from its north side, and a depth of 4 fathoms near the west side of the rock. There are depths of 9 to 16 fathoms between the rock and the mainland, and 10 to 20 fathoms between the rock and Great Dinding.

PERAK (PERAH) RIVER.—From Tanjong Katta the coast is low, covered with jungle, and forms a bight, in which are several villages, to the entrance of Perak river, situated about 14 miles south-eastward of Great Dinding island. Between Tanjong Katta and Tanjong Kupa there is a sandy beach fronted by mangroves. The bight is skirted by a bank which extends 2 to 5 miles from the coast, and nearly blocks up the entrance of Perak river. The best navigable channel to the river and the one always used, is the Eastern channel, with 10 feet least water, near the north shore, at about $1\frac{1}{2}$ miles westward of Tanjong Kupa and the same distance off the shore of the bight. Southward of this channel the mouth is nearly all shoal, and dry in places, and on which at times during the S.W. monsoon the sea breaks heavily. There are many fishing stakes on these banks. There is a passage known as Southern channel, southward of the middle banks in the entrance, with a depth of 8 feet at low water, hard sandy bottom, but it is very narrow and of no use unless buoyed.

As the banks may be liable to shift caution must be used when entering.

The river inside is wide and deep, and navigable for vessels of 11 feet draught as far as Durian Sabatang, about 36 miles from the entrance,

and for steam launches some miles beyond. The only part difficult of navigation is the entrance.*

Perak river is supposed to rise in Siamese territory, near the source of Muda river, the northern boundary of Wellesley province. It flows due South with many tortuous windings for about 100 miles as far as Durian Sabatang, from which it runs in a westerly direction to Malacca strait. The banks of the river are mostly low and covered with jungle.

Its chief importance arises from the tin mines of Lower Perak, the yield from which is rapidly improving. In 1879 it amounted in value to 236,000 dollars.

The population of Perak state is about 78,000, of which 56,000 are Malays and 20,000 Chinese.

Light.—A lighthouse is being constructed at Kwala Perak, on the south side of entrance to the river.

A Buoy marks the north-east edge of the middle flats, in 13 feet, and lies with Pulo Katta bearing N.W. by W. distant 8 miles, Kwala Perak lighthouse S.S.E. distant $5\frac{1}{4}$ miles, and the large bank which dries at low water, half a mile south-westward.

Directions.—East Channel.†—From the northward, having passed Pulo Katta, steer to bring the south point of Pulo Pangkor nearly touching the north point of Pangkor Laut bearing N.W. by W. $\frac{1}{4}$ W.,‡ which mark astern will lead northward of the outer fishing stakes and to the buoy, in 10 feet least water. From the southward, the western island of the northern group of Sembilan island, 262 feet high, should be brought northward of the eastern island of that group before bringing the above mark astern. After rounding the buoy, the lighthouse buildings will be seen open to the eastward of the fishing stakes to the southward, bearing S. by E. $\frac{1}{4}$ E.; this bearing kept on will lead over the bar in not less than 10 feet at low-water springs. The deepest water is on the eastern side of the channel; small fishing stakes border this side, and larger ones the western side. When the entrance is well open alter course up the river, keeping about 2 cables from the south shore until past the long shoal lying nearly in mid-channel, when cross over and keep the concave bank of the river to Kota Stiah. (There is a channel northward of the mid-channel shoal, but is not usually taken by local traders.) The first reach in the river is the shallowest (about 10 feet) between the entrance and Telok Ansou, 30 miles up.

* See Admiralty chart :—Malacca strait, No. 793*b*; also 1,353.

† Lieutenant Henry Belam, R.N., Admiralty Surveyor, 1884.

‡ This bearing of Pulo Pangkor leads over Pulo Katta by the chart; if such is the case the two objects in line form a much better mark.—Ed.

Kota Stiah.—There is anchorage off Kota Stiah, in 4 fathoms, mud, at about 2 cables from the shore. A bank of 6 feet lies in mid-channel off Kota Stiah, with the red tiled house bearing about S.E. $\frac{1}{2}$ E. It is to be observed that in most rivers deep water will be found in the bights or concave sides of the river and that shoals will be found off the points, which therefore should be given a wide berth, also that the position of banks in the river are liable to alteration by the freshets.

Leaving Kota Stiah keep close to that shore until southward of the middle patch, then cross to the concave bank of the river ; from abreast the first point steer about mid-channel.

Depth of 6 to 11 fathoms will be obtained in the channel between Kota Stiah and Baturabit.

On arriving at Single-tree point, distinguished by a white board fastened to a tree just below Baturabit, give it a good berth, and after rounding it steer in for Baturabit, which will then be in sight in the bend on the left bank, but keeping the left bank on board until the first point above Baturabit is neared, then sheer over to the right bank until the point is rounded. Return again to the left bank and keep it close on board until abreast the Cocoa-nut grove on that bank in the next bend, just below Telok Menintam, then steer across to the opposite bank for the white board on a tree, on reaching which steer across to a similar board on the left bank, and keeping that bank to the end of that (Long) reach, where is the new settlement.

Telok Ansou, the new settlement, is on the left bank of the river, at three-quarters of a mile by a good road from Durian Sabatang, and 30 miles from the entrance to the river. It consists of numerous wooden houses with tiled roofs, a custom house and police barracks ; the magistrate of the district resides here. Trade is carried on by Chinese, who supply the tin miners in the interior. Tin is the principal export, and is brought from the mines situated 60 miles up the Bidor river, and 6 miles from its banks. This river enter the Perak at Durian Sabatang. There is frequent communication between this place and Penang and Singapore.

Anchorage.—There is anchorage close off the settlement in 6 or 7 fathoms ; a shoal extends from the opposite point nearly half way across the river.

Vessels do not usually proceed beyond this anchorage.

Durian Sabatang.—Beyond Telok Ansou the channel to Durian Sabatang is difficult, owing to the narrow passage between the sandbanks and the absence of landmarks. The channel is close in to the right bank when clear of the shoal point abreast Telok Ansou, until a small island is reached, and which must be kept close to on the port hand ; when abreast an opening in the jungle, or one cable northward of the islet, the houses of

Sabatang will be seen opening of Padamer point, when steer direct for the point allowing for tide, and keep close to that shore up to Sabatang.

Great care is necessary in making this crossing, the deep channel being very narrow, and the sandbanks on each side dry at low water. The least water found by the *Ringdove* (1875), in the channel at low-water spring tides was 8 feet, and at high-water springs 18 feet.

Durian Sabatang, formerly the settlement, and the highest point which may be reached by gun vessels drawing 11 feet, is 36 miles from the entrance. Most of the former inhabitants have removed to Telok Ansou, where all the trade is carried on. There is just room to moor off Durian Sabatang, but the place is now seldom visited.

Water is of indifferent quality, the best is obtained from a stream flowing over the sandbank opposite the village.

Tides.—It is high water, full and change, at the entrance to Perak river at 3h. 15m., springs rise about 9 feet, and neaps 5 feet. The ebb runs about $2\frac{1}{2}$ knots an hour. From January to March the tide falls about 2 feet lower than the average spring. The tide is $2\frac{1}{2}$ hours later at Durian Sabatang, and the springs rise 12 feet; the ebb stream runs at the rate of $2\frac{1}{2}$ to 3 knots, the duration of the flood varies considerably, depending on the rains. The tides reach to the entrance of Kinta river.

The water in Perak river is fresh from 2 miles above Kota Stiah.

Residency.—Banda Baru, the former site of the British residency, is estimated to be 9 miles above Durian Sabatang. The residency has been moved to Kwala Kangsar, some 72 miles above Telok Ansou, and on the right bank of the river. It is 22 miles distant from Thaipeng, with which it is connected by a road. There is little communication between the residency and Telok Ansou, there being no road; the journey by the river is long and tedious.

Kota Lumut, a village on the right bank 5 miles above Durian Sabatang, and three-quarters of a mile below the entrance to Kinta river is the highest point steam launches can reach.

Kinta River (a tributary of Perak).—Commander Singleton remarks that “returning on the 6th January 1875, from service with the “Naval Brigade at Kinta, the river was found to be greatly swollen from “the few previous days’ rain, and the sandbanks, which there had been “great difficulty in passing, had now sufficient water to allow of boats “going over them. The British residency on the island off Banda Baru “was entirely flooded, and the guns landed were entirely under water. “The river, which had risen at least 20 feet, fell suddenly about the 10th “January, and owing to the shifting bottom (fine sand), the entire course “was altered. The current on this occasion ran at the rate of 5 or “6 knots.”

Perak State, adjoining Province Wellesley (British), on the north, and bounded by the entrance of Berman river on the south, has a coast line of about 80 miles in length, and a breadth of 50 miles. Part of the coast line of Perak state is now British territory.* The whole state is a vast jungle, with a few scattered villages. The soil is said to be extremely fertile, and capable under the influences of the mild climate of producing coffee, sugar, indigo, and other tropical plants. The chief article of trade is tin, brought from the workings situated near that foot of the mountain range, and sent to Penang. The tin mines are in the hands of the Chinese. Rice and Chinese goods are the principal imports. Several small steamers and coasting craft trade between Singapore and Penang, calling at the Perak and other rivers.

SAMBILANG ISLANDS, lying to the westward of the entrance of Perak river, occupy a space of 6 miles in a north-east and south-west direction, they are mostly small, bluff, high islands, covered with trees, steep-to, and may be seen from a distance of 20 miles. There are some small sandy beaches on the larger islands, but landing is difficult on account of the reefs fronting them. The northern group consists of four islets and a rock. The western islet is 262 feet high, and the eastern 186 feet. In the southern group there are six islands and two off-lying rocks. Pulo Rembia 615 feet high, the largest of the islets, has two peaks of nearly equal height; Pulo Lalang 388 feet high is in two portions, joined by a reef which dries at low water. Two islets 80 and 20 feet high lie westward of Pulo Lalang, and a rock which dries lies 2 cables southward of the southern one. Pulo Buluh the southern islet, 460 feet high, has a flat top. Black rock 8 feet high, and White rock, 35 feet high, lie about 2 miles westward of Pulo Rembia and Pulo Lalang, and about one mile apart in a north and south direction. The channels between the southern group of islets have not been examined. The edge of the bank of 3 fathoms which lies off Perak river is about 5 miles distant from the nearest of the Sambalang islands.

At night the Sambilangs should be approached with caution, as the depths are from 23 to 26 fathoms close-to and amongst the islands.

PULO JARRA, lying near the middle of the strait, about 26 miles W. by S. of the highest Sembilang island, is conical, about 500 feet high, half a mile long, and covered with trees. The islet is steep-to all round, with the exception of a cluster of boulders which extend about a cable from the north-east side, with a depth of 10 fathoms close-to.

DIRECTIONS.—The north and north-east winds frequently blow strong between Pulo Jarra and the islands at the north end of Malacca strait ;

* See page 2.

vessels, therefore, from the southward bound to Penang during the north-east monsoon should, after passing Dinding islands, keep near the edge of the mud bank which lines the coast, that they may not be delayed with the strong N.E. wind and short sea likely to prevail in the offing near Penang.

Vessels bound south-eastward should pass between Pulo Jarra and Sambalang islands, for the current often sets strong to the north-west in the middle of the strait, and calms are more prevalent there than near the coast. *Continued* on page 87.

The COAST between Perak river and Selangor river is low, covered with jungle, and skirted by a mud bank, on the edge of which a depth of 3 fathoms is found at one to 5 miles from the shore.

Fishing stations consisting of bamboo enclosures, 30 or 40 yards square, strengthened by cross poles, and having a solid platform well above the water, are situated along the coast, a few miles apart. They are almost always in 5 fathoms water, rarely in less, and are therefore useful in pointing out where the water shoals.*

Berman river.—The entrance to this river is situated about 13 miles southward of the entrance of Perak river. It is one of the finest on the Malay coast, has 17 feet on the bar at high water, and is said to be navigable for steam launches for about 100 miles; the snags would then prevent further progress.

The 3-fathom edge of the shore mud bank extends 3 miles off the mouth of the river.

Light.—A *fixed* white light is exhibited from a white lighthouse, at an elevation of 25 feet above high water, on the north point of entrance to Berman river, visible about 4 miles.

Directions.—The lighthouse can be distinctly seen at 3 or 4 miles distant, showing conspicuously against the dark green trees behind. It should be steered for on the bearing of N.E. $\frac{1}{2}$ N., which leads in the deepest water over the bar, passing between the fishing stakes.

In the first reach, which is long and shallow, keep in mid-channel; then follow the bends of the river, avoiding the points. The deepest water is almost invariably close in to where the nepa palms grow, and shoalest where there are mangroves. The tides run strong in the river.

H.M.S. *Moorhen*, drawing $10\frac{1}{2}$ feet, crossed the bar of Berman river in February 1877, and proceeded as far as the village of Sabba, about 20 miles from the entrance. The vessel crossed at one hour before high water, and had not less than 16 feet on the bar, and not less than 17 feet, bottom soft mud, in the channel to Sabba, where she moored in $5\frac{3}{4}$ fathoms.

* Navigating Lieutenant W. H. Stephens, H.M.S. *Egeria*, 1875.

SELANGOR RIVER.—The entrance to this river, 40 miles south-eastward of Berman river, may be recognised by Salangore hill, situated on the peninsula forming the south side of the entrance; the hill is high, conspicuous, covered with trees, and surmounted by a fort. The coast mud bank extends across the mouth of the river; its outer edge of 18 feet is about 3 miles westward of the entrance.

Settlement.—The magistrate resides in the fort on Salangore hill and the settlement is at the foot of the hill, about 3 cables within the south point of entrance. There is a Malay village on the opposite point. The population of the district is 31,000; the exports are tin, gutta-percha, gharwood, ivory, bark, hides, salt fish and rattans; the imports are rice, salt, opium, tobacco, tea, and oil. Revenue \$184,000. Tin is brought by boats from the mines situated 15 miles up the river, and taken to Singapore by coasting steamers.

Beacons.—The best channel, with about 15 feet at high-water springs, is marked by two rows of beacons, one cable apart, surmounted by baskets, the outer being placed in $2\frac{1}{2}$ fathoms at low water.

Light.—A white light is shown from a small house in the fort, visible about 3 miles.

Directions.—Vessels entering Selangore river should bring the conspicuous tree on the south point of entrance to bear N.E. $\frac{3}{4}$ E., passing between the beacons and fishing stakes, and rounding the beacon marking the edge of the bank off the south point, steer for the village, about 3 cables within the point. The holding ground is bad, being very soft mud.

Selangore river is usually navigable for boats for about 19 miles, and for steam vessels drawing 8 feet for 14 miles, or as far as Kampong Seear, but there is little room to swing there.* The bottom is soft mud. There is no danger in the river for a vessel of that draught, except a mud bank with 3 feet water, situated about 3 or 4 miles from the entrance, and about half a mile westward of a clump of attap trees 50 feet high. Close to the shore on either side of the mud-bank there is deep water. Above Kampong Seear there are several sand-banks.

The river is tortuous in its course, and the deepest water is found on the concave side. The banks are low throughout, and lined with attap and mangrove trees.

Tides.—It is high water, full and change, at Selangore river at 5h.; springs rise 15 feet, neaps 12 feet. The flood stream runs five hours, the ebb seven, at the rate of 5 miles an hour.

* In February 1885, the water in the river was so low that boats were unable to bring the tin down from the mines. H.M.S. *Rinaldo*, drawing 15 feet, entered the river in 1871, and bombarded the stockades (since destroyed) on both sides of the entrance.

The **COAST** between Salangore and Klang islands is thickly wooded, low, and flooded in most parts at high water. It is skirted by the mud-bank, already mentioned, which is dry at low water, and extends 3 miles from the coast northward of Botel islets, gradually nearing the shore to the southward.

Botel or Bottle Islets form a group of four, lying about $1\frac{1}{2}$ miles off the coast eastward of Pulo Anza; they are situated on the coast mud-bank, the outer one being 2 miles from the shore. Calcutta or sail rock, covered at half tide, and steep-to, lies three-quarters of a mile south-west from Pulo Tekolo, the south-western islet.

Pulo Anza, or Mudancūs, are two islets lying 5 miles off shore, and $9\frac{1}{2}$ miles southward from Selangor hill, on the eastern edge of the bank which extends north-west of Pulo Klang. There are depths of 5 to 8 fathoms between Pulo Anzo and Botel islets.

North Sands—Westward of Pulo Anzo are the North sands, for which see page 85.

KLANG STRAIT.—Pulo Klang and the islands to the south-west form with Pulo Lumaut, Klang strait, which was formerly used by vessels of moderate draught. It affords quiet and easy navigation, under the lee of the land, by which the North and South sands are avoided; but since the establishment of a lighthouse on One-fathom bank (North sands) much of the danger and difficulties of this portion of Malacca strait have been avoided, so that Klang strait is no longer recommended as a main route, although it is still used by coasting steam vessels.*

The strait is about 14 miles in length, and in its narrowest parts is from a quarter to half a mile wide. The least depth is $3\frac{1}{2}$ fathoms, in the northern part, and with the exception of the spit extending from Pulo Lumaut, at one mile south-west of Deepwater point, the banks are steep-to.

Pulo Klang or (Callam)—This island, with the mainland, forms the northern part of Klang strait, which is at this part one mile wide. The island is low and wooded, about 7 miles long, and 4 miles broad. Close to the north-west side Pulo Klang is an island $2\frac{1}{2}$ miles long, and three-quarters of a mile broad. On the south-west side of Pulo Klang, and extending 5 miles south-westward, is a group of five islands, the two largest of which form one side of Klang strait, and on the southernmost is the light. All these islands are low, formed of black mud, and covered with mangroves. Pulo Klang, together with the islands mentioned, are situated on the south-east side of a mud-bank which extends 16 miles north-west of Pulo Klang, and 6 miles south-west of the same island. At

* See Admiralty charts :—Malacca strait, Nos. 793*b*, and 794*b*.

its north-western part the bank is 4 to 6 miles wide, and has from 6 to 10 feet water, which breaks at half ebb.

Light.—A *fixed* white light is exhibited at an elevation of 30 feet, from a wooden framework erected on the south-east corner of the island forming the west point of entrance to Klang strait from the southward. It is visible from the southward for the distance of 10 miles.

Pulo Lumaut is 9 miles in length, and forms the south-east side of Klang strait. Its north-west point is distant but 3 cables from Deep-water point, on the west side of the strait. A large Malay house stands on the south-west point of the island, at the south entrance of the strait.

Directions.—From abreast Selangor river bound through Klang strait, steer for Pulo Anza bearing South, which may be approached close to on its eastern side, and take care not to shoal less than 6 fathoms near the bank which lies to the north and west of that islet. Between Pulo Anza and the south-west Botel islet the passage is $2\frac{1}{2}$ miles wide, and has depths of from 4 to 8 fathoms. From half a mile eastward of Pulo Anza a S.E. course leads into the middle of the strait, which is difficult to distinguish until close-to.

When about 2 miles south of Green point, north-east extreme of Pulo Klang, keep the western shore aboard, to clear the bank of $3\frac{1}{2}$ fathoms which lies nearly in the centre of the channel, and when south of it haul over for Deep-water point to avoid the $2\frac{1}{4}$ fathoms patch lying close off the entrance to Klang river. The 4 fathoms patch lying nearly midway between Deepwater point and the north-west point of Pulo Lumaut may be avoided by keeping the Lumaut shore; thence a mid-channel course to avoid the spit extending 2 cables off the Lumaut shore at one mile to the southward. The bank on the west side is steep-to, with some low bushes growing on it, and is scarcely a danger. The south entrance is clear beyond one cable from each point. In passing Deepwater point caution should be observed, as the tides set very strong past the north end of Pulo Lumaut.

Working into Klang strait from Selangor road, vessels should not stand into less than 4 fathoms towards the shore, and 6 fathoms towards the bank which lies to the westward. Botel islands should not be approached within one mile, the bottom being uneven, and there being a dangerous rock (Sail rock) lying three-quarters of a mile south-west of Tekolo islet. When about 4 miles southward of Botel islets, the coast may be approached to within half a mile, but in standing to the westward vessels should not shoal less than 4 fathoms, and Pulo Anza should not be brought to bear northward of N.W. Should a vessel, however, ground here no damage can be sustained, the banks being of soft mud and the water invariably smooth.

From the Southward.—When Parcelar hill bears about E. by N. the entrance of Klang strait may be easily discerned, the several points appearing as bluffs, the most southerly of which is Lumaut point with a large Malay house on it; the framework for exhibiting the light on the western point of the strait should also be seen.

The light should be approached bearing about N.N.E. until the passage is well open bearing N.E. $\frac{1}{2}$ N., when that course may be steered, keeping in mid-channel.

The lead is a safe guide for vessels working through. The directions from the northward must be reversed for the remainder of the strait. Caution is required in passing across the entrance to Lumaut strait on the ebb, on account of the strong tides which set into it; also in steering for Klang strait not to get set to the westward of the entrance, as a dry bank extends in that direction with deep water close to its edge. The best time for entering is near the time of high water.

Tides.—It is high water full and change, in Klang strait at about 4 hours, rise of tide being from 10 to 12 feet.

The tides at springs are rapid and somewhat irregular. The stream sets to the southward from first quarter flood to first quarter ebb, and to the northward for the reverse period.

KLANG RIVER.—The entrance of this river is in Klang strait. Its banks for a distance of 30 or 40 miles in the interior are high and covered with mangroves and various sorts of palms. It is from one to 4 cables broad, and free from danger for about 11 miles from the entrance, with a least depth of 6 feet at low water. Vessels drawing 8 feet can proceed for a distance of 12 miles beyond Klang. The soundings are irregular.

Light.—A small light is shown from the police station on the south shore, at the entrance of Klang river.

Klang.—The village of Klang is situated at about 12 miles from the entrance, and defended by a fort on a hill. A spit extends about 20 yards off the pier, below the fort at Klang, narrowing the channel to about 80 yards. There are about 20,000 Chinese in the interior working the tin mines, the tin being brought down in boats, which take a return cargo of rice. Supplies are scarce.

Kwala Limpor the capital of Selangor is 25 miles from Klang. Steam launches run from Klang to Dama-sara, 16 miles up the river, whence the distance by road to the capital is 16 miles. A railway is under construction to connect the two places.*

* Lieutenant H. Belam, R.N., 1865.

Directions.—Klang river should be approached by Klang strait. From abreast Deepwater point keep along the Lumaut shore to avoid the $2\frac{1}{4}$ fathoms shoal lying off the northern point of the channel, thence a mid-channel course for the police station, a large white house on the south point of entrance to Klang river. The station should be kept aboard to avoid a spit which projects from the north point. Having entered the river, keep mid-channel and follow the general rule of keeping in the bends and avoiding the points. Great care is necessary in approaching Klang, as the channel is narrow, and the bends sharp; in the second bend below Klang the depth is but 6 or 7 feet at low water; the spit off the pier below the fort must also be avoided.

Anchorage.—Moor head and stern off the town in 2 to 3 fathoms mud; the holding ground is bad. The river here is from 80 to 100 yards wide, and there is not room to swing without touching the bottom at low water.

Lumaut Strait.—The eastern side of Pulo Lumaut is separated from the mainland by Lumaut strait, half a mile wide, and having very strong tides. This strait is not recommended for even small vessels.

In the reach between the entrances of Klang and Langat rivers, at about 3 miles from the village of Lower Klang, there is a shoal having a depth of 3 feet, hard sand. The channel is between it and the main, and keeping close to the main as far as Langkat river, southward of which no vessel should navigate without the assistance of a pilot.*

LANGAT RIVER has two mouths, one of which opens into Lumaut strait, the other (the Jugru) into the sea to the south-west of Parcelar hill. In the former the turnings are sharp and numerous; H.M.S. *Teazer* and *Midge*, 1871–4, drawing $8\frac{1}{2}$ feet, ascended this branch to Langat, about 13 miles from the entrance, and at its junction with the Jugru. A good look-out must be kept for snags, and the services of a pilot are necessary. At about $1\frac{1}{2}$ miles inside the entrance, and extending nearly across, is a sand-bank having only a depth of 2 feet; the deepest water is very close to the banks on either side. With the exception of this bank the shoalest water found was 9 feet. The *Teazer* moored opposite the Sultan's palace, a Malay entrenchment having a few guns, and had room to swing only in one direction. The Sultan of Langat derives a large income from the tin which is brought from the interior.

Jugru river, the southern mouth of Langat river enters the sea 10 miles south-eastward of Lumaut strait.† This river has about 3 feet on the bar at low water, and 3 to 8 fathoms as far up as Parcelar hill, but is only navigable for vessels of about 10 feet draught. The shore bank

* See Admiralty charts:—Malacca Strait, Nos. 793b and 794b.

† See Admiralty chart:—Malacca Strait, No. 794b.

extends 2 miles off the mouth of the river, is steep-to, and shoaling suddenly from about 15 fathoms to 3 fathoms ; it is usually marked by fishing stakes.

Parcelar hill, or Bukit Jugru, on the left bank of the Jugru at about 4 miles from the sea, is, when seen from the northward or westward, of an oblong shape sloping at both ends, but from the southward it appears conical. It is thickly wooded, isolated, and the only hill standing near the sea coast ; it is easily known, and in clear weather may be seen from a distance of 35 miles.

Langat village is 7 miles from the sea by the Jugru branch. Jugru village, about 5 miles from the sea, is situated near Parcelar hill, and about 2 miles below Langat. The water is deep off Jugru village, and the granite face of Parcelar hill comes close down to the bank. There is a police station and a good landing place. The residency is on the slope of the hill, and the palace of the Sultan of Selangor is on the eastern side of the hill, with a road leading to it from the landing.

Light.—From a wooden framework, with the upper part painted white, erected on south point of entrance to Jugru river, is exhibited a *fixed* white light, visible in clear weather from a distance of 4 miles.

Beacons.—The entrance to the river across the bar is marked by white beacons on the port hand, and black beacons on the starboard hand. A police station with a red tiled roof is situated near the lighthouse.

Directions.—The entrance to Jugru river may be recognised by the police station and lighthouse on its south entrance point, the bar beacons, or by Parcelar hill. The latter kept on a N.E. by N. bearing leads up to and between the bar beacons. A depth of 14 feet, hard bottom, was found on the bar at high-water springs, by H.M.S. *Fly*, in 1882.

Within the bar the river is 200 yards wide, and depths of from 3 to 8 fathoms, as far as Parcelar hill, where several branches of the river unite, and where also there is anchorage. The tides in the river are strong, and caution must be taken to avoid snags. Above Parcelar hill the river appears to be only navigable by steam launches.

The COAST.—**Parcelar point**, is situated about 9 miles south-eastward of Jugru river, and being round and similar to the adjacent coast is not easily distinguished, but a little eastward of the point there is a white beach or patch on the shore, and a similar white patch about 5 miles south-eastward of it. There is a depth of 15 fathoms at about half a mile off the point.

From Parcelar point the coast takes an easterly direction for 12 miles to Sungi Sepang, which is said to be navigable for craft drawing 5 feet ; thence in the same direction for 6 miles to Sungi Lukut ; thence southward to Tanjong Kamuning, forming between the latter and the point eastward of Sepang river a shallow bay 2 miles deep and 7 miles across.

The whole of the coast from Parcelar point to Sepang river is low thickly wooded, and skirted by a sand-bank which extends from a quarter, to half a mile seaward.

Although no villages or huts are to be seen on the coast, yet it is inhabited by fishermen who apparently live a short distance from the beach, for smoke may constantly be seen rising all along the coast.

Sungi Lukut, it is said, may be entered at high water springs by vessels drawing 9 feet; steam launches can ascend about 5 miles, as far as Rajah Bott house. At the mouth of the river is a village, the inhabitants of which carry on a trade with the Bughes boatmen, who exchange grain, &c., for the tin which is brought down from the hills. There are two good fresh-water streams in the bay on the east side of entrance of Lukut river.

At one mile north of Tanjong Kamuning is Pulo Burong, a small islet skirted by rocks and surrounded by shoal water. Half a mile south of Tanjong Kamuning is Pulo Arrang Arrang, a similar island skirted by rocks and standing on the bank fringing the shore.

Bambek Shoal is situated nearly midway between Parcelar point and cape Rachada, at 3 miles from the shore. The shoal is dry near its centre, composed of hard sand, and within a depth of 18 feet is 2 miles long in a direction parallel to the coast, and 7 cables broad; it is steep-to, the water deepening suddenly to 8 or 10 fathoms within one cable. Between Bambek shoal and the nearest part of the shore, is a small bank of $3\frac{1}{2}$ to 10 fathoms, irregular soundings, between which and the shore there is a deep channel, one mile wide.

Westward of the north-west extremity of Bambek shoal are two banks of 8 and 10 fathoms, distant from the dry patch $2\frac{1}{2}$ and $5\frac{1}{2}$ miles respectively. Four miles eastward from the dry part of Bambek shoal is the north-west extreme of a sand bank from a half to one mile wide, which extends nearly to cape Rachada; the bank is 9 miles long, has a dry patch nearly in the centre, and a depth of from $1\frac{1}{2}$ to 5 fathoms. Between the bank and the shore there is a passage half a mile wide.

Vessels should not bring cape Rachada lighthouse to bear southward of S.E. by E. $\frac{1}{2}$ E., nor lose sight of the bright light at night, bearing S.E. by E. $\frac{3}{4}$ E., to ensure passing southward of Bambek shoal, and the shoals inshore of it.

CAPE RACHADA (TANJONG TUAN) is a steep bluff point, covered with trees, and easily distinguished, as it is higher than the adjacent coast, and appears when first seen in the distance like an island. Vessels may boldly approach the cape, there being deep water a quarter of a mile distant. Near the cape there are two fresh-water wells.

From cape Rachada the low woody coast of Sumatra, distant 20 miles, may be seen, the strait being here more contracted than at any other part north of Malacca.

Tides.—Off cape Rachada the flood sets to the southward, the ebb to the northward; both streams are very strong and pass the cape in noisy rippings.

LIGHT.—On cape Rachada stands a round tower painted white, 78 feet high, which exhibits at an elevation of 446 feet above the level of the sea, a fixed *white* light visible from seaward between the bearings of S.E. by E. and N.W. by W. In clear weather the light should be seen from a distance of 26 miles. The limit of the light to the northward passes over the centre of Bambek shoal, and touches Parcelar point; and the limit of the light to the southward leads half a mile south-west of Diana rock.

AROA ISLANDS are a group of small islands lying nearly mid-channel between Sumatra coast and the North Sands; they are spread over a space of 9 miles in extent. These islands are situated on a bank of 6 to 10 fathoms, the northern end of which extends 6 miles north-westward of the islands, and the southern joins an extensive mud bank adjacent to the Sumatra shore; Aroa bank is steep to on the north, east, and west sides, the depths suddenly increasing to 18 and 20 fathoms.

North rock, the northern islet, is small, of considerable height, and has a surrounding reef.

Long Aroa or (Pulo Jummur) lies nearly 3 miles south-west from North rock; it is two-thirds of a mile long, 400 yards broad, flat, and covered with trees. At 2 cables north-east of Long Aroa are two small islets nearly joined, and having a reef of rocks which extends three-quarters of a mile north-east of them.

Malay fishermen sometimes visit Long Aroa to fish and procure turtle. There is a small spring of fresh water in Long Aroa, but not sufficiently large to water a vessel from. In the rainy season, in the months of October to January, an abundance of water may be found, there being in the island several natural tanks which dry in the hot season. The best watering place is on the western side, which is clear, and a vessel may anchor close to the island in 6 or 8 fathoms mud, with the highest part of the island being North.

Western Aroa, or group of islets, three-quarters of a mile westward of Long Aroa, are five in number, namely, Tekong Mass, Pulo Rendang, Pasir Panjang, Labuan Biti, Tukong Chama, and occupy a space of $1\frac{1}{2}$ miles; they are all connected by a reef nearly dry at low water and extending half a mile N.N.W. of them.

Batu Balia, a group of six rocks surrounded by a circular reef, is half a mile in diameter; they lie $3\frac{1}{4}$ miles eastward from Long Aroa.

A rock which covers at half tide lies $1\frac{3}{4}$ miles East of Batu Balia, and has 17 fathoms close-to.

East Rock, or Batu Mandi, lying $6\frac{3}{4}$ miles eastward of Long Aroa, is low and flat, with depths of 16 or 18 fathoms within one cable.

Round Aroa or **Tekong Simbang**, is the highest of the Aroa group; its summit is covered with trees and may be seen from a distance of 15 miles. There are several rocky islets near. Round Aroa with its outlying islets occupy a space of $1\frac{3}{4}$ miles north and south, and three-quarters of a mile east and west; the southern islet is named Pulo Tekong.

Tides.—The tides at Aroa islands are very irregular, especially during neaps, when there appears to be a constant stream setting to the north-west, slackening only towards the time of high water; although the direction and duration of the tides are so irregular, there is still a regular rise and fall of 14 feet at springs and 9 feet at neaps.

Caution.—Much care is requisite in approaching Aroa islands during the night as many of them are low, and difficult to see after dark.

NORTH SANDS comprise various sand-banks and spits extending from the Malay coast between Selangor river and Parcelar hill towards Aroa islands. The sand-banks have a general north-west and south-east direction, and depths of 6 to 20 fathoms water between them. The north-west extremity of the sands is on the parallel and 25 miles west of Bukit Jerom, situated 6 miles southward from Selangor; a narrow strip of sand-bank, having depths varying from 7 fathoms to nearly dry, extends thence in a south-easterly direction a distance of 12 miles; the southern half of this shoal is named Batu Kinching, and has a dry spot about one mile from its southern end. These banks and patches are usually discernible during daylight.*

Blenheim Shoal, having 4 feet least water, is about 2 miles in length, and lies 5 miles south-west of Batu Kinching, and about 11 miles northward of One-fathom bank lighthouse. Coming from the northward it should be carefully avoided, passing well to the westward.

Banks.—A bank with $2\frac{1}{2}$ fathoms lies between the Blenheim and Batu Kinching. At 8 miles eastward of Blenheim shoal is a bank 3 miles long, and 7 feet least water. Five miles southward of Blenheim shoal, in the direction of One-fathom bank, is a patch of $3\frac{1}{2}$ fathoms, and 3 miles south-east of this, is a patch of the same depth. Between Blenheim shoal and the

* See Admiralty chart:—Malacca Strait, North and South Sands, Nos. 794a and 794b

banks just mentioned, and the flat extending northward from Pulo Klang, are other shoal banks, the positions of which are best seen on the chart.

One-fathom Bank, on which is a lighthouse, is the most prominent of the North Sand banks; it is 2 miles in length, and has from 6 to 16 feet water. Westward and eastward of One-fathom bank the soundings deepen quickly to 10 and 13 fathoms. North-westward the bank extends 8 miles, with depths of 4 to 8 fathoms.

A patch of $3\frac{1}{2}$ fathoms lies about 8 miles south-westward from the lighthouse.

LIGHT.—An iron screw-pile light tower, painted in bands of red and slate colour, is situated on One-fathom bank about half a mile eastward of the shoalest part, and the same distance from the south extreme. From the tower is exhibited a *revolving* white light, which attains its greatest brilliancy *every minute*; it is elevated 61 feet above the level of the sea, and in clear weather should be visible from a distance of 13 miles.

A bell is rung in thick weather.

Channels.—There is a deep channel between the bank which extends from Pulo Klang and the eastern side of North Sands, but unless it were buoyed it would be dangerous for large vessels to use it, as no bearings can be given to direct them. Coasting vessels use this channel, keeping on the edge of Pulo Klang bank in 4 and 5 fathoms.

The channel between the north-west extreme of North Sands and Aroa islands is deep, there being from 20 to 60 fathoms, mud, the depths decreasing as the islands are brought to bear about West. The deep water extends to within 5 miles of North rock, Aroa islands, and close to East rock.

SOUTH SANDS are of similar formation to North Sands, and extend across to the Sumatra coast. There are several extensive dry banks between the part surveyed and the Sumatra shore, between which are narrow and intricate channels. The neighbourhood of South Sands may be considered as the most dangerous part of Malacca strait, there being no near objects from which bearings can be given for vessels working through, to clear the numerous dangers.

The eastern edge of South Sands forming the western side of the navigable channel through Malacca strait extend about 40 miles in an E.S.E. direction, from a position 7 miles south of One-fathom bank, and are distant from the Malay coast 12 or 15 miles.* The northern shoal head, of $2\frac{1}{2}$ fathoms, lies $10\frac{1}{2}$ miles S. by E. $\frac{1}{2}$ E. from One-fathom bank lighthouse.

* The eastern edge of South Sands is said to have extended about one mile farther east than is shown on the present charts.—1877.

Pyramid Shoal, the eastern extreme of the South Sands chain, is the most dangerous, standing out beyond the others a distance of 4 miles nearer the track of vessels. The shoal is about one mile long, and has one fathom least water, bottom hard sand. Bambek shoal, the nearest danger on the other side of the fairway track, bears N.E. by E. $\frac{1}{4}$ E. distant 12 miles from Pyramid shoal; Rachada light bearing E. by S. leads about 2 miles northward of Pyramid shoal. *Buoy proposed.**

Tides.—It is high water, full and change, from 5h. 30m. at the head of the North sands, to 6h. at One-fathom bank and on the South sands. During springs the tides are regular, running N.W. and S.E. on the North sands; W.N.W. and E.S.E. on the South sands at the rate of 3 to $3\frac{1}{2}$ miles an hour, and run from two to three hours after the time of high and of low water. The flood stream comes from the north-westward. During neaps the tides are weak and irregular. Springs rise 15 feet, neaps 12 feet.

DIRECTIONS.—Vessels from the northward should make One-fathom lighthouse bearing about E.S.E., and passing about 3 miles westward and southward of it, should then haul to the eastward toward Tanjong Parcelar, passing it at the distance of 5 miles; maintaining this distance off shore will clear Bambek shoal, as will also Rachada lighthouse, bearing S.E. by E. $\frac{1}{2}$ E., or more eastward. In working to windward they should not stand farther off the coast than 10 miles, nor nearer inshore than 3 miles when between cape Rachada and Bambek shoal. The depths near the banks are so irregular that they afford no guide as to the proximity of those dangers.

At night.—Vessels should keep Rachada light bearing eastward of S.E. by E. $\frac{1}{2}$ E., or the light in sight showing brightly, to avoid Bambek shoal.

LINGEY RIVER.—The entrance of this river is situated 7 miles to the eastward of cape Rachada; the coast between is fronted by a mud bank which extends off the bight westward of Bukit Salomit, a distance of $1\frac{1}{4}$ miles. The river forms the western boundary of the British possession of Malacca, and is navigable for vessels of 8 or 9 feet draught as far as Sempang, about 5 miles from the mouth, and for large boats for 4 or 5 miles beyond. At Sempang, where there is a police station, the tide rises 9 feet at springs.†

Anchorage.—There is good anchorage off the entrance in 9 fathoms, mud, with Rachada lighthouse bearing W. by N. $\frac{1}{2}$ N., and Bukit Salomit N. $\frac{3}{4}$ E.

* See Admiralty charts :—Malacca strait, No. 794b, and 1,355.

† See Admiralty chart :—No. 795a, or 794b, scales, $m = 0\cdot5$ of an inch.

Beacons.—A beacon, with ball, is erected on the rock lying between the entrance points of the river. A police station stands on the east point, and a tree (whitewashed) marks the west point.

Batu Mandi, a rock awash lying $1\frac{1}{2}$ miles south-west of the entrance of Lingey river, is marked by a beacon.

Batu Tinga, are three rocks just above water, lying 2 miles E.S.E. from Batu Mandi.

Banks with 12, 9, and 11 fathoms, lie south-westward of Batu Tinga, at the distance of 2, 3, and 6 miles respectively.

Directions.—The river should not be entered without a pilot, who may be procured at Malacca. The bar, with rocks on either side, has a depth of 12 feet at high-water springs. The beacon rock in the entrance covers when there is a depth of 10 feet on the bar. From off the entrance the course is about N.E. by N., passing about 3 cables westward of the eastern point of the river, until the whitewashed tree bears E. by N., when it should be steered for until a conspicuous clump of trees is on with the rock beacon in the entrance; from this position a solitary hill will be seen over the river, which should be steered for, passing about 50 yards or less northward of this beacon rock, as the water shoals rapidly from 7 fathoms to 3 or 4 feet westward of the north point; thence there appears to be no difficulty in proceeding to within half a mile of Sempang, where there is anchorage in 4 fathoms, with plenty of room to swing.*

The COAST.—From Lingey river the coast takes a south-east direction for 15 miles to Tanjong Kling. It consists mostly of irregular rocky points with occasional small sandy beaches.†

Tanjong Kling is a low projecting point of land covered with high jungle and easily seen; it is the north-west boundary of Malacca bay, and may be approached to half a mile.

Diana rock is a large rock always above water, one mile from the shore; it lies S.E. by E. $\frac{1}{4}$ E., distant nearly 16 miles from cape Rachada lighthouse, which light is obscured when within half a mile of the rock. Inshore of Diana rock there are several other rocks; a sandy ridge of $3\frac{1}{2}$ to 5 fathoms lies between a half and $2\frac{1}{2}$ miles north-west of the rock.

A shoal head of 2 feet lies $1\frac{1}{4}$ miles south-eastward from Diana rock, and one mile off Tanjong Panchu. Several islets and a sunken rock also lie within half a mile of this point.

Raleigh Shoal, of $3\frac{1}{2}$ fathoms, is about half a mile long, and lies S. by E. distant 18 miles from cape Rachada, and 9 miles from Pulo Rupert on the Sumatra shore. The shoal is steep-to on its north side, on its other sides $4\frac{1}{2}$ and 5 fathoms will be found within half a mile. A bank of 12 to

* H.M.S. *Foxhound*, 1879, in charge of a pilot.

† See Admiralty chart:—No. 759a, scale, $m = 0\cdot5$ of an inch.

15 fathoms extends from 8 to 10 miles in a north-west direction from Raleigh shoal.

MALACCA is a free port. The town is built on either side of a small river of that name, and is the seat of government of the British settlement of Malacca. The river is spanned by several bridges. The country a few miles inland is formed of undulating hills, moderately elevated, named Malacca hills, and 20 miles E.N.E. of them is Gunong Ledang or Mount Ophir, having a triple peak, 3,840 feet high; the coast and land adjacent to the town are low and wooded.

On the left bank of the river is St. Paul hill, surrounded by the remains of an old fort. On the summit of the hill stand the ruins of the ancient church of Our Lady del Monte, erected by Albuquerque, and the scene of the labours of St. Francis Xavier; also the lighthouse and flagstaff. Around the base of the hill lie the barracks, court house, church, hospitals, post office, harbour master's office, and other public buildings.

A little to the south rises the hill of St. John's, and in the rear of it that of St. Francis; on these eminences are the remains of batteries erected by the Portuguese and Dutch; smaller knolls intervene covered with extensive Chinese cemeteries.

The larger part of the town, including the bazaars, are situated on the right bank of the river. The principal public institution in Malacca is the Anglo-Chinese college, established for the instruction chiefly of Chinese and Malays; there are also many schools for Chinese and Hindūs.

The lighthouse flagstaff is in lat. $2^{\circ} 11' 30''$ N., long. $102^{\circ} 15' 33''$ E.

Population.—The population of the settlement of Malacca in 1381 was as follows: Europeans, 40; Malays, 67,513; Chinese, 19,741; natives of India, 1,891, a total of 93,579.

The town is reported to be healthy. There is a government hospital for all classes.

Trade.—The chief exports comprise tin, rice, tapioca, pepper, nutmegs, mace, sago, rice, buffalo hides, and horns, rattans, gutta, gum, coffee, and opium. The united value of the exports and imports of Malacca in 1883 was about 1,500,000*l.* The number of vessels that entered the port in 1884 was 857, with a tonnage of 180,000.

Supplies.—Malacca is convenient for vessels requiring water and supplies. Water is obtained on application to the harbour master; and fish, yams, grain, sago, and a variety of fruits may be obtained at moderate prices; also poultry, hogs, buffaloes. Poon spars from Siak river suitable for masts may be procured. A small quantity of coal is kept for the government steam launch only.

Communication.—Malacca is in connection with Singapore and Penang by submarine cable. There is constant steam communication with the other Strait Settlements.

LIGHTS.—On the summit of St. Paul hill from a white square tower 90 feet high, is exhibited at an elevation of 180 feet above the sea a *fixed* white light, visible in clear weather seaward, between the bearing of N.W. and S.E., from a distance of 12 to 15 miles. See also Pulo Undan light on page 92.

From the pier head at Malacca is exhibited a fixed *red* light, visible from a distance of 7 miles.

River.—The entrance to Malacca river is nearly dry at low water, being obstructed by a bank of soft mud, which extends $1\frac{1}{4}$ miles from the shore, with 18 feet on its outer edge. The river is spanned by several bridges, and a pier extends a quarter of a mile seaward from the entrance. The channel over the bar is marked by stakes, and boats can enter the river about a quarter flood. A small boat can with difficulty go alongside the pier at low water. An iron pile pier 1,200 feet long is about to be constructed.

Fisher islet, situated $2\frac{3}{4}$ miles westward of Malacca town, and $1\frac{1}{4}$ miles from the shore, is about a quarter of a mile in extent, and situated on the outer edge of the mud bank which skirts the shore; the islet is of moderate height, its top covered with trees and easily discerned. A patch of 18 feet lies about half a mile southward of the east point of the islet. At night, vessels should not approach this islet to a less depth than 15 fathoms.

Pulo Java, or Red island, is composed of two islets nearly joined. It is about 4 cables in extent, and lies three-quarters of a mile south-east of the river, and on the edge of the mud bank. There is a beacon on the islet situated 2 cables seaward of Pulo Java.

Pulo Panjang, a narrow rocky flat half a mile in extent, lies nearly one mile south-south-eastward from Pulo Java, and about the same distance off shore; it is steep to on its south side, but on the inner side the water is shoal.

Pulo Panjang is marked by three white stone beacons, each surmounted by a diamond top, namely, one at the north extreme, one at the west, and the other at the east extreme of the islet.

Anchorage.—The best anchorage in Malacca road is in 8 fathoms, with the fort bearing N.E., and about 2 miles off shore, or with Pulo Anjote and Pulo Undan (Water islands) in line bearing S.E. The soundings deepen quickly to 7 and 8 fathoms outside the coast bank. Under a depth of 10 fathoms the bottom is chiefly of mud; exceeding that depth it is a stiff tenacious clay. On the east side of the road the bottom is rocky.

Small vessels may lie closer in, with Tanjong Kling just open inside of Fisher island, and the flagstaff bearing N.E. The depth here is $2\frac{1}{2}$ fathoms mud, at low-water springs.

The sea-worm in this road is very destructive to vessels or boats not having copper sheathing.

Tides.—It is high water, full and change, in Malacca road at 7h. 30m.; springs rise 11 feet, neaps 8½ feet. The tidal streams have a rate of 2 knots, and continue to run two or three hours after high and low water respectively. The flood stream comes from the northward.

Winds.—Malacca road is neither visited by the hurricanes of higher latitudes, nor is it within the influence of the monsoons of the adjacent seas; but during the period of the south-west monsoon in the China sea, sudden hard squalls frequently blow into the road from the Sumatra side in the night, accompanied with lightning, thunder, and rain. These winds, called "Sumatras," generally commence to blow at seven or eight in the evening, and attain their greatest strength at midnight.

Directions.—Malacca road is included in the space lying seaward of a line joining Fisher islet and Pulo Panjang, and is a safe anchorage. In approaching from seaward, the first object that strike the eye are a cluster of trees crowning the summit of St. Francis hill, the lighthouse and ruinous church on St. Paul's, and the white edifices which skirting its base, and extending along the seashore, are gradually lost in the thick groves of cocoanut trees which cover the dwellings of the Chinese and Malays. In the background rise the Malacca hills, and in the distance the triple peak of Mount Ophir.

The road may be safely approached, as there is no sunken danger beyond the mud bank skirting the shore, except the 3 fathoms patch lying half a mile southward of Fisher islet.

Vessels approaching from the southward at night will make Pulo Undan light, and passing southward of it, and westward of Pulo Anjote, bring these islands in line astern, or the light bearing S.E., which will lead to the anchorage, and well clear southward of Pulo Panjang, which is steep to and marked by white beacons. Pulo Undan light will also be seen when approaching the road from the northward.

WATER ISLANDS are a group of six, lying south-eastward of Malacca. Pulo Undan, the outer island, lies about S.E. by S. 10 miles from Malacca lighthouse, and 5½ miles from the nearest shore. The islands are of moderate height, round, and covered with trees. Inshore of Pulo Besar the largest island, the bottom is foul and rocky, but between the others there are depths of 10 to 20 fathoms. A shoal of 2 to 3 fathoms water extends one mile north and north-west of Pulo Besar, and between that island and Pulo Srinbong. The channel between Pulo Dodole and Pulo Besar has a dangerous rock of 1½ fathoms, nearly in mid-channel.

Water.—On Pulo Besar there are said to be several wells of good water.

LIGHT.—On the summit of Pulo Undan, from an octagonal red tower rising from the centre of a square two storeyed white building, is exhibited at an elevation of 155 feet above the sea, an *occulting* light showing at intervals of *ten* and *twenty* seconds, and visible from a distance of 20 miles in clear weather.

Rob Roy Bank lies on the western side of the main channel through Malacca strait, and abreast the Water islands. Within a depth of 6 fathoms the bank is about 6 miles long. The shoalest spot of one fathom on its eastern end, lies with Pulo Undan lighthouse bearing N.E. by E. $\frac{1}{4}$ E. distant $17\frac{1}{2}$ miles. Shoal heads of 2 to 3 fathoms extend thence about 3 miles in a north-westerly direction, deepening to 5 and $5\frac{1}{2}$ fathoms for a further distance of $2\frac{3}{4}$ miles, and then to 12 and 14 fathoms. On the north and south sides the bank is nearly steep-to.

The outer edge of an extensive mud bank which skirts the shore of Pulo Benkalis, approaches within 4 miles of the south side of Rob Roy bank.

A shoal head of $4\frac{1}{2}$ fathoms lies 8 miles S.E. by E. $\frac{3}{4}$ E. from the one-fathom patch on Rob Roy bank. This head is the centre of a narrow ridge 6 miles long, having depths of 5 to 8 fathoms. This ridge continues about 11 miles farther to the south-eastward, with depths of 9 to 15 fathoms.

The COAST between Malacca and Tanjong Seginting near mount Formosa, a distance of 45 miles, trends south-eastward, forming two bays; it is low, thickly wooded, and skirted by a mud bank which extends in some places $2\frac{1}{2}$ miles off shore, and in the bight between Water islands and Moar river to 4 miles from the shore.

Moar river, enters the strait at about 15 miles eastward of Water islands, and is the eastern boundary of the settlement of Malacca; the entrance is narrow, and on account of the shallow flat which extends off its mouth, is only navigable by small vessels. The river, inside, is deep and wide.

Bukit Moar is an isolated thickly wooded hill 5 miles south-eastward of the river entrance, and is visible from Malacca road.

Tanjong Tor is a low projecting point of land, covered with jungle, at 10 miles south-eastward from Moar river, and a useful mark for clearing Formosa bank.

FORMOSA RIVER, or Sungai Batu Pahat, is fronted by a shallow flat, extending 3 miles off, and has only a depth of one foot at low water, near the entrance. The river, inside, is deep.

Mount Formosa, 1,480 feet high, is the summit of a small range of undulating hills, which terminate at Tanjong Seginting, and is visible from a considerable distance. A small island lies within a cable of the shore, west of the point.

Formosa Bank, lying off Formosa river, is 6 miles long in a north-west and south-east direction, 3 cables broad, and having depths of from 2 to 4 fathoms, hard black sand.* The east end of the shallow part of the bank lies with mount Formosa bearing N.E. $\frac{1}{2}$ E., and $3\frac{1}{2}$ miles off Tanjong Seginting; a ridge with depths of 5 to 10 fathoms extends 7 miles north-west of the west extreme of the bank.

LIGHT VESSEL.—At about 3 cables off the centre of the south side of Formosa bank, is a light vessel, moored in 11 fathoms, which exhibits at an elevation of 38 feet above the sea, a *flashing* light every *half-minute*, which should be visible in clear weather from a distance of 10 miles. During thick or foggy weather a gong is sounded.

The vessel is painted yellow, and lies with mount Formosa bearing N.E. by E. $\frac{1}{4}$ E. distance 8 miles.

The COAST from mount Formosa to Tanjong Bulus a distance of 47 miles, is low and thickly wooded, and abreast Pulo Pisang forms a bight 3 miles deep; it is fronted by a shallow mud bank which extends one or 2 miles from the shore except between Pulo Pisang and Pulo Cocob, where it extends nearly 6 miles from the shore.† Several creeks empty themselves into the sea in this tract of coast. Inside of a line joining Tanjong Seginting and Pulo Pisang, the bottom is uneven, with banks of $3\frac{1}{2}$ and 4 fathoms, and 6 to 8 fathoms close-to; vessels therefore should keep outside the line.

Tides.—It is high water, full and change, from 8h. 30m. off mount Formosa, to 9h. 30m. off Tanjong Bulus; springs rise 10 or 11 feet, neaps 7 or 8 feet; the streams run two or three hours after high and low water, the flood making to the south-eastward.

PULO PISANG, is 200 feet high, one mile long, and covered with trees. The island is 7 miles off shore, 19 miles north-westward of Tanjong Bulus, and may be seen from a distance of 20 miles.

A spit about half a mile wide, steep to and having a depth of 3 feet only near its extreme, extends 5 miles in a S.E. by S. direction from Pulo Pisang. A bank having depths of 3 to 4 fathoms extends 5 miles north-west of Pulo Pisang.

LIGHT.—From a lighthouse 40 feet high, built of red brick, and with a white lantern, erected on the summit of Pulo Pisang, is exhibited at an elevation of 325 feet above the sea, a *flashing* white light every five seconds, and should be visible in clear weather from a distance of 30 miles.

* Borings have been made on Formosa bank with the object of finding a site for a lighthouse, but under a layer of 4 feet of sand, soft mud was found for a further depth of 20 feet.

† See Admiralty chart, Malacca strait, No. 796.

Fair Channel Bank, a long and narrow bank stretching the whole distance between Formosa bank and Pulo Pisang, is steep to, and has general depths of 9 to 12 fathoms; a patch of $4\frac{1}{2}$ fathoms lies 5 miles from its south extreme, with Pulo Pisang bearing E. $\frac{1}{4}$ N. distant 7 miles.

Long Bank lies on the southern side of the fairway, and is of a similar character and parallel to Fair channel bank, but shoaler.

The western extreme of the shoal portion, which has from $2\frac{3}{4}$ to 5 fathoms over a distance of about 18 miles, lies nearly on the meridian and 16 miles southward of Tanjong Seginting. It is steep to on its north and south sides.

Westward of Long bank are numerous similar banks extending to within a short distance of the fringing banks on the Sumatra side of the strait. It would be perplexing to the seaman to give any further description of these banks, the best idea of them is to be gained by studying the chart.

Pulo Cocob is a low flat wooded island 2 miles long and $1\frac{1}{2}$ miles broad, lying 6 miles westward of Tanjong Bulus, and is separated from the coast by a narrow creek. The trees on the north-west side are of a bright green colour, and at the south-east end they are tall erect poon trees, like those on the adjoining coast. A sand-bank, dry at low water, extends $1\frac{1}{2}$ miles off the north-west extreme.

Tanjong Bulus or Buro, the south point of the Malay peninsula, is a broad semicircular tongue of low land having high trees on its western side and low bright green mangroves to the eastward. All the adjacent country is low with the exception of Gunong Pulai or Pontiana, an isolated mountain 2,150 feet high, situated 19 miles northward of the point.

The edge of the mud bank dries at low water, and lies one mile south of the east part of the point. It is steep to, having 10 fathoms within 2 cables. From its southern point it trends west one mile, thence W.N.W. for Pulo Cocob.

Caution.—In passing Tanjong Bulus and Pulo Cocob, caution must be exercised, as the flood tide sets strongly towards the bank.

Between the latter and Little Carimon island, Malacca strait is $9\frac{1}{2}$ miles wide and has depths of 18 to 20 fathoms.

CHAPTER II.

SINGAPORE STRAIT.

VARIATION $2^{\circ} 40'$ East, in 1886.

GENERAL DESCRIPTION.—Singapore strait is bounded on the north by the Malay peninsula and Singapore island, and on the south by the Bulang archipelago, and the large islands of Battam and Bentán. The entire length of the strait is about 60 miles. Its breadth, at the western entrance between Little Carimon island on the south side and Tanjong Bulus on the north is about 10 miles, the main channel of the strait, between Coney island and the islands to the southward, is barely 3 miles wide, and the eastern entrance, between Tanjong Brakit on Bentán island and Ramunia point on the Malay peninsula, is 20 miles broad.*

Owing to the many dangers in Singapore strait, its navigation was formerly attended with much difficulty and anxiety, but such has ceased to be the case since the erection, in 1851, of Raffles lighthouse upon Coney island, and Horsburgh on Pedra Branca rock, in the middle of the eastern entrance. These are well situated, so that with common attention the strait can now be navigated either by day or by night, without risk or delay.

For the sake of convenient reference it has been thought best, in describing this strait, to divide it into four portions, viz., Singapore strait, western part; Singapore New harbour, town and road; Singapore strait, eastern part; and Old strait of Singapore. The western part to comprise a description of the strait from its western entrance to Singapore road, and the eastern part, from Singapore road to its eastern entrance.

WESTERN PART OF SINGAPORE STRAIT.

SOUTH SHORE.—Tree island, or Pulo Angup, situated about 10 miles within the western entrance of Singapore strait, is the north-westernmost of the islands and dangers which extend about 5 miles

* See Admiralty charts:—Singapore strait, No. 2,403, scale, $m=0\cdot66$ inch; Banka strait to Singapore, No. 2,757, scale, $m=0\cdot15$ inch; China sea, No. 2,660A, scale, $m=0\cdot05$ inch; and plan of Singapore Main strait, No. 2,404, scale, $m=1$ inch.

in a south-easterly and north-westerly direction, and limit the southern side of Singapore Main strait. The islet, half a mile long in a north-west and south-east direction, is formed of rocks and sand, very little elevated above the sea at high water, and with a few mangrove trees.

A stone beacon surmounted by a basket, both painted red, has been erected on the north-western edge of the reef, which is steep to, and extends nearly half a mile north-westward from Tree island; Raffles lighthouse bears E. $\frac{1}{2}$ N., $5\frac{1}{8}$ miles from the beacon.*

In passing northward of Tree island, Raffles lighthouse should not be brought to the northward of East, which bearing will keep a vessel one-third of a mile northward of the reef.

Kent rocks, between Red and Tree island reefs, lie north-west and south-east from each other, nearly half a mile apart. From the southern rock, which is the larger of the two, and has $2\frac{1}{2}$ fathoms at low-water springs, the east extreme of Long island is in line with the centre of Red island, bearing S.E. by E., and Raffles lighthouse E.N.E. The northern rock is about 15 feet in length, with 6 feet water. The position of these rocks may easily be perceived when the tides run strong, by the rippings over them. The depths close to, are 7 to 10 fathoms, deepening suddenly to 15 and 20 fathoms.

The channel between the south-east rock and the reef surrounding Red island is one mile wide, with depths of 8 to 13 fathoms; that between the northern rock and Tree island reef is three-quarters of a mile wide, with depths of 12 to 20 fathoms. These rocks, however, render the passage between Red island and Tree island unsafe, and it ought not to be attempted.

Red island, or Pulo Palompang, is a mere islet or rock 20 feet high, covered with green trees, with a beach of red sand, lying $2\frac{3}{8}$ miles E.S.E. of Tree island. The reef which surrounds Red island, extends only a short distance on the east side, but projects more than half a mile on the west side.

Reefs.—Two detached reefs lie in a south-westerly direction from Red island, the outer and larger being distant nearly $1\frac{1}{2}$ miles. Raffles lighthouse in line with the north-west extreme of Long island, leads to the eastward; Round island bearing E. by N. leads to the southward; and Tree island, bearing N.N.W., leads to the westward of these reefs.

Long island or Tekong Besar, 115 feet high, and lying three-quarters of a mile south-east of Red island, is similarly surrounded by reefs, and a small islet lies close to its north shore.

* See Admiralty chart:—Singapore Main strait, No. 2,404, scale, $m=1$ inch.

Between the south-east side of Red island and the reef extending from Long island, is a channel about a third of a mile broad, with 8 to 17 fathoms water in it.

Round island, or Tekong Kechil, is a small but elevated island, lying half a mile south-east of Long island. It is surrounded by reefs to the distance of a quarter of a mile.

Long island and Round island are also known as the Brothers, both being covered with trees.

Between Long island and Round island reefs, is a narrow channel, close to the south end of the former, with 11 to 13 fathoms water.

Phillip channel is formed between Long and Round islands to the north-westward, and the numerous islands fronting Battam and Bulang islands to the south-eastward. It appears to be free from danger, with good anchorage, and is a short route for vessels proceeding to or from Singapore, through Durian strait. *See* directions, page 458.

Cap island, so named from its appearance, is situated at the south entrance to Phillip channel, $3\frac{3}{4}$ miles southward of Round island, and 2 miles westward from Steep cape. Cap island is a rock about 40 feet in height, with a flat top and perpendicular sides, surrounded by a reef to the distance of about 300 yards, near to which the depths are from 5 to 9 fathoms.

Mid-channel reef, situated nearly midway between Cap island, and Steep cape the north-west extreme of Bulang island, is about three-quarters of a mile long north and south, and $1\frac{1}{2}$ cables broad; there is a depth of 12 fathoms between Cap island and the reef, and 6 to 18 fathoms between the reef and Steep cape.

The Coast.—That part of the southern side of Singapore strait between Phillip channel, and the Sambo islands, a distance of 8 miles to the north-eastward, is formed of numerous islands lying on each side of the entrance of Salat Batu Hadji, which separates the islands of the Bulang archipelago, from Pulo Battam.

The north-west coast of Battam comprises the islands and coast extending from the entrance of Salat Batu Hadji, in a north-east direction to Tanjong Pingi a distance of 3 miles. From Tanjong Pingi the coast on the west side recedes south-south-eastward, forming a deep bay $1\frac{1}{4}$ miles wide at the entrance, which, however, with the exception of a channel a quarter of a mile wide close to the point, is blocked by coral reefs. Tree island, at the entrance of this bay, is a third of a mile in extent, and stands on the edge of the reef which fronts the islets and coast from High point, at the entrance of Salat Batu Hadji.

Bulang N.W. islands are those outlying this part of the Bulang archipelago, and, together with Helen Mar reef, lie at the junction of Singapore strait and Phillip channel.

Ganymede, the largest island, nearly a mile long north-west and south-east, and half a mile broad, is composed of a number of moderately elevated hills. Several islets lie off the main island, encircled by reefs.

Little Ganymedes are two small islands half a mile westward of Ganymede island. They are connected with Ganymede by a reef which further extends 3 cables westward of them.

Helen Mar reef is the outermost of the dangerous reefs which lie off the north-west end of Bulang. From this reef, which is steep to, Round island bears W. by S. $\frac{2}{3}$ S., distant $3\frac{1}{2}$ miles, and Raffles lighthouse is just inside the left extremes of Alligator island bearing N.W.

The south peak of Great Carimon in line with Red island W. $\frac{3}{4}$ S. leads about half a mile northward of this dangerous shoal; and Steep cape bearing S. $\frac{1}{2}$ W., will lead half a mile westward of it.

Two coral ledges, dry at low water and steep to, lie midway between Ganymede island and Helen Mar reef.

Buffalo Rock, or Token, 5 feet high, lying well out towards the fairway of the strait, is of a black colour, about 30 feet long, with depths of from 12 to 16 fathoms within a short distance. It bears S.W. by S. distant 4 miles from the south extreme of West St. John; and E. $\frac{1}{4}$ S. $4\frac{1}{2}$ miles from Raffles lighthouse.

Between Buffalo rock and the reef extending south-eastward of Middle island, the strait is $2\frac{1}{2}$ miles broad.

Barren Island, the outer of the islets on the western side of the entrance to Salat Batu Hadji, is a mere rock, and bears S.E. $\frac{3}{4}$ E. distant $1\frac{1}{4}$ miles from Buffalo rock.

Close to Barren island are depths of 7 to 11 fathoms, and 12 to 14 fathoms between it and Buffalo rock; northward of it the soundings are deep but irregular.

Islets, reefs.—A short distance south-eastward and southward of Barren island are several similar islets, some of which have reefs extending off them. The two principal islands are known as High island and Pulu Urup. Midway between the southern ends of these is the northern part of another island, about twice as large as High island; it is surrounded by an extensive reef, and has two small islets on each side of it. Further to the southward are many other islets and reefs which, however, are not in the way of the navigation of Singapore strait.

Close to the reef surrounding the island last mentioned is the eastern end of a large reef which fills up the greater portion of the space between Pulu Urup and Ganymede island. Near the middle of the southern edge

of this reef is a small islet, from which the western extreme of the reef bears W. by N., nearly three-quarters of a mile, and the northern extreme W.N.W. about the same distance.

Salat Batu Hadji, or Strait of the Pilgrim rock, separates the Bulang archipelago from Pulo Battam. This strait is said to afford a safe and short passage into Rhio and Varella straits, but it is unavailable not having been properly surveyed, and, from the intricate nature of its navigation, it seems improbable that it will ever come into general use.

The strait may be approached by any of the channels between the groups of islands just mentioned, as also by the channels amongst the islands next to be described; but the safest channel appears to be between the Sambo islands and Pulo Blakan Padang, taking care to keep over towards Pulo Mariam, to avoid the coral spit which projects about half a mile eastward of Blakan Padang. From the northward, after passing Pulo Mariam, and bringing it to bear N. by E., steer to the southward through the channel separating the groups of islands southward of Blakan Padang from the Battam coast and the islands fronting it.

Pulo Blakan Padang, the largest of the islands fronting the entrance of Salat Batu Hadji, is circular and about $1\frac{1}{2}$ miles in diameter; it lies south-westward of Sambo islands, and is separated from them by a channel half a mile broad, in which the depths are 8 to 15 fathoms. This island is encircled by a reef, which projects a third of a mile from the north point, and half a mile from the south-east and south-west points, but to less distances in other parts.

Pulo Telup about half a mile in extent, lies barely a quarter of a mile north-westward of Pulo Blakan Padang, the channel separating them being narrowed to little over one cable in width by the reefs fronting each island. Sannang is a small islet lying on the north-west edge of the reef which projects nearly 2 cables from the north-east end of Pulo Telup.

Three small patches with depths of 7 and 8 fathoms close-to, lie off the west side of Pulo Telup, the outer edges of the two northern and most distant ones lying about West, half a mile from the centre of the island.

A cluster of seven small islands stands on a reef nearly 2 miles long east and west, and three-quarters of a mile broad; this reef which lies to the southward of Pulo Blakan Padang, is separated from it by a passage about a quarter of a mile broad, with depths of 3 to 8 fathoms.

Nearly half a mile southward of the middle and largest island of the group are two small islands lying close together, each encircled by a reef; from the western island the reef projects a third of a mile in a W.N.W. direction, having a small detached coral patch lying 3 cables to the westward.

Saddle island lies three-quarters of a mile southward of the two just described, and between are two islets, each fringed with a reef. Saddle island is the middle of several islets which lie at the entrance of Salat Batu Hadji.

Between the various groups are channels with depths varying from $4\frac{1}{2}$ to 11 fathoms.

Pulo Sambo, the larger of two islands which form the western limit of Battam bay, is separated from Pulo Blakan Padang by a channel nearly half a mile wide having depths of 5 to 15 fathoms. Pulo Sambo is nearly a mile long, and a quarter of a mile broad, and is encompassed by a belt of coral, about a cable broad in most places.

Little Sambo Island and Ledge.—Little Sambo, about 3 cables in length, lies one-third of a mile north-westward of Pulo Sambo, and is nearly everywhere fringed with coral, extending to a short distance, but from the north-west point it stretches off 3 cables; this part is known as Sambo ledge, and has a rock always uncovered near the middle.

Batu Beranti is a rocky ledge, one-third of a mile in extent, the centre of which is above water, and lies 6 cables N. by W. from Little Sambo.

Another ledge, similar to that just described, lies a third of a mile westward of it, and three-quarters of a mile from Little Sambo.

The soundings near these dangers are irregular, and afford no reliable guide for a vessel approaching them; close to are depths of from 7 to 20 fathoms.

Pulo Mariam is an islet two cables south-eastward of Pulo Sambo and three-quarters of a mile north-westward of Tanjong Pingi. The channel between the islet and Tangong Pingi, is encumbered near the middle with three patches of dry reef and some shoal water. There is, however, a deep but very narrow passage between Tanjong Pingi and these dangers, and a similar passage between them and Pulo Mariam; there is also a passage between the islet and Pulo Sambo.

CAUTION.—Eddies and Overfalls.—Owing to the strong tides which run through this part of the strait, and the rocky and uneven nature of the bottom, violent eddies and overfalls are usually to be met with, more especially on the south side of the channel, towards the Sambo islands; it is therefore advisable to keep on the north side, near St. John islands.

All the islands and dangers, however, south-westward of Sambo islands, except Buffalo rock and two 9 fathoms banks between the rock and Helen Mar reef, are within the 10-fathom edge of the bank which extends from the southern shore of this part of the strait.

NORTH SHORE.—Between Tanjong Bulus, and Tanjong Gul (the south-west extreme of Singapore island), a distance of 9 miles in an E. by N. direction, lies the west entrance of the Old strait or Salat Tebrau, fronted by a bank having from 6 to 18 feet water, which extends from Tanjong Bulus, and terminates in a prong half a mile to the southward of Tanjong Gul (*see* page 149).*

Anchorage.—During the north-east monsoon good anchorage may be obtained about three-quarters of a mile south of this bank in 9 or 10 fathoms water with Tanjong Bulus bearing West, distant 3 miles.

Sultan shoal, or Trumbu Carimon, situated $8\frac{1}{2}$ miles E. $\frac{3}{4}$ S. from Tanjong Bulus, is circular, about two-thirds of a cable in diameter, and the rocks dry about 2 feet at low-water spring tides. It is marked by a beacon, painted in red and white stripes, from which Raffles lighthouse is just open of the west extremes of Alligator and Barn islands, S.E. $\frac{1}{2}$ E. $7\frac{1}{4}$ miles. Close to the westward of the beacon are depths of 3 and 4 fathoms, and 7 or 8 fathoms at 2 cables distant, but the east side of the shoal is steep-to, there being 6 fathoms close to the rocks.

Ajax shoal, lies one mile S.E. by E. $\frac{1}{4}$ E. from the Sultan shoal beacon; this shoal composed of coral with sharp pinacles, is nearly one cable in extent in an E. by N. and W. by S. direction, and has on its south-west extremity a depth of 3 fathoms. The water deepens gradually north-westward of the rock; but the south and west sides are steep-to.

A buoy, painted red, has been placed on Ajax shoal, with Sultan shoal beacon bearing N. 58 W., distant $1\frac{1}{10}$ miles.

SALAT SENKÉ (Sinki), by which Singapore New harbour is approached from the westward, is bounded on either side by reefs, the edges of which are marked by stone beacons with basket tops. The length of the channel is 4 miles, and its breadth at the eastern and narrowest part is three-quarters of a mile. The depths are very irregular, generally from 9 to 16 fathoms, but in one place, just to the southward of the westernmost beacon on the north side, there are 25 fathoms. The eastern extreme of the channel is about 3 miles to the westward of New harbour.

Pulo Saluk, a small islet 90 feet high, lies on the east side of entrance to Salat Senké. A coral reef extends nearly half a mile eastward of it, but the channel side is nearly steep-to. Pulo Saluk bears E. by S. $\frac{1}{2}$ S. from Ajax shoal on the western side of the entrance.

Beacons.—Three of the red stone beacons which mark the south side of this channel are situated on the northern edge of the large reef

* *See* Admiralty chart:—Singapore strait No. 2,403; and Singapore Main strait No. 2,404; scale, $m=1$ inch.

that surrounds Pulo Bosing. The first or westernmost beacon bears N.E. $\frac{1}{2}$ E. distant $1\frac{1}{10}$ miles from Pulo Saluk; the second E.N.E. the same distance from the first; and the third is about a quarter 4 cables eastward of the second. The fourth or easternmost beacon stands on the northern edge of the reef that surrounds Freshwater island or Pulo Bukum, and bears E. by N. distant one mile from the third beacon.

A white stone beacon marks the reef, at half a mile southward of Pulo Laut, and two white stone beacons the southern edge of Cyrene reef, north side of the channel. All these beacons have basket tops.

About 3 miles E. $\frac{3}{4}$ N. from Sultan shoal, and half a mile south of Pulo Laut, lies a small reef marked by a white beacon.

North Side.—A reef awash, lies one mile westward of Pulo Laut, on the north side of Salat Senké, and N.E. by E. $\frac{1}{4}$ E. $2\frac{1}{8}$ miles from Sultan shoal.

Pulo Laut, half a mile in extent, has a small island close to the eastward of it. These two islands are the southernmost of an extensive group of islands lying close together, to the northward of which is a navigable channel named Salat Sambulun.

Cyrene reef forms the north-eastern limit of Salat Senké, and is the first reef westward of New harbour; from its south-east extreme Blayer point bears E. by N. $\frac{1}{4}$ N. $2\frac{3}{4}$ miles. It is about half a mile in extent north and south, more than a mile east and west, and very irregularly shaped, the western part forming a narrow spit; on the northern part is a sand patch, having upon it a spot of coral which is barely covered at high water. From the south side two small horns project into the channel, the extreme of each being marked by a white beacon.

Directions.—Coming from the westward, and intending to proceed through Salat Senké, a course may be steered to sight the red and white striped beacon on Sultan shoal, which may be passed at a prudent distance on either side; after passing Sultan shoal, care is necessary to avoid Ajax shoal, marked by a buoy. But to provide against the chance of the marks having disappeared, or in the event of thick weather, the safer plan will be to steer for Pulo Saluk on an East or E. $\frac{1}{2}$ S. bearing. When Sultan beacon is seen, and brought to bear from N.N.W. to N.W., steer from E. by N. to E.N.E., giving Pulo Saluk a berth of $1\frac{1}{4}$ miles; after passing it keep a good look-out for the outer beacons on either side, and steer mid-channel between them.

The same course, E. by N., always remembering to guard against the effects of tide, will lead to the entrance of a New Harbour. See p. 110.

If the tripod beacon upon Sultan shoal or the buoy on Ajax shoal cannot be seen, a vessel should not proceed until quite certain of her position, and assured that some accident must have happened to them. As the mail steam vessels, both to and from Europe, now pass through Salat Senké, great attention is paid to the beacons which mark it.

At night, Raffles light well in sight and bearing S.E. by E. or more easterly, leads southward of Sultan and Ajax shoals.

Salat Sambulan is a navigable channel half a mile in breadth between the reefs fringing the south shore of Singapore island, and Pulo Picé and Ayer Limau.

A white stone beacon, with basket, marks the reef 4 cables off shore, and nearly one mile eastward of Tanjong Gul, north side of Salat Sambulan; and a red stone beacon, with basket, marks the south-west end of the reef extending from Pulo Picé, on south side of Salat Sambulan.

ISLANDS.—Freshwater island.—A group of islands, about 5 miles in extent, lies to the southward of Salat Senké, and to the westward of St. John and Blakan Mati islands, from which it is separated by a navigable channel nearly 3 miles broad. The islands are all small, and separated by deep channels, which however, are so encumbered with reefs as to render them unavailable for anything but boats.

Freshwater island, or Pulo Bukum, and Pulo Bosing, are the northern islands of the group; they have been previously mentioned in connexion with Salat Senké, of which the reefs extending from them form the southern limit; Pulo Saluk, the south-west limit of that channel, is the north-west island of this group.

Pulo Sudong is a small island, nearly $1\frac{1}{4}$ miles E.S.E. from Pulo Saluk, having two small islets off its north-west end. The island stands on the eastern part of an extensive coral reef, the western edge of which is a mile distant from it.

Alligator Island, or Pulo Renkam, about one mile in extent, 185 feet high, and of a sloping form, the highest part being at its south end, lies about half a mile to the southward of Pulo Sudong, and nearly joins the north-west end of Barn island, the space between the reefs encompassing each island affording no safe passage for vessels. At a quarter of a mile from the south end of Alligator island there are depths of 14 and 16 fathoms, but off its west side not more than 6 to 9 fathoms will be obtained at from a half to two-thirds of a mile.

Barn Island, or Pulo Sennang, lying half a mile south-east of Alligator island, is about a mile in extent, 133 feet high, of a square level aspect, covered with trees, and visible at a distance of 15 miles. Barn island is fringed with a reef, which extends a quarter of a mile from its

east side, but barely two cables from its south and west sides, close to which are 9 and 11 fathoms, with 18 and 19 fathoms at a short distance.

The Rabbit and Coney are two small islets, nearly connected with the south-east end of Barn island by a reef of rocks partly dry at low water. The Coney, or southernmost, is the smaller, and distant from the south-east point of Barn island rather more than one-third of a mile. A rocky spit, covered at high water, projects from the Coney one cable to the southward.

RAFFLES LIGHT.—The lighthouse on Coney islet, named after Sir Stamford Raffles, the founder of Singapore, is 91 feet high, and exhibits at an elevation of 105 feet above high water, a *fixed* white light which is visible from a distance of 13 miles, between the bearings of S.E. by E. through north to S.W. by W. $\frac{3}{4}$ W., westerly. To the westward, the light well in sight bearing eastward of S.E. by E., clears Sultan and Ajax shoals; and to the eastward clears the reef extending from Middle island, and St. John islands.

Mangrove Island and Reefs.—Mangrove island (Pulo Simakau) about a mile in extent, lies near the centre of the group, $2\frac{1}{2}$ miles N.N.E. from Coney islet, and about $1\frac{3}{4}$ miles westward of Middle island; between it and Middle island is Pulo Siking surrounded by a reef.

Southward of Mangrove island are several reefs, or small coral patches, the three outer ones of which bound the north side of the channel between Middle island and Coney island. The southern extremes of these dangers lie nearly in a line, and about S.W. by W. $\frac{1}{2}$ W. from the south-east end of Middle island, from which the nearest is distant nearly $1\frac{3}{4}$ miles; the eastern patch is partly dry, over the middle one there is a depth of $1\frac{3}{4}$ fathoms, and over the western 2 fathoms.

The peak of Great Carimon in line with the north part of Barn island leads close to the southward of the western patch, but well clear of the others; it is advisable, however, not to come northward of a line joining the southern extremes of West St. John and Barn islands.

Middle Island, or Pulo Sabarút, the eastern island of the group, is half a mile long, 78 feet high, and surrounded by a reef which projects from the south-east point nearly half a mile.

Rock.—A dangerous ledge of rock which is steep to, lies S.E. by E. distant 6 cables from the south-east point of Middle island. The ledge is small, and covered, except at very low tides, some points of the rocks being then just discernible.

A tripod beacon, painted red, surmounted by a basket, marks this rock.

Pulo Jong (a small round islet 75 feet high, lying half a mile north-west of Middle island) open eastward of Middle island, leads north-east of the ledge, and the south point of West St. John N.E. by E. $\frac{1}{2}$ E., or Raffles

lighthouse S.W. by W. $\frac{3}{4}$ W., leads to the southward ; the high peak of the Great Carimon in line with the north part of Barn island will also lead to the southward of this danger.

The Sisters are two small islets not quite a mile to the westward of West St. John island ; the South Sister, named Pulo Subur, is 89 feet high. They are surrounded by reefs to the distance of a cable, and close to their edges are irregular soundings of 5 to 9 fathoms. Southward of the South Sister the soundings soon deepen. The channel between them and West St. John is free from danger, with depths of 14 to 24 fathoms. Nearly half a mile W.S.W. of the Sisters is a bank of 3 fathoms, with 5 and 6 fathoms between, and a short distance westward of this bank is another of 5 fathoms.

Trumbu Sileger.—A red stone beacon surmounted by a basket, has been erected on the eastern side of Sileger reef, situated about 7 cables north-west of the Sisters.

St. John islands, three in number, form the south-western limit of Singapore road. They lie about north-east and south-west from each other, extending nearly a mile in those directions.

West St. John island is about one mile long north-west and south-east and a quarter of a mile broad. Its south-east extreme is joined to the main body by a narrow neck of low land, which at a little distance gives it the appearance of a separate islet. A reef extends about a third of a cable from its southern and western sides, and $1\frac{1}{2}$ cables from its eastern side.

The middle island, known as East St. John island, is about half a mile long north-west and south-east, a quarter of a mile broad, 189 feet high, and surrounded by a reef which extends a little over half a cable from its south point, and $1\frac{1}{2}$ cables from its south-eastern shore.

Peak island, or Pulo Tambakúl, the north-easternmost and smallest of the three, has a peaked hill 100 feet high. The island is encompassed by a reef which extends about three-quarters of a cable in a southerly and south-easterly, and 2 cables in a north-westerly direction.

A white stone obelisk on the south-east side of Peak island, marks the southern limit of Singapore road.

Between these islands are narrow channels about half a cable wide, with depths of 6 to 16 fathoms.

In the space between St. John islands and Blakan Mati, are a few small islands and several extensive reefs. Between the latter are channels of deep water, but they are so narrow and intricate as to be useless for the purposes of ordinary navigation.

Pulo Ringat is the easternmost of two small islets which lie close to the north-eastward of St. John islands.

Pulo Sikúkur, about half a mile long, but very narrow, lies nearly mid-channel between West St. John and Blakan Mati islands.

Clearing Marks.—To avoid all the dangers between St. John islands and Malay point, Peak island must not be brought to the eastward of S. $\frac{1}{2}$ E., whilst mount Serapong bears to the northward of W.N.W. When mount Serapong is to the westward of that bearing, a vessel may stand on until the western extreme of West St. John island bears S. by W. $\frac{1}{2}$ W., but no farther.

Blakan Mati island lies to the southward of the southern part of Singapore island, from which it is separated by a channel now known as New harbour. The island is 2 miles long in an east-south-east and west-north-west direction, and its western end terminates in a point, but its eastern extreme is a mile broad. It is fringed by a reef, which from Berala point, its north-eastern extreme, projects a quarter of a mile to the eastward; this part of the reef is known as Berala spit, and from its outer part Berala point bears W. $\frac{3}{4}$ S.; thence it tends about S. by W. for the eastern extreme of the island, from which it projects but a short distance. Off the south point of the island the shore reef extends about three-quarters of a cable, and about the same distance along its west side; but a small detached reef, named Pelawan, about $1\frac{1}{2}$ cables in extent, lies 2 cables from the west shore of the island, at three-quarters of a mile from its north-west point.

Ports are being built on the east and west ends of this island, and one also near its centre.

Mount Serapong, rising to the height of 303 feet near the north-eastern extreme of Blakan Mati, is conspicuous when approaching Singapore roads from the eastward, and will assist a stranger in making out the land, St. John islands being seen to the southward of it. There are several other hills of less height than Serapong upon Blakan Mati, but they are more observable in coming from the westward, when they will be seen under the higher land of Singapore island.

Over Rimau point, the west extreme of the island, is mount Siloso, 170 feet high, to the eastward of which, and south from Berdaun rock, is mount Imbeah, 202 feet high, and other hills to the eastward.

BANKS.—In the main channel about midway between Tree island and Sultan shoal, is the north-western extreme of a bank which extends $3\frac{1}{2}$ miles in a south-easterly direction, its average breadth being nearly half a mile, having from $5\frac{1}{2}$ to 9 fathoms and 11 to 16 fathoms close-to. Its southern extreme lies West, $1\frac{1}{2}$ miles from Coney island.

Close to the south edge of the reef which surrounds Alligator island are depths of 14 fathoms, but a bank with 7, 8, and 9 fathoms extends about 3 miles from the west side of that island, and parallel with the bank

just described. Between these two banks the depths are from 13 to 15 fathoms.

The soundings south of Coney islet are deep but irregular; near the reef which projects from it is a depth of 20 fathoms; south-westward from Coney, depths of 18 to 22 fathoms extend to the distance of about $1\frac{1}{2}$ miles thence deepening to 40 or 50 fathoms towards Long island.

At half a mile north-eastward of Helen Mar reef, is the western part of a bank, which is about a mile in extent with 9 to 10 fathoms water. A patch of 9-fathoms lies half a mile northward of its eastern extreme.

A bank with depths under 20 fathoms, but irregular in contour, fronts the whole of the islands and dangers on the south side of the strait, between Helen Mar reef, and Batu Beranti. Between Pulo Sannang and the ledges west of Batu Beranti, the edge of this bank is about half a mile from the shoal water near the reef extending from the north part of Pulo Blakan Padang, and nearly three-quarters of a mile outside Pulo Sannang.

TIDES.—The tidal stream from Malacca strait when setting to the eastward, and the tidal stream from the China sea when setting to the westward, meet between Tree island and Tanjong Bulus. It is high water, full and change, at Coney island, at 11 a.m., but the tide does not set to the eastward till about 1 p.m., and it is then about half ebb by the shore.

Between Tanjong Bulus and Tree island no dependence can be placed upon the set of the tides, for they sometimes run strong towards Durian strait, and at other times northward towards the Old strait of Singapore.

From Tree island to Raffles lighthouse the tides cannot be depended on to set as fairly through the channel as they do to the eastward of the lighthouse, but may be expected to draw more across the channel in a north-easterly and opposite direction. The tides set fairly through the channel about E.N.E. and W.S.W. between Raffles lighthouse and St. John islands, frequently very strong, with eddies on the springs. Their velocity, when strongest, is from 4 to $4\frac{1}{2}$ miles per hour, making it unpleasant to anchor here in large vessels when the weather is unsettled in the night, particularly if unacquainted.

The tidal stream has been observed in both monsoons to run to the westward 10 or 12 hours at a time, or even 18 hours, strong and weak alternately; at other times, it sets only 6 hours to the westward, and the same length of time to the eastward. During the strength of the north-east monsoon at neap tides, the stream sets to the westward at times for three or four days, although there is a regular rise and fall by the shore.

Temporary anchorages.—Owing to the strong tides and currents in the western part of Singapore strait, sailing vessels are frequently obliged to anchor, for which purpose the north side of the channel is to be

preferred. Between Sultan shoal and Raffles lighthouse on that side, there is convenient anchorage in 6 to 12 fathoms, while to the southward the water is deep, and the bottom rocky; the south side of this part of the strait is, therefore, unsuitable for anchorage, especially as violent squalls are of common occurrence. The most convenient anchorages between Raffles lighthouse and St. John are the banks which front the Sisters and Middle islands.

Abreast of the south end of St. John islands, vessels ought not to anchor if it can be avoided, for the water is deep, and the tides run in eddies with greater strength than in any other part of the strait.

There is fair anchorage between Buffalo rock and Helen Mar reef, as well as about a mile or so to the northward and westward of the latter danger; also a mile or two eastward of Buffalo rock, in 12 to 19 fathoms, or between it and Barren island. Vessels may stand closer inshore and anchor in depths under 10 fathoms, inside of a line N.E. by E. $\frac{1}{2}$ E. and S.W. by W. $\frac{1}{2}$ W. of Barren island; it is, however, unadvisable to go too close in, on account of the strong tides sometimes rendering it difficult to get under way again, especially in the light winds which prevail here.

Caution.—Vessels at anchor, or coming to an anchor during the night, should be careful to ascertain their exact position as nearly as possible, and to have a good bearing off Raffles light; they should also keep a vigilant look-out that they do not drag their anchors and drift into danger.

DIRECTIONS.—To proceed eastward through the western part of Singapore Strait.—When in mid-channel between Little Carimon and Tanjong Bulus, in depths of from 17 to 22 fathoms, steer East or E.S.E. as the prevailing wind and tide require.

Raffles lighthouse bearing between E. by S. and E.S.E. is the fair channel course between Tree island and Sultan shoal, not bringing the lighthouse to the northward of East to avoid Tree island, nor to the southward of S.E. by E., or at night, not to lose sight of the bright light, to clear Sultan shoal. Having passed Tree island steer to round the lighthouse from a half to one mile distant; or if the wind and tide be adverse, or from other circumstances it be desirable to do so, anchor to the westward of Barn island, out of the strength of the tide. Having rounded the lighthouse, steer to pass St. John islands about half a mile distant, not bringing the lighthouse to the southward of S.W. by W. $\frac{3}{4}$ W., to avoid the rock marked by a beacon south-eastward of Middle island, on the north side of the channel. At night, keep Raffles light in sight W.S.W. or more westerly. After rounding St. John, and bound to Singapore road, proceed as directed at page 125; and if bound through the eastern part of

the strait, shape course E.N.E. to pass northward of Horsburgh light, and proceed as directed at page 143.

In working through between St. John islands and Raffles lighthouse, it is usual to keep on the north side of the channel, making short tacks if necessary, as that part of the strait affords tolerably convenient anchorage along the greater portion of it, and vessels are liable to meet with light baffling airs which would render it necessary to anchor. It is especially requisite to attend to this when eastward of Buffalo rock, for on that part of the south side of the strait the water is deep, and the bottom rocky and unsafe for anchoring, the danger being much increased by rapid currents and tides with violent eddies and overfalls.

All danger on the north side of this part of the channel will be avoided if the south extreme of St. John islands be not brought eastward of N.E. by E. $\frac{1}{2}$ E., or Raffles lighthouse southward of S.W. by W. $\frac{3}{4}$ W., but these bearings more particularly apply to the rock now marked by a beacon, which lies S.E. by E. from Middle island. While to the westward of the rock, vessels may stand to the northward until the south end of St. John bears E.N.E.; and eastward of the rock, between Middle island and the Sisters, as far as E. by N., observing that Pulo Jong open westward or eastward of Middle island, clears the rock.

When approaching Buffalo rock from the westward, until Middle island bears N. by W. $\frac{3}{4}$ W., the vessel will be westward of the rock, and in daylight may stand to the southward, if necessary, until Red island bears W. $\frac{1}{2}$ S., which clears Helen Mar reef, but it is better to keep over towards the lighthouse. When Middle island bears N. by W. $\frac{1}{2}$ W. be careful to keep Raffles lighthouse to the southward of W. $\frac{1}{4}$ S., until eastward of Buffalo rock.

To proceed from Singapore road or from the eastward, through the western part of Singapore strait, steer to pass the south point of St. John islands as close as prudence and the wind may permit, and then about S.W. by W. $\frac{1}{2}$ W. to round the Rabbit and Coney. It is better to keep near the north side of the channel in this track. The south end of St. John bearing N.E. by E. $\frac{1}{2}$ E., or Raffles lighthouse S.W. by W. $\frac{3}{4}$ W., leads clear of danger, and either of these are safe bearings to lead along the north side of the channel until Raffles lighthouse is approached, which may be rounded at the distance of 2 or 3 cables, if the wind be northerly.

After rounding the lighthouse, steer W.N.W. to pass between Tree island and Sultan shoal; the lighthouse kept between the bearings of E. by S. and E.S.E. will lead in a good fairway course, but it must not be brought at all to the northward of East to avoid Trec island reef, or to the southward of S.E. by E. or, if at night, the bright light must not be lost sight

of, to clear Sultan shoal; having passed between those dangers, a course West to W.N.W., according to the set of the tide and other circumstances, will lead between Little Carimon and Tanjong Bulus.

Caution.—In hazy weather during the night, great care must be taken in steering between Raffles lighthouse and Tanjong Bulus, for no dependence can be placed upon the set of the tides, for they sometimes run strong towards the Strait of Durian, at other times to the northward towards the Old strait of Singapore.

SINGAPORE NEW HARBOUR.

New harbour, the name given to the channel between Singapore and Blakan Mati islands, is about $2\frac{3}{4}$ miles long, in a general direction east and west, but the main channel takes a somewhat serpentine course; the breadth of the harbour in several places is not more than $1\frac{1}{2}$ cables. The western entrance, which is little more than one cable wide, lies between Rimau and Blayer points. The eastern entrance is bounded on the north by Malay and Pagar spits, and on the south by Buran Darat reef, and the reefs surrounding the eastern sides of Blakan Mati and Ayer Brani islands.*

As an anchorage, New harbour is very indifferent, for the breadth of the navigable channel is but 100 to 200 yards, the bottom is rocky and foul, and affords but bad holding ground, whilst the tides run through it with great velocity; there is, from these circumstances, great risk of vessels dragging their anchors and going ashore, especially during the violent squalls which are common in this part of the world.

Notwithstanding these drawbacks, New harbour has grown into a place of considerable importance, for it possesses facilities for constructing jetties and making docks, which render it of the highest possible value to a large shipping port like Singapore, situated in the very centre of Eastern commerce. The Peninsular and Oriental Company, the Tanjong Pagar Company, together with other steam proprietors and merchants, have erected extensive coal stores, capacious docks, wharves, and jetties, the latter allowing of the largest steam vessels being lashed alongside in perfect security. It is the place of arrival and departure of the mail steamers; and all other steam vessels proceed here to coal.

The whole of the above establishments are situated on the north or Singapore side of New harbour.

Both sides of the harbour are fringed with reefs which dry at low water, but close to their edges are depths of 3 to 4 fathoms, increasing suddenly to 5 and 6 fathoms, and to this circumstance New harbour owes its importance.

* See Admiralty plan of New harbour, No. 2,023; scale, $m = 12$ inches.

Docks.*—The following are the dimensions of the docks at Singapore : New Harbour Docks Company in Chermin bay : No. 1 dock, length 444 feet, breadth at entrance 55 feet, depth over sill 19 feet at ordinary springs ; No. 2 dock, length 416 feet, breadth $42\frac{1}{2}$ feet, depth over sill $14\frac{1}{2}$ feet. Tanjong Pagar Company : Victoria dock ; No. 3, length 450 feet, breadth 65 feet, depth over sill 20 feet ; Albert dock, No. 4, length 470 feet, breadth 60 feet, depth on sill 21 feet. Bon Accord dock belonging to the same company, on Ayer Brani island, length 330 feet, breadth 50 feet, depth over sill 17 feet. There is a jetty for heaving down vessels on Blakan Mati island, south-eastward of Silugu island. The large sheers on the Tanjong Pagar Company's sheer wharf will lift 40 tons. Repairs to hulls and machinery of vessels of the largest class can be effected by the dock companies ; and barracks have been built at the docks to accommodate crews of 500 and 250 men.

Supplies.—Every description of supplies are to be obtained. Powerful tugs are available when required.

Coal.—Most of the large steamers make use of the extensive wharf accommodation belonging to the Tanjong Pagar and other companies, alongside which there is from 25 to 40 feet at low water. Her Majesty's vessels are coaled at the wharves of the company who may happen to have the contract, the English naval coal stores on Pulo Ayer Brani are not now used for that purpose.

Both the Pagar and Borneo Company's wharves are easy to go alongside. Vessels requiring coal should hoist the Commercial Code rendezvous flag, at the dip, when a similar flag will be waved from the wharf to which the vessel can go alongside. 200 tons an hour can be put on board, if urgently required ; 100 tons an hour can always be depended on.†

The Tanjong Pagar Company lease the Government stores on Ayer Brani island, and usually kept there about 2,000 tons of coal, for the purpose of coaling vessels in Singapore road, by lighters.

North side of New Harbour.—The shore reef which extends from the north-west limit of the harbour and passes about 50 yards outside Lot's wife, Blayer point, trends to the northward one cable and about the same distance to the eastward, forming a small bay nearly filled with shoal water, thence to the north-eastward for about $1\frac{1}{4}$ cables to the foot of mount Chermin, from which the reef curves to the eastward, forming Chermin bay. On the eastern side of this bay are two of the docks, and works previously alluded to ; the reef thence trends in an E. by S. direction

* Vessels of 5,000 tons burthen have been docked here.

† There are some shoal patches off the Borneo Company's wharf of about 18 or 20 feet, towards its west end, which makes it awkward for vessels of heavy draught to get alongside.—Navigating Lieutenant H. Roxby, H.M.S. *Bacchante*, 1882.

for 3 cables to the Peninsular and Oriental jetties, which have extensive coal stores and godowns behind them. The whole of these buildings are on ground that was once a small island, but is now connected to Singapore by a roadway.

These jetties have a frontage of $1\frac{1}{2}$ cables in an easterly direction to the entrance of a shoal bight named Sibat bay; on the opposite side of which, at about a cable to the eastward, is St. James hill, 70 feet high, having a house and some trees on its summit, and is a beautiful feature in the delightful scenery of this harbour. Mooring buoys are placed off the jetties, and a dolphin at either end, to assist in securing steam vessels when coaling.

On the east side of St. James hill is a shoal bight named Blangah bay, about a cable wide at its entrance. From the East point of this bay the edge of the reef trends about N.E. by E., and for a distance of nearly a quarter of a mile is fronted by jetties and coal stores with godowns behind them. These belong to Jardine and the Borneo Company.

The Tanjong Pagar Company have built a sea wall about 750 yards long on the east side of their docks, extending to the extreme of Pagar spit. From this extreme their wharves and docks extend a considerable distance to the westward. The space between them and the Borneo Company is being rapidly reclaimed, and increased wharf accommodation afforded.

Mount Faber is the name of a conspicuous range of hills which rises boldly on the northern shore, about the middle part of New harbour. The direction of the range is about north-west and south-east, the highest point, 357 feet, being towards its north-west end. Near the middle of the range is a flagstaff, which, like that upon fort Canning hill, is crossed by two yards, used for signalling the arrival of vessels from the westward, and repeating the signals made from fort Canning. The height of the range where the flagstaff stands is 303 feet, the same height as mount Serapong on the opposite side of New harbour.

Eastward of mount Faber, behind the wharves and jetties, are several small hills from 100 to 130 feet high.

Blayer point, the north-western limit of New harbour, is formed of cliffs of a moderate elevation, and projects in a S.S.E. direction from the low mangrove behind it to a rather sharp point. From this point the coast trends in a north-westerly direction and is fringed with a white beach named Pasir Panjang, or long beach, upon which, at a cable from Blayer point, stands a board, denoting the harbour limit in this direction.

Lots Wife is a rock about 6 feet above high water, lying immediately off the pitch of Blayer point, about 50 yards inside the edge of the

shore reef, which is here steep-to. A white beacon, 10 feet high, marks the south edge of the shore reef.

Blayer rock, with 7 feet water, lies S.W. rather more than half a cable from Blayer point.

A patch having $3\frac{1}{4}$ fathoms water lies W. $\frac{1}{4}$ S. distant $2\frac{1}{2}$ cables from Blayer point, and is the shoalest part of a bank having depths of 4 and 5 fathoms, with 7 and 8 fathoms close to its outer edge, and 6 fathoms between it and the shore reef fronting Pasir Panjang beach.

To clear this patch, and also Blayer rock, keep Tereh point, a conspicuous red bluff on Ayer Brani island, well open south of the Peninsular and Oriental Company's jetties.

SOUTH SIDE OF NEW HARBOUR.—**Rimau point**, the north-west extreme of Blakan Mati island, and the south-west limit of New Harbour, is formed of cliffs with patches of shelving rock projecting from their bases. The shore reef extends half a cable in a W.N.W. direction from the extreme of the point, with 7 feet water at that distance, and from 3 to 4 fathoms close beyond.

Hantu, the small round island lying in front of Chermin bay, is nearly $1\frac{1}{2}$ cables in diameter, 96 feet high, and covered with trees. Its southern side, being nearly in the same line as the Peninsular and Oriental jetties and Lots wife, forms part of the northern side of the main channel of the harbour. A reef surrounds the east, south, and west sides of the island, the edge of which, on the south side, is marked by a white beacon. The north-east side, opposite the dry dock, is free from reefs, with depths of 3 fathoms close-to.

Berdaun rock, is a small patch of reef above water, grown over by mangrove trees, distant about half a mile east from Rimau point, and half a cable from the Blakan Mati shore. A reef, dry at low water, extends about two-thirds of a cable westward, and about a third of a cable northward and eastward from it. Close to this reef are $2\frac{3}{4}$ and 3 fathoms water, excepting on its eastern side, where the depths are less.

Between this rock and Blakan Mati there is a channel about one-third of a cable wide, with a depth of $3\frac{1}{2}$ fathoms.

Silugu island lies at the western entrance of Sinki strait about $1\frac{1}{2}$ cables to the eastward of Berdaun rock, and fronts a shallow bight, dry at low water, named Imbeah bay. It is a remarkable little island, almost circular in shape, and moderately elevated, with a small bungalow on its summit.* The shore reef projects from the coast, a short distance outside this island, with from $3\frac{1}{2}$ to 5 fathoms close-to.

* This bungalow is named Pilot house on the chart of New harbour, owing to its having been built and first inhabited by Mr. Clunis, then the pilot for the Peninsular and Oriental Company; but it is not the usual residence or station of a pilot, as might be inferred from the name given it.

Keppel rock, with 24 feet water, is 23 yards long in an east and west direction, and 12 yards broad, and lies W.S.W., one cable from the western extreme of the Peninsula and Oriental Company's works.* Close around the rock are depths of 5 and 6 fathoms. The south extreme of St. James hill on with the eastern extreme of the Peninsular and Oriental Company's jetties leads southward of the rock.

Mæander shoal, about one cable in extent, east and west, with from 6 to 16 feet water, lies on the south side of the main channel of New harbour, about $1\frac{1}{2}$ cables south of the Peninsula and Oriental Company's works, and a cable to the north-west of the extreme of the spit extending from Risim point. The northern edge of the shoal is marked by two red buoys; around and in the channel between it and Risim spit, the depths are $3\frac{1}{2}$ to $4\frac{1}{2}$ fathoms.

Ayer Brani Island, (Pulo Brani,) lies in New harbour. It is nearly two-thirds of a mile long, east and west, and the same in breadth; its greatest length is on its north-eastern side, facing Singapore road, and upon this part are three hills, the middle one, which is the highest, being 168 feet above the sea. Tereh point, the north extreme of the island, and Teregeh point, the south-east extreme, are both formed by cliffs; those forming Tereh point are of a red colour and present a bold red bluff, which is conspicuous when viewed from either entrance of the harbour.

This island, like Blakan Mati, is encircled by a coral reef with occasional patches of sand, which uncover at two-thirds ebb. From Risim point the west extreme of the island, the reef extends $1\frac{3}{4}$ cables to the westward, and forms a spit, having a white beacon on its outer edge, thence it trends about E.N.E. 4 cables, to the naval store jetty on the west side of Tereh point. From Tereh point the reef projects only about 20 or 30 yards, thence it curves round to the south-eastward, passing about a cable outside Silingsing point, at the middle of the east side of Ayer Brani, and terminates abreast Teregeh point. From this point the reef projects about half a cable to the southward, and more than 2 cables eastward, the extreme of the latter part being known as Teregeh spit, and marked by a white beacon.

Buoys.—A black buoy with ball is moored in $2\frac{3}{4}$ fathoms, about one cable north-east of the white beacon on Teregeh spit, and a similar black buoy in 5 fathoms, about one-third of a cable off the reef, abreast Brani bay.

Saga bay.—Between Tereh and Risim points, on the north-west side of Ayer Brani, is Saga bay, dry at low water, which offers great facilities for the construction of dry docks.

* H.M.S. *Charybdis*, by the explosion of dynamite, increased the depth from 15 feet to 24 feet.

Some years ago a dry dock was begun here, but its completion was stopped by the Government, who has since built a jetty and store houses close to the dock, at the north-eastern part of Saga bay, but with the dock itself nothing has been done. This jetty is leased to the Tanjong Pagar Company, who store coal here for supplying vessels in the road; the depth of water alongside (17 feet) and the strength of the tide near the wharf being such as to prevent it being generally used by steamers. Just to the north-eastward of Risim point, are the torpedo stores, with a convenient jetty, off which dolphins are placed to secure vessels to.

Sinki strait.—Beacons.—Sinki strait, the channel between Ayer Brani and Blakan Mati islands, is not much used. To render it navigable, beacons have been placed on the edges of the reefs; on the north side, in addition to the white beacons on Teregeh and Risim spits, white beacons have been placed on the edge of the reef south of Teregeh point, and on the east extreme of the detached reef lying south-westward of Bon Accord dock; a pole beacon marks the west extreme of this reef. On the south side red beacons mark the end of the reef north of Berala point; the end of the reef opposite Kopih village, and the edge of the reef between Kuchin and Gila creeks.

Owing to the uncertainty of the direction of the gusts of wind caused by the adjacent high land, it is scarcely considered safe for sailing vessels.

The western entrance of the strait, between the spit off Risim point and the reef fronting Blakan Mati, is quite clear, with depths of 4 and 5 fathoms. Off the south side of the western part of Ayer Brani is a detached reef marked by beacons, dry at low water, and surrounded by a bank which projects more than half-way across the channel towards Blakan Mati narrowing it to the breadth of half a cable. From the eastern extreme of this reef the strait is barred by a bank with a greatest depth of 3 fathoms. A tongue, with a depth of $2\frac{3}{4}$ fathoms, projects from the west point of Bindarah bay, on Blakan Mati island, nearly to the opposite side of the strait, in the direction of Kopih village.

The entrance to this strait from the eastward is between Teregeh and Berala spit, where it is about one cable wide, with depths of 7 to 12 fathoms; within Teregeh and Berala points the depths decrease to 7, 6, and $4\frac{1}{2}$ fathoms.

EASTERN ENTRANCE.—Brani Shoals lie at the eastern entrance of New harbour, between Pagar point and Ayer Brani island. They extend, under a depth of 3 fathoms, about half a mile in a N.W. by W. and S.E. by E. direction, and from their south-east extreme Teregeh point bears S.W. by W. $4\frac{1}{2}$ cables; from their north-west extreme the eastern part of Teregeh point bears S. $\frac{3}{4}$ E., 5 cables. The least water upon these shoals is 10 feet, near their centre, over a space about 2 cables in length, and from a few yards to half a cable wide.

Buoys.—The channel on their eastern side is marked by three white buoys, one near their south-east extreme, one near their middle, and the other at half a cable inside their north-west end. A white buoy also lies in 10 feet on Brani shoal, about one cable west of the middle white buoy.

The soundings decrease gradually towards these shoals, and if the lead be properly attended to, it will show when a vessel is nearing them.

Timbaga rocks, dry at low water springs, and lie between Pagar docks and Brani shoals; they are about half a cable long in a north-west and south-west direction but only a few yards broad. Two red beacons mark these rocks, one on either extreme.

Timbaga shoal, about half a cable in extent, and with a depth of 9 feet lies about a cable north-westward of Timbaga rocks, and its north-western end is marked by a red buoy.

Both of these dangers have depths of 3 to 5 fathoms within a short distance.

South Channel lies between Brani reef and Brani shoals, it is about 6 cables long and three-quarters of a mile broad, with depths of 3 to 10 fathoms.

Middle Channel, between Brani shoals and Timbaga rocks, is about one cable broad, with depths of $4\frac{1}{2}$ to 8 fathoms.

North Channel, between Timbaga rocks and Pagar docks, is nearly one cable broad, with depths of $4\frac{3}{4}$ to 10 fathoms.

Anchorage.—The general depths in New harbour are from 6 to 8 fathoms, but the bottom is foul, rocky, and very indifferent holding ground. Staff Commander Richards, R.N., who surveyed this harbour in H.M.S. *Saracen*, which vessel remained at anchor there for 3 months, remarks:—“The holding ground is bad, and great care is necessary to prevent fouling the anchors; vessels remaining more than a day should moor.” The best anchorage is considered to be off the Torpedo stores, on Ayer Brani island.

Caution.—Vessels are not permitted to anchor in the fairway of New harbour, except for such length of time as may be necessary, preparatory to dropping alongside or moving from the wharves.

TIDES.—It is high water, full and change, at the Peninsular and Oriental Company's wharf, at 9h. 45m.; springs rise 10 feet, neaps $7\frac{1}{2}$ feet, During the north-east monsoon the day tide rises the highest, and in the south-west moonsoon the night tide. The low water at Singapore is affected by a large diurnal inequality, amounting at times to 6 feet. The ordinary rate of the tide at springs is $2\frac{1}{4}$ knots, but it is much influenced by the prevailing monsoon, and often runs 4 knots at the springs. At the Pagar Dock Co. wharf there is a self-registering tide gauge.

The irregularities of the tides are very great, so that no dependence can be placed on them from one day to another; for although a tide may rise

8 feet one day, it may increase to 10 feet the next, and the contrary. Again the night tide may be the lowest in one 24 hours,—and in the next the morning tide. During the north-east monsoon the neap tides, although the water rises and falls, yet the stream continues to run to the westward, sometimes for two, three, or four days consecutively; other times it may be as many days quite still; or a rush of water will flow into and out of the harbour at the rate of 3 and 4 knots. All these fluctuations occur most frequently during the north-east monsoon, and depend chiefly on the force of the wind in the China Sea, yet they sometimes do happen in the south-west monsoon, without any apparent cause.

DIRECTIONS.—Western entrance.—Vessels proceeding into New harbour through the western entrance, which is little more than one cable across, should keep in mid-channel, observing that the conspicuous red bluff forming Tereh point kept well open to the Peninsular and Oriental Company's jetties, bearing E. $\frac{1}{2}$ N., will lead clear of the 19 feet patch outside the harbour, also of Blayer rock, and the reef extending from the south end of Hantu, on which there is a white beacon. Keppel rock will be avoided if St. James mound be not shut in behind the east extreme of the Peninsular and Oriental Company's jetties; and after passing Mæander shoal, a vessel may anchor in 6 or 7 fathoms abreast the Torpedo stores.*

Approaching the western entrance of New harbour, from the eastward, the channel between the Sisters and Middle island is recommended. Between the 3 fathom shoal half a mile westward of the Sisters, and the rock with beacon, south-eastward of Middle island, the channel is nearly $1\frac{1}{2}$ miles broad. Pulo Jong kept open eastward of Middle island leads eastward of the rock. Trumbu Silegar, with beacon, nearly one mile north-westward of the Sisters should be given a wide berth, thence to the entrance to New harbour there are no dangers beyond a quarter of a mile off shore. The channel, eastward of the Sisters, between them and West St. John island, is a good channel, and half a mile wide, for which the chart is sufficient guide. In the fair channel the general depths vary from 10 to 17 fathoms. The tides are very irregular in the passages among these islands, running sometimes 4 miles an hour at springs.

Eastern entrance.—Vessels proceeding from Singapore road into New harbour, should steer to the south-westward, not approaching Malay point nearer than one mile, nor hauling to the westward until mount Faber flagstaff is in line with the left corner of a conspicuous red tiled white house bearing W. by N. $\frac{1}{2}$ N., which clears Malay spit. In rounding this spit the fishing stakes furnish a ready guide to vessels, the

* For the directions for approaching New harbour from the westward, see page 102

outer ends of the longest lines of stakes having 3 fathoms water close to them, increasing at a short distance to 5 and 7 fathoms. Having rounded Malay spit, steer to the westward until the two red beacons on the Timbaga rocks are in line, bearing N.W. by W. $\frac{1}{4}$ W., when they may be steered for.*

To proceed through the North channel, Timbaga rock beacons in line should be steered for, until abreast the end of the sea wall of Pagar docks, when course should be altered to pass between the white buoys on the east side of Timbaga rocks, and the Pagar wharves. Continue to the north-westward, according to circumstances, leaving the red buoy on Timbaga shoal about half a cable on the port hand, and edging to the westward as convenient when Pulo Silugu, with a bungalow on its summit, is seen just open of the red cliffs of Tereh point, which mark clears the north-west extremes of Timbaga and Brani shoals.

To proceed through the Middle channel after having rounded Malay spit, and brought the beacons on Timbaga rock in line, steer about N.W. by W. $\frac{1}{2}$ W. until Mount Faber flagstaff is in line with the left corner of the white house bearing W. by N. $\frac{1}{2}$ N. which will lead about half a cable to the westward of the beacons, and also of the red buoy on Timbaga shoal, and about midway between the latter and the white buoy on the north-west extreme of Brani shoals, in depths of 6 to 4 fathoms, deepening to 6 and 7 fathoms as Pulo Silugu comes open of the red cliffs of Tereh point; when steer West and W.S.W. to pass mid-channel between the jetties and Tereh point. Vessels may anchor as convenient off the torpedo stores.

SINGAPORE TOWN AND ROAD.†

SINGAPORE.—The town of Singapore is built on each side of the Singapore river, a small stream, only navigable for boats, the entrance of which lies N. by E. $\frac{3}{4}$ E., nearly one mile from Malay point. The commercial part of the town is on the south side of the river, the bank on that side being lined with quays and godowns for the landing and reception of merchandise. The river is usually crowded with cargo boats and many other descriptions of small craft on their way to and from the ships in the harbour, presenting a scene of extraordinary bustle and activity. Singapore is a free port; there are no harbour or tonnage dues.

The new post office and master-attendant's office occupy a portion of the site of Fullerton battery, on the south point of the river, and

* Staff Commander J. Richards observes, that owing to the strong tides and to the hard bottom, the floating beacons frequently break adrift, so that no dependence can be placed upon them; he therefore recommends strangers to take a pilot.

† See Admiralty chart:—Singapore road, No. 1,995; scale, $m = 6.0$ inches

handsome blocks of buildings have been erected to the southward of the spot, upon some land which was reclaimed from the sea for that purpose. These buildings very much improve the sea front of the town, and are conspicuous as it is approached from the eastward.

Dalhousie obelisk stands a little northward of the north point of the river; close to the southward are two fine buildings, the one standing back is the court house, and that nearer the sea, the town hall; the public offices lie southward of these, and close to the bridge across the mouth of the river.

On the north of Dalhousie obelisk, the esplanade extends along the sea front for the distance of a quarter of a mile, and the drive round it is the fashionable resort of the European residents in the cool of the evening. Behind the esplanade stands St. Andrew's church, one of the finest ecclesiastical structures in India, built after the model of Netley Abbey; the church has a fine tower, surmounted by a lofty spire, which is very conspicuous when viewed from seaward. To the right of the church is a very large building, a museum and library, named the Raffles Institution; extending from which in the same direction are a number of handsome detached houses, standing in gardens. Beyond this line of houses, is an extensive native town, the greater part of which is hidden by the sandy point, named Tanjong Rhū.

Observation spot.—Fullerton battery, which formerly stood on the southern point of the entrance to Singapore river, has been demolished. It is important from being the position to which it has been customary of late years to refer the meridian distances obtained in Her Majesty's surveying and other vessels employed upon the station. The observation spot, a square block of stone, situated close behind the master attendant's office, still remains. It was considered to be in lat. $1^{\circ} 17' 20''$ N., long. $103^{\circ} 51' 18''$ E.; but from a telegraphic determination made by Lieutenant-Commander Green, U. S. Navy, in 1881-2, lat. $1^{\circ} 17' 11''$ N., and long. $103^{\circ} 51' 15''$ E. has been adopted.

Landing.—Dredging operations are going on slowly in the river, to admit of landing at all times. The landing pier outside the river (Johnston pier) would admit of considerable improvement, as with the least ripple on, embarking or disembarking there becomes a dangerous operation.

Strait Settlements.—Imports and Exports.—The free port of Singapore, which ranks as the third port in the commerce of India, was founded in 1819 by Sir Stamford Raffles, who had the sagacity to perceive that from its central geographical position, on the direct route between India and China, and but 40 or 50 miles out of the direct route between Europe and China, it could not fail to become a place of great commercial

importance, the rapid growth of Singapore has, however, exceeded all expectation.

The total in 1884 amounted to 29,000,000*l.*, the imports being about 16,000,000*l.*, and the exports 13,000,000*l.*; about one-fourth is British.

The total imports and exports of the Strait Settlements amounted to 42,000,000*l.*; that of Penang being 12,000,000*l.*, and Malacca about 1,000,000*l.*

The chief imports are—

From Europe and North America: Treasure, cotton manufactures woollens, beer and wines, arms and ammunition, iron and ironwork, copper and yellow metal, lead, earthenware, and canvas.

From Calcutta: Opium, grain, saltpetre, gunnie bags.

From China: Gold bars and dust, sycee silver and dollars, china cash, sugar, tea, camphor, cassia, alum, raw thread, silk, tobacco.

From the Dutch ports in Java: Treasure, tobacco, rice, pepper, gambier, coffee, cottons, birds' nets, cloves, cassia, cinnamon, other spices.

From Borneo: Unprepared sago, antimony ore, rattans, gutta percha from Sarawak, and coal from Labuan.

From Celebes: Sandal wood, sapan wood, coffee and gutta percha, the products of the island, and of mother of pearl, bartered for with the natives of New Guinea and other islands to the south-east of the Archipelago. Birds' nests and a small quantity of bees-wax also form items of importation from Celebes.

From Sumatra: Pepper, sago, coffee, gutta percha, gum benjamin, gum elastic, and ivory.

From the Malayan peninsula: Chiefly rice, gutta percha, and tin; small supplies of ivory, horns, hides, and birds' nests.

From Australia: Chiefly horses, bread-stuffs, coals from the mines at New South Wales, and sandal wood from Western Australia.

The chief articles of export are:—Tin, gambier, sago, tapioca, sugar, pepper, tortoise shell, mother of pearl, gutta percha, india rubber, nutmegs, and mace, camphor, gum elastic, coffee, tobacco, sapan wood, sticklac, rattans, and most of the articles enumerated among the imports. Of these, the only articles produced to any extent in our own territories, are gambier and pepper in Singapore; tapioca, chiefly in Malacca and Wellesley; rice, in Wellesley and Malacca, and sugar in Wellesley.

Shipping.—During the year 1884, the number of arrivals at Singapore was 2,951, with a tonnage of 2,288,118 tons; and 2,863 departures, with a tonnage of 2,235,278 tons. Of native craft 5,321 arrived, and 5,359 left.

The number of British vessels registered at this port amount to 298 sailing vessels of the tonnage of 20,000 tons, and 55 steam vessels of 13,300 tons. 95 vessels were built here in 1884, amounting to 4,527 tons burthen.

During the year 1883, the total arrivals, including all the Straits Settlements, amounted to 13,820. There is a shipping office at the port.

Climate.—The island of Singapore is hot, with but little variation of temperature, the thermometer usually ranging from 70° to 90°; the total rainfall is about 100 inches. The monsoons are little felt on the island, but it is kept in a perpetual state of verdure by frequent showers. There are no diseases nor ailments due to climatic causes against which special precautions are necessary. For winds in the strait *see* page 2, also wind charts.

Hospital.—A large hospital, built in 1882, has 50 beds, in the seaman's wards, and 10 in the officers. The sailors' home accommodates 95.

Revenue.—The total amount of the revenue of the Straits Settlements, from all sources for the year 1883, amounted to 559,000*l.* The duty on the export of tin forms the largest item of the revenue.

Population.—The population of the Straits Settlements in 1881, amounted to 423,384; that of Singapore being 139,208; Penang, 90,951; Province Wellesley, 97,324; Malacca, 93,579; and the Dindings, 2,322.

The population of Singapore consists of 2,769 Europeans; 22,155 Malays; 86,766 Chinese; and 12,058 natives of India.

Communication. — There is weekly communication between Singapore and England by the Messageries Maritime Company's mail steam vessels, viâ Ceylon and Marseilles, not calling at Penang; and by the Peninsular and Oriental Company's steam vessels, viâ Ceylon and Brindisi, about 29 days. There is also regular communication by steam vessels between Singapore, Calcutta, Batavia, and Hong Kong; to the eastern ports of Australia by way of Torres straits monthly, and bi-monthly viâ Galle; and to Western Australia about once in two months. There is also constant communication between the ports of the Straits Settlements, and Bangkok, Saigon, and the principal ports of Borneo and Sumatra.

Telegraph. — Singapore has telegraphic communication by submarine cable with Madras viâ Penang; Australia viâ Batavia; and Hong Kong viâ Saigon.

FORT CANNING.—Rising abruptly behind, and overlooking the town of Singapore, is a hill 156 feet high, upon which formerly stood a bungalow, the residence of the governor; now, however, the crest of the hill is covered by a large fort, named fort Canning, in honour of the late Viceroy of India. Near the middle of the fort is a flagstaff, crossed with two yards, which is used during the day to signal the arrival of vessels.

LIGHT.—A *fixed* white light is exhibited from a flagstaff in fort Canning, at an elevation of 256 feet above the level of the sea. It is visible through an arc of 68°, between the bearings N.N.W. $\frac{1}{2}$ W. and

W. $\frac{1}{2}$ S., or from one mile eastward of Peak island to one mile southward of Johore shoal. In very clear weather it may possibly be seen from a distance of 20 miles.

SINGAPORE ROAD* in which the depths are from 6 to 10 fathoms, mud, is situated on the southern side of Singapore island, between the shore bank extending north-eastward from Malay spit, and Outer shoal, which is a portion of the mud bank fronting the shore between St. John islands and Tanjong Katong, the eastern limit of the road being defined by a line drawn from Tanjong Katong obelisk to that on the south-east extreme of Peak island. The limits of Singapore harbour, defined by the Colonial Government, 21st June 1877, are comprised within the lines joining the obelisk on Tanjong Katong and that on Peak island, the north-west extreme of Peak island, and south extreme of Blakan Mati; the east and north coast of Blakan Mati, and the coast from Blayer point to the obelisk on Tanjong Katong.

Banks.—Outer Shoal, lying on the south-east boundary of Singapore road, is $1\frac{1}{2}$ miles long in a north-east and south-west direction, and from one to 5 cables in breadth, having depths of 4 to 5 fathoms over the greater part of it, but some patches of $3\frac{1}{4}$ to $3\frac{1}{2}$ fathoms near its southern extreme.† From the north-east end of the shoal, in 5 fathoms, the obelisk on Tanjong Katong bears N. $\frac{1}{2}$ E., and fort Canning flagstaff is just to the northward of the obelisk on the north side of the river entrance; from its south-eastern extreme fort Canning flagstaff bears N.N.W. $\frac{1}{2}$ W.

The whole of fort Canning kept just open northward of the obelisk, bearing N.W. by W. $\frac{1}{4}$ W., will lead clear of the north end of Outer shoal; Peak island S.W. by S. will lead eastward of it; and the southern extreme of Blakan Mati island S.W. by W. $\frac{1}{2}$ W. will lead northward.

A small patch, about 2 cables in extent, having 4 fathoms least water, lies about a third of a mile south-westward of Outer shoal, and from its centre, fort Canning flagstaff bears N.N.W. and Peak island S. by W. Mount Serapong bearing W. $\frac{3}{4}$ N. leads between this patch and Outer shoal, and bearing W. by N. $\frac{3}{4}$ N. leads to the southward of it.

Inside Outer shoal are depths of from 10 to 12 fathoms, mud, decreasing gradually to 7 or 6 fathoms, but shoaling suddenly from a depth of 5 to 3 fathoms; when fort Canning flagstaff bears to the northward of N.W. by W. $\frac{1}{2}$ W., caution is necessary in large vessels anxious to get as close in as possible. With fort Canning flagstaff to the westward of

* See Admiralty plan :—Singapore road, No. 1,995, scale, $m=6$ inches. For winds and weather see pages 2 and 91.

† This bank is shoaling rapidly. In 1846, when surveyed by Mr. Thompson, Government surveyor, the general depths upon it were $5\frac{1}{2}$ and 6 fathoms, and the least water $4\frac{1}{2}$; in 1867 the general depths were but 4 and $4\frac{1}{2}$ fathoms, and the least water $3\frac{1}{4}$ fathoms.

N.W. by W. $\frac{1}{2}$ W., the soundings decrease more regularly. The 2-fathoms line extends nearly half a mile south-eastward of Johnston pier, and nearly three-quarters of a mile from the depth of Singapore bay. The outer extremity of the fishing stakes marks the 3-fathoms edge of the shore bank, eastward of Malay point.

Buran Darat is the name of an extensive coral reef which uncovers at two-thirds ebb, and fronts the eastern shore of Blakan Mati island, being separated from the shore reef by a narrow channel, with depths of 4 to 8 fathoms. The reef is about a mile long, in a north-east by north, and south-east by south direction, a quarter of a mile broad at the northern end, and terminates in a point at its southern extreme. There is a detached patch of $1\frac{1}{2}$ fathoms with $3\frac{1}{4}$ to 4 fathoms close around, lying about one cable northward of the north edge of the reef; Teregeh point bearing W. $\frac{1}{2}$ S. leads northward both of this patch and Beralap spit.

The north-eastern extreme of Buran Darat is marked by a white beacon.

Malay spit, a mud and sand flat, with several patches of rocks, and which dries at two-thirds ebb, fronts the small bay between Pagar docks and Malay point, projecting in a south-easterly direction to the distance of a third of a mile. Shoal water, under 3 fathoms, extends about 3 cables outside the spit, and its edge is marked by several lines of fishing stakes.

Malay or Malang point, the south-western limit of Singapore road is nearly one mile south of the entrance of Singapore river. Tanjong Pagar village lies on the west side of it, from whence the shore takes a south-westerly direction for nearly half a mile to Pagar sea wall, the termination of which is the entrance to New harbour. A mud-flat fronts the whole shore of Singapore road from abreast Malay point to Tanjong Katong, varying in distance from a half to two cables from the shore.

Tanjong Rhū, or Sandy point, is the extreme of the land extending $1\frac{1}{2}$ miles West from Tanjong Katong, and forming the northern shore of Singapore road. It is separated from the western shore of the bay by a channel a quarter of a mile wide, with about 3 feet water at low spring tides.

Inside Tanjong Rhū is an extensive shallow lagoon, convenient for the anchorage of boats and native craft, and many are to be seen there at certain seasons. Some shipwrights' yards are now established at this point, and many small vessels go there to be repaired.

Tanjong Katong, or Deep-water point, forming the north-eastern boundary of Singapore road, lies N.N.E. $4\frac{1}{2}$ miles from St. John islands. The obelisk, which marks the harbour limit in this direction stands about a cable westward of the point. The coast for some distance to the westward of Tanjong Katong, is low land, covered with cocoa-nut plantations.

Fishing Stakes.—Lines of fishing stakes extend from the coast about Tanjong Katong, over the shallow bank fronting the coast, and close to the ends of the stakes are from 2 to 5 fathoms water, but these soundings are in a narrow run of deep water, behind the harbour bank, the 5-fathoms line at the edge of which is about three-quarters of a mile distant from the point.

Between the deep water close to the point, and the 5-fathoms line outside of it, are several patches with but 15 and 16 feet water over them, and two patches with as little as 12 feet. The eastern of these lies S.E. by E. $\frac{3}{4}$ E. from the obelisk, distant half a mile from the nearest shore, and the western lies S. by W. $\frac{1}{2}$ W. nearly three-quarters of a mile from the obelisk.

These shoals will be avoided by keeping mount Serapong westward of S.W. by W. $\frac{1}{2}$ W. until the flagstaff on fort Canning bears W. by N. $\frac{1}{2}$ N. ; or by not shoaling under a depth of 6 fathoms.

ANCHORAGE.—The trade of Singapore is now so considerable that a large number of vessels can always be found anchored in the road within the harbour limits, and small vessels may run in, guided by their soundings, and anchor where they can find a convenient berth.

Vessels of large draft must be more cautious, on account of the soundings decreasing suddenly from 5 to 4 and 3 fathoms. Good, safe anchorage, in from 7 to 10 fathoms water, will be found with the flagstaff on fort Canning between the bearings of W. by N. $\frac{1}{2}$ N. and N.W. $\frac{1}{2}$ N., and with mount Serapong bearing S.W. by W. $\frac{1}{2}$ W., or the left extreme of Blakan Mati S.W. $\frac{1}{2}$ W.

Vessels of War.—The most convenient anchorage for vessels of war, and the nearest to the shore, is with the flagstaff on fort Canning in line with the obelisk on the pier, and the left extreme of Blakan Mati island bearing from S.W. $\frac{1}{2}$ W. to S.W. $\frac{1}{4}$ W. ; or the obelisk on Tanjong Katong from N.E. by N. to N.E. $\frac{3}{4}$ N. She will then be in 9 fathoms at a little more than 2 cables from the 3-fathom edge of the bank, and $1\frac{1}{4}$ miles from the landing place.

To indicate this anchorage, a conical, red buoy, with a staff and plate, marked man-of-war anchorage, is moored in 10 fathoms, with fort Canning flagstaff in line with the obelisk on the pier, and the obelisk distant $1\frac{6}{10}$ miles. A space one cable in width, marked by the flagstaff and obelisk in line, and extending from the shore to the buoy, is reserved for vessels of war of all nations, exclusively. This buoy is occasionally dragged from its proper position, but is replaced by the harbour authorities with as little delay as possible. During the sea breeze, a choppy sea gets up, especially on the ebb, rendering it dangerous for boats alongside.

The **quarantine anchorage** is with the obelisk on Tanjong Katong bearing N.N.W., in not less than 11 fathoms water.

DIRECTIONS.—When bound to Singapore road from the westward, and having rounded Peak island at the distance of about 2 cables, steer N. by E. or N.N.E. according to the tide, across the Outer shoal for the anchorage. A large vessel wishing to avoid Outer shoal may steer to the northward with Peak island hearing between South and S. by E., until the left extreme of Blakan Mati bears S.W. by W. $\frac{1}{2}$ W., which bearing kept on will lead north-westward of Outer shoal, and then steer as convenient for the anchorage.

In working towards the dangers between St. John islands and Blakan Mati, care must be observed not to bring Peak island eastward of S. $\frac{1}{2}$ E. while mount Serapong is northward of W.N.W.; but when mount Serapong is westward of that bearing, a vessel may stand on until the western extreme of West St. John island bears S. by W. $\frac{1}{2}$ W. The shoalest spots on Outer shoal will be avoided by not bringing Peak island westward of South, after the south extreme of Blakan Mati bears W. by S. The fishing stakes will give warning when a vessel is standing towards Malay spit. The south extreme of Blakan Mati, if not brought westward of S.W. by W. $\frac{1}{2}$ W., will lead inside of Outer shoal; and large vessels not wishing to stand over this shoal, when outside of it, should not bring Peak island southward of S.W. by S.

Small vessels bound to Singapore road from the eastward will have no difficulty, as they have merely to proceed to a convenient anchorage. Those drawing between 12 and 16 feet may pass inside the shoals off Tanjong Katong, by keeping in the run of deep water, pretty close to the end of the lines of fishing stakes which extend out from that point.

Vessels of larger draught had better keep outside those shoals, and in approaching them must be careful not to bring mount Serapong (on Blakan Mati island), to the southward of S.W. by W. $\frac{1}{2}$ W., until the flagstaff on fort Canning bears W. by N. $\frac{1}{2}$ N., or to avoid getting under a depth of 6 fathoms.

It is advisable for sailing vessels, and the usual custom for those belonging to the port, to keep these shoals well aboard when proceeding to the anchorage from the eastward, when the wind is off the land and the tide setting to the westward.

A vessel of large draught will pass north-eastward of Outer shoal and not have less than 5 fathoms water, by keeping the flagstaff between the bearings of W. by N. $\frac{1}{2}$ N. and N.W. by W., and she should be prepared to anchor directly mount Serapong bears S.W. by W. $\frac{1}{2}$ W., or the left extreme of Blakan Mati S.W. $\frac{1}{2}$ W., inside of which vessels of heavy draught

should not go; but those drawing not more than 18 or 20 feet may go a cable or so farther in, and have 4 or 5 fathoms.

EASTERN PART OF SINGAPORE STRAIT.

SOUTH SHORE.—This part of Singapore strait eastward of the Sambo islands, is formed by Pulo Battam, an island of considerable size lying on the west side of Rhio strait, and by the larger island Pulo Bentán on the east side of Rhio strait.*

BATTAM BAY lies close eastward of Sambo island, and is $7\frac{1}{2}$ miles wide, and 2 miles deep, being bounded to the westward by the two Sambo islands, and to the eastward by the peninsula of which Sikwang point is the north-west extreme.

Tanjong Pingi, the north-west point of Battam bay, lies about $1\frac{1}{4}$ miles south-eastward of Pulo Sambo; a reef extends from the point to the distance of half a cable.

The soundings in the outer part of the bay vary from 10 to 20 fathoms; but close to the reefs extending from the shores, are depths of 6 to 8 fathoms, so caution is necessary in approaching them.

Three rivers fall into the bay; the Mentaru, Ladi, and Jodu, the two latter are separated by Tanjong Oma, a strip of land three-quarters of a mile wide, having a hill near the point.

Pulo Dangas is an islet on the south shore of Battam bay, close to a projecting point situated $1\frac{1}{4}$ miles east of Tanjong Pingi. The bay between this islet and Pulo Bokok, is free from danger, and the shore reefs extend off but a short distance; vessels may therefore safely anchor there in about 5 fathoms water. The bay westward of Pulo Dangas is filled with coral, which extends about a quarter of a mile from that island in a north-westerly direction; thence nearly straight to Tanjong Pingi.

Pulo Bokok, or Mangrove island, 4 cables in diameter, lies about that distance off Tanjong Liengsi, on the southern shore of the bay, and $1\frac{1}{2}$ miles east of Pulo Dangas; it is encompassed by the coral reef projecting from the shore, and which extends about $1\frac{1}{2}$ cables beyond it.

Jodu bay is the name of the anchorage off the two small rivers Jodu and Lapi, in the depth of Battam bay. It lies between Pulo Bokok and two small reefs dry at low water, which lie off the entrance of Sungai Jodu, a third of a cable outside the shore reef which fringes the whole coast line from Sikwang point to Pulo Bokok, and obstructs the mouths of all the rivers.

Vessels should enter the bay with the hill over Tanjong Oma bearing about S.E., and anchor in 5 or 4 fathoms, with Pulo Bokok abeam,

* See Admiralty charts:—Singapore strait, No. 2,403; scale, $m = 0.66$ of an inch.

and about 4 cables distant. The depths decrease suddenly from 7 to 3 fathoms towards Pulo Bokok, but more regularly towards the shoals on the opposite side of the bay.

Sikwang point and Tanjong Pengair are, respectively, the north-west and north-east extremes of a peninsula which projects from about the middle of the north coast of Battam, separating Battam and Bulang bays. The land in the vicinity consists of moderately elevated hills, and the coast line is fringed with coral extending one or 2 cables off, near the edge of which are irregular depths, of from 6 to 11 fathoms.

BULANG BAY, situated about 2 miles eastward of Battam bay, is $2\frac{3}{4}$ miles wide between Tanjong Pengair and Tanjong Pekapu, and $2\frac{1}{2}$ miles deep, narrowing towards its head; into which fall the rivers Tring and Belie-an. The shores of the bay are fronted by reefs which extend barely a quarter of a mile from the entrance points, but more than double that distance within them; and from a point a mile south-eastward of Tanjong Pengair, a coral spit, with 15 feet over it, projects in an E. $\frac{1}{4}$ N. direction nearly one mile.

A small detached reef, part of which dries 3 feet, lies at the entrance of Bulang bay, with its outer edge E. $\frac{1}{2}$ N. one mile from Tanjong Pengair. Eastward of this reef the depths are $3\frac{3}{4}$ and 4 fathoms for about one mile, and then 5 and 6 fathoms towards Tanjong Pekapu. Outside the line of the heads the depths are 8 to 11 fathoms, increasing suddenly to 23 fathoms; and between the reef and Tanjong Pengair the depths are 4 to 8 fathoms.

Anchorage.—The best anchorage in this bay for vessels of moderate draught is in about 6 fathoms, with Pulo Nongsa bearing N.E. $\frac{1}{2}$ E., and the hill over Tanjong Pekapu, East. Small vessels may, with proper attention to the lead and a good look-out, go farther in.

Eastward of Tanjong Pekapu, the coast is fronted by a coral flat extending nearly a third of a mile from the shore.

Pulo Nongsa, a small island one-third of a mile in extent with a high tree upon it, lies about a mile to the northward of Tanjong Pekapu, and nearly three-quarters of a mile off Tanjong Batu Bla, the nearest point of Pulo Battam. This island is surrounded by a reef, extending about a quarter of a mile off, between which and the shore reef is a narrow channel having depths of 5 to 13 fathoms.

Pulo Nongsa is rather a conspicuous object when near this part of the strait, and if kept open of Tanjong Bulang will lead a vessel clear of Little Pan reef.

Rosa rock, nearly one mile E. by N. from Pulo Nongsa, and 2 cables northward of the shore reef extending from Tanjong Bulang, dries at low water, with 10 to 12 fathoms close to its north side.

TANJONG BULANG, or **Nongsa**, the most northern point of Pulo Battam, lies nearly a mile north-east from Tanjong Batu Bla, the coast between forming a bay, in which, on the banks of a small stream, is the Malay village of Nongsa. This bay is filled with coral dry at low water, the edge of which extends half a mile from the shore as far as Tanjong Bulang. From the east side of that point the shore reef does not extend farther out than 2 cables, thence to Tanjong Bombang, entrance to Rhio strait, a distance of about 3 miles in a S.E. by E. direction, it projects three-quarters of a mile from the shore.

PULO BENTÁN is the largest island on the south side of Singapore strait; the north side of this island is about 16 or 17 miles in length, in an east and west direction, the greater part being taken up by Sumpat bay; several dangers lie off the island, which will be described in detail. Like most of the other land forming the strait of Singapore, it is covered with trees, and, excepting the hills inland, is not much elevated.

Bentán Great and Little Hills.—Bentán Great hill is situated about $6\frac{1}{2}$ miles from the northern shore of the island, and may be seen in clear weather about 40 miles, being 1,253 feet high, and is a good mark in approaching the entrance of Singapore strait from the northward. When viewed from that direction, it shows a saddle-shaped summit; and appearing to adjoin it on the north side, but in reality 3 miles distant, is a conical hill, named False Bentán, or Bentán Little hill, 792 feet high, the summit of which is in line with the saddle of the large hill when bearing S. 9° E.

Tanjong Subong, the north-western point of Pulo Bentán, lying 13 miles E. $\frac{1}{4}$ S. from Tanjong Bulang, Crocodile shoal, and Pan reefs, in the entrance of Rhio strait, are included in the description of that strait (*see* pages 425–6).

Tanjong Perjam.—From Tanjong Subong the coast trends $1\frac{1}{2}$ miles in an easterly direction, thence half a mile in a northerly direction to Tanjong Perjam, which is a point formed by a small hill projecting in a N.N.W. direction from the coast line; the shore reef extends off only a short distance, but a group of islets or large rocks, occupying a space nearly half a mile in extent, lies 4 cables off the point.

Pulo Perjam is a small islet situated in the bay between Tanjongs Subong and Perjam, at half a mile S.W. by W. from the latter; several large rocks above water extend nearly a mile to the westward of Pulo Perjam; as this bay has not been thoroughly examined, other rocks may exist below water.

Langui Shoal, about a third of a mile in extent in a north-east and south-west direction, and having 10 to 12 feet water, lies N.E. $\frac{3}{4}$ N. distant $1\frac{3}{4}$ miles from Tanjong Perjam. Close to the northward of this shoal are

depths of 5 and 6 fathoms, and 10 to 12 fathoms at a short distance; a bank with 2 to 5 fathoms extends nearly one mile to the south-westward.

These shoals will be avoided by keeping Pulo Kera or Skerrie, which lies on the east side of Rhuo strait, open of Tanjong Subong, bearing S.W. until the small hill over Tanjong Batu Sau bears S.E. by S.

Tanjong Batu Sau, a prominent point on the north coast of Bentán, having a small hill over it, lies $2\frac{1}{2}$ miles E. by N. from Tanjong Perjam. The coast to the eastward as far as Peak islet, is fronted by reef to the distance of one-third of a mile, with several rocks above water.

Between Tanjong Batu Sau and a bluff 2 miles westward, is a small bay about a mile in depth, the shores of which are fronted by coral, extending about half a mile off. Clusters of large rocks, lie just inside the edge of the shore reef westward of Tanjong Batu Sau.

Small vessels may anchor in 4 or $4\frac{1}{2}$ fathoms in the middle of the bay, by keeping nearer the rocks off the bluff than to those off Tanjong Batu Sau, the edge of the shore reef being close to the former; avoiding Langui shoal which lies in the approach.

Diana Shoal, lying E.N.E. 4 miles from Langui shoal, and S. by E. $\frac{1}{2}$ E. $5\frac{3}{4}$ miles from Pedra Branca lighthouse, is about half a mile in extent, with a depth of $2\frac{3}{4}$ fathoms, and 6 to 8 fathoms a short distance north and south from it.

East and west of the shallow part, the bank, with a less depth than 5 fathoms, extends about half a mile. Isolated patches of 5 fathoms or less lie between it and Langui shoal. To avoid Diana shoal, the north extreme of Tanjong Brakit should not be brought eastward of E. $\frac{1}{2}$ S.

TELOK SUMPAT, or **Sumpat Bay**, is the extensive bight between the point 2 miles eastward of Tanjong Batu Sau, with two small hills over it, and the western extreme of Tanjong Brakit; the points of the bay lying about E. by N. and W. by S. 8 miles apart. The head, and eastern part of the bay is blocked with coral reefs extending from one to $1\frac{1}{2}$ miles from the shore.

Pulo Sumpat, a small island 178 feet high, lying in the eastern part of Sumpat bay, may be readily known by its saddle shape. It lies just outside the edge of the extensive reefs fronting that part of the shore, and filling up the depth of Sumpat bay.

Vessels should not anchor in less than 6 fathoms water, or come inside a line connecting Batu Rumpat point with the north-west extreme of Tanjong Brakit.*

* A doubtful shoal, apparently about half a mile in extent, having $1\frac{1}{2}$ fathoms water over it, is marked on the chart N. $\frac{1}{4}$ E., distant 2 miles from Sumpat island, and $1\frac{1}{4}$ miles off shore. This shoal could not be found by the officers of the *Riflemen*, and tolerably even soundings, 6 to 8 fathoms, were obtained in the neighbourhood; owing to the setting in of the north-east monsoon the search had to be discontinued without the existence of the shoal being completely disproved.

TANJONG BRAKIT, the north-east point of Bentán island, has some hills on its east side, one of which is 217 feet high, and others at one mile farther to the southward, with one 267 feet high. Reefs and foul ground extend from one to $1\frac{1}{2}$ miles off this point.

Postillion Reef, composed of coral and sand, with 2 fathoms water, lies half a mile outside the shore reef extending from Tanjong Brakit; with depths of 4 to 5 fathoms between. Patches of 4 fathoms extend more than half a mile from this reef in a north-west direction.

Black Rock is a dark-coloured rock lying on the shore reef at half a mile off the north extreme of Tanjong Brakit.

Pulo Brakit, 30 feet high, also stands on the shore reef, and lies half a mile N.N.E. from Tanjong Brakit.

The shore reef extends about 3 cables outside these rocks, and a tongue of sand, with but 3 fathoms water, projects a third of a mile from the reef, and distant $1\frac{1}{4}$ miles from the north extreme of the point.

Pulo Kuku, 40 feet high, is narrow, and three-quarters of a mile long, it lies close to and appears to form the eastern side of Tanjong Brakit.

Brakit Rock, is one cable in length, and half a cable in breadth, with a depth of 2 fathoms at low water, and 10 to 12 fathoms close-to. It lies N.N.E. $\frac{1}{2}$ E. $2\frac{9}{10}$ miles from Tanjong Brakit, and from its shoalest part the northern extreme of Pulo Sumpat appears in line with the apex of Little Bentán hill. A conspicuous double tree on a long hill 4 miles south of Tanjong Lokan kept well open of Tanjong Lokan bearing S. by W., leads eastward of it; Pulo Panjang peak S.E. $\frac{1}{2}$ S. leads north-eastward; Barbukit hill about four times its own breadth open eastward of Horsburgh lighthouse W. by N. $\frac{1}{4}$ N., leads to the northward; and Little Bentán hill well open northward of Pulo Sumpat S.W. $\frac{3}{4}$ S. leads to the westward of it.*

The channel between Brakit rock and Tanjong Brakit is free from danger. It is not, however, advisable to use this channel except in cases of emergency.

CAUTION.—From the above description it will be seen that the whole of the north coast of Bentán is fronted with dangers, and it is advisable that vessels should not attempt to come inside Diana and Langui shoals, which will be guarded against by keeping Pulo Kera or Skerrie open of Tanjong Subong, until the north extreme of Tanjong Brakit bears E. $\frac{1}{2}$ S.; Pulo Sumpat bearing S.S.E. will lead to the westward of the shoals in the vicinity of Pulo Brakit.

* The German ship *Hansa* is stated to have struck about 5 miles northward of Tanjong Brakit. The wreck, afterwards destroyed by H.M.S. *Pegasus*, was found at 5 miles N. by E. $\frac{1}{2}$ E. from Pulo Brakit. The locality was unsuccessfully searched by the German vessel of war *Freya*. The existence of a shoal in the assigned position is considered doubtful.

Tides.—It is high water, full and change, at Tanjong Brakit at 11h., springs rise 12 feet, neaps 9 feet.

THE NORTH SHORE of the eastern part of the strait is formed by the south-east part of Singapore island, Johore shoal, and the south-east part of the Malay peninsula. Ramunia point the south-east extreme of the peninsula, and the north-eastern limit of Singapore strait, is 19 miles N.W. of Tanjong Brakit the south-eastern limit of the strait; but the Ramunia islands with several rocks and dangers near them, together with Ramunia shoals, North patch, and Eastern bank, extend nearly as far to the eastward as the meridian of Tanjong Brakit. These outlying dangers will be described in detail; but the following hills, as they form convenient landmarks for navigating the strait and for recognising the entrance from the eastward, will be first mentioned.

Johore Hill or Marabukit, 661 feet high, is of a regular, oblong, sloping form, and covered with trees. Standing but a very short distance inland from Tanjong Johore, the south-west point of the Malay peninsula, it is one of the most conspicuous objects in Singapore strait.

Little Johore Hill, or Gunong Bow, 749 feet high, lies N. by W. $\frac{3}{4}$ W. $5\frac{1}{4}$ miles from Johore hill. Although higher, this hill is not so extensive as Johore hill.

Barbukit Hill, 645 feet high, is nearly $5\frac{1}{2}$ miles W.N.W. from Ramunia point; it is a regular pyramid rising from the low land, and is a very useful object in making the strait.

False Barbukit Hill, 432 feet high, is situated on the coast of the Malay peninsula, 8 miles northward of the entrance of Singapore strait, and 6 miles N.N.E. $\frac{1}{4}$ E. from Barbukit hill; it is a low sloping hill near the sea, appearing like a topé of trees a little more elevated than the adjacent coast, which is all rather low and woody to the northward of the hills over Ramunia point. It bears W. $\frac{3}{4}$ S. about 17 miles from the centre of eastern bank, and being discernible during hazy weather much sooner than Barbukit hill, answers as a guide in coming from the northward towards the northern extremity of the outer shoals.

EAST COAST of SINGAPORE ISLAND.—From Tanjong Katong, the north-east limit of Singapore road, the coast trends E.N.E. and N.E. about 5 miles to Tanjong Buddah or Mung Kwang; about midway between is the village of Siglap, which may be known by two bungalows built on the summits of two hills about a mile inland behind the village. Just to the northward of Tanjong Mung Kwang there is a slight indentation in the coast line, known as Telok Mati Ikan (Dead Fish bay); the coast then trends about N.E. by N. $3\frac{1}{2}$ miles to Tanjong Changhi.

Red cliffs.—The south and south-east coasts of Singapore are level and woody. The most conspicuous objects are the small Red cliffs, or Tanah Merah Kechil, in a small bight just to the south-westward of Tanjong Buddah, and the large Red cliffs, or Tanah Merah Besar, about S.W. $\frac{1}{2}$ S. $2\frac{1}{2}$ miles from Tanjong Changhi. The large Red cliffs are visible from a considerable distance to the eastward, and will be seen some time before the small Red cliffs come in sight.

Tanjong Changhi, the north-east extreme of Singapore island, forms the south-east limit of the old strait of Singapore. It is low land with a white sandy beach, and bears about W. by N. nearly 6 miles from Tanjong Johore. A shallow bank extends about 2 cables from the point, close to which are depths of 6 fathoms.

A shallow bank fronts the whole of the east coast of Singapore island, extending off half a mile from the small Red cliffs, and one mile in a south-easterly direction from the large Red cliffs. The depths decrease regularly towards it, but large vessels should not shoal to a less depth than 10 fathoms.

Red Cliff Bank, is an extensive flat of mud and sand, with some patches of rock and coral, extending from the eastern part of Singapore island, between Tanjong Changhi and Tanjong Buddah. The north-eastern edge of the bank projects south-east about 4 miles from Tanjong Changhi, its extreme forming a horn or spit. From Tanjong Buddah the bank projects in an easterly direction towards Johore shoal, which may be considered the outer horn or spit of the bank.

The north-eastern side of this bank forms the west side of the channel leading to the Old strait of Singapore and the main entrance of Johore river.

Buoys.—A red cone buoy with staff and basket lies about 8 cables E. by S. from the rock which dries on the Red cliff bank, and a white cone with staff and basket buoy lies 3 cables eastward of the red buoy. These buoys lie in 7 feet water. Small craft approaching Johore channel from the westward, keep Pulo Tukong Kechil between the buoys, which mark leads clear of all dangers southward of them.

Johore Shoal, or Allang Bau, which fronts the entrance of the Old strait of Singapore, is about 2 miles long east and west, nearly a quarter of a mile broad, and is composed of hard sand, having $1\frac{1}{4}$ fathoms on its shoalest part at low water, and 2 to 3 fathoms elsewhere. Depths of $3\frac{1}{2}$ to 5 fathoms extend about a mile to the eastward, and rapidly increase from 7 to 19 fathoms; close to the south and south-west sides are depths of 8 or 9 fathoms deepening at a short distance to 11 or 13 fathoms.

From a depth of 3 fathoms on the east extreme of the shoal, the south end of St. John island bears S.W. by W. $\frac{1}{2}$ W.; Little Johore hill North; and distant about 6 miles from the east part of Singapore island.

South Ramunia island open of South point bearing E. by N. $\frac{1}{2}$ N. leads to the southward of this shoal; and when coming from the eastward it may also be avoided by not approaching the north shore under a depth of 13 fathoms when Johore hill bears eastward of North. Coming from the westward, St. John island should not be brought to the southward of S.W. by W. $\frac{3}{4}$ W., when little Johore hill bears northward of N. by E., nor the shoal neared under a depth of 13 fathoms until Johore hill bears North.

At night, fort Canning light in sight bearing W. $\frac{1}{2}$ S. or more westerly will lead about one mile south of Johore shoal.

There is no safe passage for vessels of large draught between Johore shoal and the eastern extreme of Singapore island, although there are narrow channels with depths of $3\frac{1}{2}$ and 4 fathoms between the patches which connect Johore shoal with Red cliff bank.

JOHORE RIVER.—**Kwala Johore** or Johore channel leading to the mouth of the Johore river, is also the entrance of Old strait, and lies between the dangers extending southward one mile from Tanjong Johore, and Johore shoal and Red Cliff bank. It is about $2\frac{1}{2}$ miles wide abreast of Johore shoal, with from 11 to 17 fathoms in the fairway, decreasing to 9 fathoms towards Tanjong Johore; but there is a bank of $5\frac{1}{2}$ and 6 fathoms about a mile south-westward of the edge of the tongue outside the Malang Berdaun rocks, with depths of 12 to 17 fathoms between.*

Between the spit of Red Cliff bank, and the bank southward of Tekong Besar, the channel is about $1\frac{1}{2}$ miles wide, with depths of 7 to 13 fathoms; farther in between Pulo Ubin bank and the shoal bank opposite, the breadth is but three-quarters of a mile, with depths of 7 to 14 fathoms, excepting abreast of Tekong Kechil, where there are some patches of 5 fathoms.

The old town of Johore, once a place of considerable trade, consists of some wretched huts built with bamboe and mud, where good water may be procured, but nothing else. It stands about 10 miles up Johore river, which is navigable for vessels the whole distance.

Tekong Besar, and Tekong Kechil, are the two islands lying north-westward of Tanjong Johore, at the entrance of the Johore river, dividing that stream into two branches. Tekong Besar, as its name implies, is the larger island of the two, being in extent $3\frac{1}{2}$ miles east and

* See Admiralty plan of Sirangún (Sirangong) harbour and Johore channel, No. 1,734: scale, $m=2$ inches.

west, and $2\frac{1}{2}$ miles north and south. Tekong Kechil, or little Tekong, lying close to the west side of the larger island, is nearly round, its diameter being about two-thirds of a mile. There is a small islet named Pulo Sijonkan lying close to the south-east side of Tekong Besar; and another named Pulo Sijahat at three-quarters of a mile to the southward of Tekong Kechil. A rock awash having 6 fathoms close to, lies on the edge of the bank, 2 cables north-westward of Pulo Sijahat.

Kapala Rocks appear to be three rocky heads awash, the outer one lying S. by E. $\frac{1}{2}$ E. distant $1\frac{1}{2}$ miles from the south point of Tekong Kechil. From this rock the northern one bears N.W. about 2 cables, and the eastern one E.N.E. the same distance.

Tekong Bank is the extensive shallow bank which surrounds both the Tekong islands, and also projects outside the islets and rocks just mentioned. Its apex is distant from Pulo Sijonkan, in the direction of Tanjong Johore, about $1\frac{1}{4}$ miles, from whence it turns towards the east and west points of Tekong Besar.

The western portion projects about a third of a mile beyond Pulo Sijahat, thence taking a northerly direction, and passing close to the south-west part of Tekong Kechil, projects, outside some rocks, a third of a mile off the north-west part of that island, and in the form of a long spit $2\frac{1}{2}$ miles to the northward of it.

The eastern side of this bank is rather steep, and must be approached with caution; on the south side the depths decrease more regularly, and it may be approached by the lead; but its western side is steep to, from half a mile south-eastward of Kapala rocks to its extreme northern point, and the lead will give no warning when nearing it.

The southern extreme of Tanjong Johore bearing East will lead southward of this bank; and to keep clear of that part of it near Kapala rocks Tanjong Changhi must not be brought to the westward of W.N.W. until the western extreme of Tekong Kechil bears N. $\frac{1}{2}$ W.

Directions.—In proceeding through Johore channel, Tanjong Changi should be kept on the bearing of N.W. by W. or more westerly, which leads clear of Red bank in not less than 4 fathoms until within one mile of the point, when course should be altered to N.N.W. until Johore hill is in line with the eastern Kapala rock, E. $\frac{3}{4}$ S., which mark kept astern will lead into Tebrau channel, the entrance of Old strait (*see* page 151).

Should a vessel have to proceed up Johore river, of which so little is known, it would be necessary to obtain the assistance of a native pilot.

Calder Harbour is the name given to the entrance of one branch of the Johore river. It lies close round Tanjong Johore, bounded on one side by the bank fronting the coast to the north-westward of Johore hill, and on

the other, by the bank which projects from Tekong Besar. The breadth of the harbour is three-quarters of a mile, with anchorage in from $5\frac{1}{2}$ to 9 fathoms.

MALAY PENINSULA.—**Tanjong Johore**, bearing E. by S. distant $5\frac{3}{4}$ miles from Tanjong Changhi, is a bluff promontory forming the eastern side of the entrance of Johore river, and of the Old strait of Singapore.

Malang Berdaun is the name of a small group of rocks comprising one several feet above water, and others close to its east and west sides. The large rock lies about three-quarters of a mile south-eastward of Tanjong Johore inside the edge of the bank, which extends off in some places more than a mile from the coast. South-westward of the rocks the edge of the shore bank is about 4 cables distant, the bank there forming a tongue which extends two or three cables, in a southerly direction from Tanjong Johore, outside its general contour.

The soundings decrease suddenly from 7 to 4 fathoms towards the bank fronting the coast between Johore and Stapah points, which must be approached under the distance of $1\frac{1}{2}$ miles, with caution. Little Johore hill bearing N. $\frac{1}{2}$ W. will lead westward of Malang Berdaun rocks; and South point, open of Tanjong Stapah, bearing East, will lead to the southward.

These dangers are, however, quite out of the ordinary track of vessels as they lie inside Johore shoal.

Tanjong Stapah, lying $3\frac{1}{4}$ miles eastward from Tanjong Johore, is a somewhat prominent point, owing to the coast line westward of it receding sharply for a third of a mile. The 3-fathom edge of the shore bank is half a mile distant from Tanjong Stapah, which should not be approached under a depth of 7 fathoms.

Tanjong Tiram, lies $1\frac{1}{2}$ miles eastward of Tanjong Stapah, the coast line between forming a bay, in which are a few fishermen's huts, and some fishing stakes extending off; rocks, awash and below water, lie off Tanjong Tiram, and there are also many between it and South point; but they are all within the depth of 3 fathoms, which extends along this coast at the distance of about three-quarters of a mile.

South Point, or Tanjong Tehimpang, the most southern point of this part of the Malay peninsula, lies about $2\frac{1}{2}$ miles eastward of Tanjong Tiram. The point is clear beyond the distance of a third of a mile.

South point, in line with Tanjong Stapah, is a good mark to keep vessels well clear to the southward of all the dangers near the Ramunia islands.

Tanjong Romynia lies E.N.E. $1\frac{3}{4}$ miles from South point. Close to the westward of it are two small points, between which and South point is a small bay and the entrance of a small stream named Sungai Kalarang. The three fathom edge of the shore bank is rather more than half a mile from this part of the coast.

The coast from Tanjong Romynia recedes to the north-eastward for about 2 miles, thence south-eastward for $1\frac{1}{2}$ miles to Ramunia point, forming a bay.

The head of the bay is filled with mud and sand, and the 3-fathom edge of the shore bank, which fronts the whole south coast of the Malay peninsula is $1\frac{1}{4}$ miles from the shore, and three-quarters of a mile southward of the south-west part of Ramunia point.

Water Island, lying N.E. $\frac{1}{2}$ E. about half a mile from Tanjong Romynia, is a round island, about a quarter of a mile in extent, with an islet off its south-west part, connected to it by a reef.

This island can be approached on its south side to three-quarters of a mile in depths of 5 or 4 fathoms, the three fathom edge of the bank being distant rather more than half a mile in a southerly direction.

Diana cove.—**Water.**—Close westward of the south-west extreme of Ramunia point, is Diana cove, where there is a stream of fresh water. Romynia river, situated at the head of the bay, has a depth of 2 or 3 feet at its narrow entrance at low tide, and is navigable by boats 2 or 3 miles inland.

“Water may be procured with ease in this river, during the north-east monsoon; but there are several better and more convenient watering-places in the sandy bays between Water island and Ramunia point. Inside Water island there is an excellent stream upon the main, where fresh water may be obtained with facility in either monsoon; but in the north-east monsoon the streams between it and Ramunia point are more convenient.”

Excellent water can also be procured from the river close round the rocky point, about 6 cables northward of Ramunia point.

RAMUNIA POINT, or Tanjong Penyusoh, the south-east extreme of the Malay peninsula, is level land covered with trees, with some small hills behind. Coral reef extend off from one to 3 cables.*

Tides.—At Ramunia point, it is high water, full and change, at 10h. 30m.; springs rise 12 feet, neaps 8 feet.

The coast from Ramunia point trends sharply to the northward, and at a distance of three-quarters of a mile is a point with some rocks off it, whence the land recedes, forming a bay about a mile deep, the northern horn of which, named Tanjong Pungi, bears N. $\frac{3}{4}$ E. 4 miles from Ramunia point.

* See Admiralty chart:—Singapore strait, No. 2,403; scale, $m=0.66$ of an inch.

Close southward of Tanjong Pungi is the small islet, Pulo Pungi, lying off the entrance of Pungi river. About $4\frac{1}{2}$ miles N. by W. from Tanjong Pungi is Sitajam point, which bears about West from the northern edge of North patch, the outermost of the shoal patches which extend from Ramunia shoals.

A shallow bank fronts the whole of the coast from the point situated half a mile northward of Ramunia point, to Sitajam point, projecting about midway a distance of $1\frac{1}{2}$ miles from the shore. Off Pungi point it extends about a third of a mile, and off Sitajam point three-quarters of a mile.

Except near that part of this bank extending from abreast North rock to a mile nearly north of it, and which shoals suddenly under a depth of 9 or 8 fathoms, the bank may be approached by the lead, as the depths decrease regularly from 10 to 6 fathoms.

The country abounds with various kinds of timber, wild elephants, buffaloes, inoose-deer, hogs, guanias, monkeys, and peacocks; oysters will also be found upon the rocks; but this part of the Malay peninsula is not inhabited. Near Romynia river there is a considerable extent of forest, which being without much underwood is easily penetrated; but in other parts the woods are generally impervious.

RAMUNIA ISLANDS comprise six islets or rocks which, together with many dangers around and amongst them, front Ramunia point; they extend nearly 2 miles in a N. by E. and S. by W. direction.*

Large Island, the westernmost and largest of the islands, lies half a mile E.S.E. from Ramunia point; it is barely a cable in extent, but is conspicuous from being covered with trees. An islet, or rock, one-third the size, lies about a cable north-eastward of it, both being situated towards the southern part of a reef which extends 3 cables northward of Large island, but a much less distance in other directions.

South Island lies 4 cables east-south-eastward from Large island; it is small, covered with trees, and therefore easily discerned. There is a rock, about 12 feet high, near the south point of South island, and a reef of straggling rocks extending to the eastward, which are bold to approach on the south side.

Peak Rock, a remarkable barren rock, easily recognised, lies 6 cables eastward of Large island. A rock awash lies close to the north-eastward of it.

North Island, very small but covered with trees, lies N.W. by N. 6 cables from Peak rock; shoal water extends 3 cables to the northward of it.

* These islands and dangers have not been thoroughly examined. The survey of the neighbourhood was commenced in H.M.S. *Rifleman*, 1868, and after a few days had to be discontinued for more urgent work. Most of the descriptions here given are from the survey of Mr. Thomson, formerly Government Surveyor at Singapore, and from Horsburgh's Directory.

North Rock, very small and barren, lies N. $\frac{3}{4}$ E. nearly a mile from North island.

Shoals.—A shoal of $2\frac{3}{4}$ fathoms, the existence of which is doubtful, is reported to lie with the large Ramunia island bearing N.N.E. $1\frac{1}{4}$ miles. A patch of $4\frac{3}{4}$ fathoms lies one-third of a mile in a south-easterly direction from this position.

Clearing mark.—There is a depth of 9 to 14 fathoms close to these dangers. Tanjong Stapah in line with South point bearing West, will lead clear to the southward of all the dangers near Ramunia islands.

A Rock awash lies with South island bearing N.E., one-third of a mile, and the large Ramunia island N. by W. about the same distance.

A three-fathom patch lies E.S.E. nearly half a mile from the rock awash.

Stork Reef, lying N.E. by E. $\frac{1}{4}$ E. half a mile from the three-fathom patch, is about 3 cables in extent, and from its south-west point Barbukit hill is in line with the north hump of the large Ramunia island, distant a little more than half a mile.

Congalton Skar, a rocky patch with 9 feet water, and 8 to 12 fathoms close to, is the easternmost of the dangers lying near Ramunia islands. From it the middle of Large island is in line with Peak rock, the latter distant one mile.

Large island, W. $\frac{1}{4}$ N., leads southward, and Tanjong Pungi, N.N.W. $\frac{1}{2}$ W. leads eastward of the Skar.

Caution.—When the tide is running to the westward, vessels passing through North channel must be very careful that they are not set too near this danger, of which the lead will not give timely warning.

A rock awash lies a short distance E.N.E., and a 4-fathom patch about a quarter of a mile N.N.E. from Peak rock. Another 4-fathom patch, with 12 fathoms near it, lies a short distance to the northward of Whale rock.

Whale Rock, lying nearly nearly three-quarters of a mile N.E. from Peak rock, is a small ledge which is particularly dangerous, as it is only at about three-quarters ebb that a small rock becomes visible and indicates the existence of the danger. It is steep-to, and the depths in its vicinity are irregular, varying from 15 to 9 fathoms.

Jones Reef, having 6 feet water, and 8 or 9 fathoms close to, lies N. by W. $\frac{3}{4}$ W. a little over half a mile from Congalton Skar.

A Reef, about half a mile in extent, and with rocks above water, lies between North island and North rock. Its eastern extreme lies North from Peak rock nearly one mile; and its western extreme rather less than half a mile S. by W. from North rock. There are several patches between it and North island.

Caution.—As no advantage is to be gained by venturing amongst the Ramunia islets, it is best to consider the whole of the space occupied by them as impracticable for ordinary navigation, and avoid the locality.

RAMUNIA SHOALS are a number of detached patches of sand and coral, stretching in a north-easterly direction from the Ramunia islands, towards the North patch. Between these patches are channels with depths of 8 to 10 fathoms water.

Within a depth of 5 fathoms these shoals extend $2\frac{1}{2}$ miles in a north and south direction, and nearly half a mile wide. The north extreme lies with Horsburgh lighthouse bearing S. by E. $\frac{1}{2}$ E. distant 6 miles, and the south-west extreme lies with the lighthouse bearing S.E. $\frac{1}{2}$ S. $4\frac{1}{2}$ miles. The shoalest spot, $2\frac{3}{4}$ fathoms, rock, is about half a mile in extent, steep-to on its south-east and north-west sides, and lies with the lighthouse bearing S.S.E. easterly, $4\frac{1}{2}$ miles.

A few cables to the southward of this dangerous patch the depths increase to 16 and 17 fathoms.

Patches of 5 fathoms lie one mile eastward of the northern edge of the shoal, with Horsburgh lighthouse S. $\frac{1}{2}$ E., distant $6\frac{1}{4}$ miles; and an isolated patch of 5 fathoms lies N.E. by E. $3\frac{1}{4}$ miles from the other patches of that depth. Also a bank of $4\frac{1}{2}$ fathoms, half a mile in extent, lies off the south-west end, with the lighthouse S.E. $\frac{1}{4}$ E. $5\frac{1}{4}$ miles. Nearly midway between this bank and Jones reef, is a patch of 5 fathoms.

Clearing marks.—South island, the southernmost of the Ramunia islands, just open of South point, bearing W. by S. $\frac{1}{3}$ S. leads southward of Ramunia shoals; and Horsburgh lighthouse kept in line with the west apex of Bentán Great hill, S. by E. $\frac{1}{4}$ E. leads eastward of Ramunia shoals, in from 6 to 10 fathoms water, and between them and the 5 fathoms patches which lie one mile to the eastward.

North Patch, lying N.E. by N. $7\frac{1}{2}$ miles from the shoalest part of the Ramunia shoals, is generally considered the outermost of the Ramunia shoals, for the reason that the Eastern bank, which lies 4 miles E. by N. from North patch, not having less than 7 or 8 fathoms water, is not only not dangerous to the mariner, but is, in fact, useful to him, serving to determine his position; whereas the North patch, having depths only of $3\frac{3}{4}$ and 4 fathoms, is not safe for a large vessel to cross in a swell or heavy sea. The patch is nearly one mile long, north and south, one-third of a mile broad, and composed of mud and sand. From the north end of the North patch, False Barbukit hill bears W. $\frac{3}{4}$ S. $12\frac{1}{2}$ miles; and Horsburgh lighthouse S. by W. $11\frac{1}{4}$ miles.

North patch lies near the north end of a narrow strip of bank which extends from Ramunia shoals; the general depths over it are from 6 to

10 fathoms, but about three-quarters of a mile S. by E. $\frac{1}{3}$ E. of North patch there is a depth of $3\frac{3}{4}$ fathoms, and at $1\frac{1}{2}$ miles farther south a depth of 5 fathoms, previously referred to.

Bentán Little hill, open to the westward of Bentán Great hill, leads half a mile eastward of North patch, and clear of all dangers.

Eastern Bank, the outermost of the shoal patches off Ramunia point, is nearly $1\frac{1}{2}$ miles in extent, with depths of 7 to 10 fathoms, and 11 to 14 fathoms close around. It lies about a mile inside the range of Horsburgh light, and from its northern edge the light bears S.S.W. $\frac{2}{3}$ W. distant 14 miles.

Navigators striking soundings of 8 to 10 fathoms on this bank, during hazy weather, sometimes think they are on the strip of bank extending northward and southward from North patch, and then haul more to the eastward, which renders them liable to fall to leeward of the strait.

PEDRA BRANCA, or White Rock, lying in the middle of the eastern entrance of Singapore strait, is 150 feet long, 100 feet broad, and 24 feet high. It will be readily known by the lighthouse, which was erected on it in 1851, and named after the celebrated hydrographer, Horsburgh, whose labours have in a high degree benefited the interests of navigation and commerce in every part of the eastern seas. The lighthouse is a pillar of granite, and the lantern is covered by a spherical dome, painted white. The largest island off Ramunia point bears from it W. by N. $\frac{1}{4}$ N. 7 miles; and it is 8 miles distant from the shore of Bentán.

HORSBURGH LIGHT.—The lighthouse on Pedra Branca exhibits, at an elevation of 95 feet above high water, a *revolving white* light, which attains its brightest period *once every minute*; its greatest brilliancy is of *fifteen seconds* duration, when it gradually declines until it totally disappears to a distant observer; but within a short distance of the lighthouse it is never entirely invisible. The light should be seen in clear weather from a distance of about 15 miles. Position, lat. $1^{\circ} 20' N.$; long. $104^{\circ} 24' 27'' E.$

Patches.—With the exception of a patch of 4 fathoms, the north and north-west sides of Pedra Branca are steep-to, there being 17 fathoms close to the rock.

This 4-fathoms patch lies about a quarter of a mile northward of the rock, and is the only shoal spot between it and Ramunia shoals, in which space the depths vary in mid-channel, from 17 to 33 fathoms, but become more regular, 17 to 14 fathoms, towards Ramunia shoals.

The east, south, and south-east sides of Pedra Branca should not be approached nearer than one mile, for there are dangerous rocky patches to the distance of half a mile from the east side; and the south and south-east sides are foul to three-quarters of a mile.

Middle Rocks are two dangerous ledges, a little above the surface at high water, lying South and S.S.E. from the lighthouse. Eastward a short distance from the Middle rocks is a patch of 4 fathoms, and N. by W. $\frac{1}{2}$ W. a quarter of a mile from this patch is a rock with 3 feet of water.

South Ledge, named by Horsburgh South-west rocks, consists of three dangerous pointed rocks, with 8 and 9 fathoms close to, and 16 or 18 fathoms at a short distance. They are of small extent, not visible until the ebb has made some time, and are nearly covered before the stream of flood begins to run. Horsburgh lighthouse bears from them N. by E. $\frac{1}{2}$ E., distant 2 miles.

Depths in Singapore Strait.—From $1\frac{1}{2}$ to 2 miles south-eastward of St. John island, where the depths are 85 and 86 fathoms, the general depths in mid-strait to abreast of Ramunia point, are 18 to 27 and 30 fathoms, with occasional casts of 12 and 14 fathoms; towards the northern shore the depths decrease gradually to 8 and 6 fathoms, but towards the southern the depths are irregular and deeper, there being 27 to 30 fathoms within a mile of Pulo Battam; the only dangers to be avoided are Johore shoal on the north side of the strait, and the Pan reefs and Crocodile shoal, within the entrance of Rhio strait, but the latter are out of the direct tract of vessels working through Singapore strait.

About 5 miles W.S.W. from Pedra Branca, there are some small banks with 10 to 17 fathoms water on them and 20 to 30 fathoms around; between them and Pedra Branca, there are depths of 34 to 36 fathoms.

In the South Channel between Tanjong Brakit and Pedra Branca, the depths are too irregular to be relied upon to guide a vessel safely. The 10-fathom edge of the shore bank extends from a short distance outside Langui shoal in a north-easterly direction, passing about a mile outside Diana shoal, thence with an irregular outline it extends half-way across the channel between the western part of Tanjong Brakit and Pedra Branca. Depths of 6 and 7 fathoms extend about 2 miles E.N.E. of Diana shoal; to the southward of this bank are 9 and 10 fathoms, decreasing to 7 and 6 fathoms close to the Bentán shore. In the fair channel are 12 to 14 fathoms, and 16 to 20 fathoms towards the dangers near Pedra Branca. The depths in this channel are much greater to the westward of the meridian of Pedra Branca than upon or to the eastward of its meridian, which ought to be kept in remembrance when passing through in the night.

In the Middle channel, between Horsburgh lighthouse and Ramunia shoals, the depths are irregular, 17 to 35 fathoms close to the light-house, 19 to 30 fathoms in mid-channel, with some soundings of 14 and 15 fathoms rather nearer the shoals, close to which are 17 to 14 fathoms.

Approaching the eastern entrance of Singapore strait from the southward, when from 5 to 10 miles eastward of Pulo Ruig or Pulo Panjang, the depths will be generally 22 or 24 fathoms. Between Pulo Panjang and Tanjong Brakit, the south-eastern extreme of the strait, the depths are 20 and 21 fathoms at the distance of 20 miles from the Bentan coast, decreasing to 17 or 18 fathoms at 10 miles from it. Ten miles north-eastward of Tanjong Brakit are 20 to 19 fathoms, decreasing towards Brakit rock to 14 and 13 fathoms, which depths will be found close outside that danger. A narrow bank of coral and sand, with 7 to 10 fathoms, lies 4 or 5 miles off Tanjong Brakit, between the bearings of N.E. and N.W. by N.; outside this bank are 14 and 13 fathoms, and 11 and 14 fathoms inside, with several patches of 9 and 10 fathoms. Towards Tanjong Brakit and the Postillion reef the depths decrease with tolerable regularity, but vessels should not come under 10 fathoms.

Approaching the strait from the eastward from 22 to 20 fathoms will be found 20 miles from Horsburgh lighthouse, decreasing to 14 or 13 fathoms at 15 or 13 miles. At 10 miles eastward of the lighthouse the soundings become irregular, 9 to 14 fathoms, and continue to be so to within 4 miles of the lighthouse, when they deepen to 16 or 17 and soon to 18 or 19 fathoms; close to the dangers near the lighthouse they are irregular, 9 to 14 fathoms.

Approaching the strait from the north-eastward, about 25 fathoms will be obtained at a distance of 30 miles, decreasing to 15 fathoms, at 16 or 17 miles, and then again deepening, regularly 29 or 30 fathoms towards Horsburgh lighthouse, close to which are irregular soundings of 18 to 35 fathoms. A mile or two eastward of Eastern bank the depths are 14 or 15 fathoms, and 16 to 18 fathoms from one to 4 miles eastward of North patch. At one or two miles from Ramunia shoals the depths are 18 or 20 fathoms, shoaling to 16 or 14 fathoms, near them.

The TIDES * near Pedra Branca, and contiguous to Ramunia reefs, are frequently very irregular in time, velocity, and direction. In the strength of the north-east monsoon, when the current runs to the S.S.E. from Pulo Aor across the equator, the flood sometimes runs into the entrance of the strait to the south-west 10 or 12 hours at a time; but the ebb generally runs with the greatest velocity, and of longest duration, in both seasons, particularly in the south-west monsoon. About full and change, the ebb often sets out strong during the night, for 10 or 12 hours together, but not very rapidly in the first and latter part; at other times it is changeable, and not strong. Between Pedra Branca and the edge of Ramunia reef the strength of the ebb runs generally about N.E. by N., when regular, and

* Horsburgh.

the flood in the opposite direction; but the tide has been sometimes observed to set all round the compass during the night, and once N.N.W. 2 miles an hour directly over the reef. About the northern patches of the reef the tides have also been found at times very irregular, setting East and West, and all round the compass; but their general direction in that part is nearly North and South, or within two points of the meridian. In the South channel, between Pedra Branca and Bentán, the flood sets about W.S.W., and W. by S., and the ebb in the opposite direction along the Bentán shore, but subject to irregularities.

It is high water, full and change, at Pedra Branca about 11h., when any irregularity is preserved by the tides. The velocity of the ebb, when strongest, is from 4 to $4\frac{1}{2}$ miles an hour in the entrance of the strait and between Ramunia point and Pedro Branca; but the flood is not so strong. The strength of the tides during the neaps is from 2 to 3 miles an hour. frequently very irregular.

In making Singapore strait, vessels should always be prepared to meet with a current running to the southward in the north-east monsoon, and to the northward in the opposite season, the strength of which is governed by the strength of the monsoon. In fine weather its rate is usually from $1\frac{1}{2}$ to 2 knots an hour, but the rapidity of the current is also accelerated or retarded by the local tides near the coast. Between Pedra Branca and a position 40 miles to the eastward, it has been known to set at the rate of from 3 to 4 knots an hour.

The flood sets in on the southern side of the strait, while in the northern part the ebb is running out strong.

DIRECTIONS.—Singapore Road to the Eastward.—

Having cleared the road, course may be shaped about E. $\frac{1}{2}$ N., and by not bringing the flag-staff on fort Canning to the southward of W. $\frac{1}{2}$ S. as long as it remains in sight, will lead clear of Johore shoal. When Johore hill bears North, the vessel will be eastward of Johore shoal, and may steer for Horsburgh lighthouse, and passing about one mile to the northward of it, proceed to sea as convenient.

To work through the Eastern Part of the Strait.—

No difficulty will be experienced by strangers in working in either direction through the eastern part of the strait. The most prudent plan is to keep towards the north shore, in case of having to anchor, as the depths are more convenient on that side of the strait. From Singapore road to Johore shoal the shore may be approached to 12 or 11 fathoms; but it is not prudent to go into a less depth. Ramunia South island kept open of South point leads to the southward of Johore shoal, and when standing

towards this danger, if these objects cannot be seen, on no account come under 12 or 11 fathoms, for the shoal is steep-to.

Between Johore shoal, and the west extreme of Ramunia point, the shore may be approached to a depth of 12 or 11 fathoms; from thence, Tanjong Stapah must not be shut in behind South point when standing to the northward, until South island bears to the westward of North; and when standing towards Stork reef and Congalton Skar, South point should not be brought to the southward of $W. \frac{3}{4} S.$ A vessel may stand towards Ramunia shoals, until South island is seen opening of South point.

There are no dangers on the south side of the strait, excepting those fronting the Bentán coast and the Crocodile and Pan shoals, &c. But a vessel should not stand so far over as to get near these dangers, for no advantage will be gained by doing so, and the depths there are inconveniently great for anchoring. Pulo Nongsa, a remarkable little island, with a high tree upon it, lying just to the westward of the entrance to Rhio strait, is very convenient for taking bearings of when getting over to the southward near Rhio strait, and if kept to the southward of West, will lead clear of all danger at the entrance of that strait.

From the northward and eastward.—Middle channel between Horsburgh lighthouse and Ramunia shoals, is the main entrance to Singapore strait from the eastward. (Although South channel is recommended by Horsburgh as being preferable for sailing through in the night, yet as no good marks can be given to clear its dangers, it is seldom used by those accustomed to the navigation of the strait, more especially since the discovery, in 1861, of Brakit roek off Tanjong Brakit. See page 147.)

Coming then from the northward or eastward in the daytime, the entrance of Singapore strait may be easily recognized if the weather be fine and clear, by Bentán Great hill, a remarkable Saddle hill (1,250 feet high) on Bentán island, and the sharp-peaked hill of Barbukit (645 feet high), on the opposite side of the strait. Bearings of these objects will serve to determine the vessel's position and guide her in shaping a course to sight the lighthouse. In making the entrance at night, if the vessel's position be known, it will be merely necessary to stand on boldly for the light, being careful to make a proper allowance for the set of the stream, and when the light is seen, steer so as to pass about a mile to the northward of it. Vessels should not get within about 2 miles of the light until it bears to the southward of $W.S.W.$, on account of the dangers lying off its east side. (See also foot note, p. 146.)

It is from the northward, however, that the strait is mostly made (*viz.*, by vessels coming from China), it being now the general custom for vessels from the southward to enter from Rhio strait.

During the strength of the north-east monsoon the current sets generally to the southward or S.S.E., between Pulo Aor and the east end of Bentán, by which vessels running for Singapore strait in thick weather, are liable to fall to the southward of its entrance, if proper allowance be not made.*

Departing from Pulo Aor, steer to bring it to bear about North when disappearing: if the weather be clear, Bentán hill and Pulo Aor may be seen together; but this seldom happens. Bentán Little hill, open to the westward of Bentán Great hill, leads eastward of North patch. Vessels must keep eastward of this line until Horsburgh lighthouse is seen from the deck.

In hazy weather, Bentán hill is seldom visible until Eastern bank is passed, in which case, having Pulo Aor disappearing about North, a course S. by W. to S.S.W. may be requisite to counteract the south-easterly current, or the ebb tide setting out of the strait to the north-eastward. The depths will decrease regularly in steering southward, and the low land will probably be seen to the westward, when in 20 or 18 fathoms; if so, coast it along at 10 or 12 miles' distance, until False Barbukit low sloping hill is discerned, appearing a little way from the sea like a clump of trees more elevated than the others. When this hill bears W.S.W., 15 fathoms is the fair track; with it bearing W. $\frac{1}{2}$ S., overfalls in 16 to 13 fathoms may be experienced, or probably less water, being then about the parallel of the North patch and Eastern bank.

With this hill on the latter bearing, if a cast of 10, 9, or 8 fathoms be got, but uncertain whether these soundings are near the North patch, or on the shoal patch of Eastern bank, haul to the south-eastward until in 14 or 15 fathoms. Then steer South until False Barbukit hill bears West, when the vessel will be to the southward of Eastern bank; she may then haul in W.S.W., and get a cast of 10 or 11 fathoms, and will then be certain that these soundings are on the outer edge of Ramunia shoals, but in doing so, heave the lead quickly, and if there be less than 10 fathoms, haul out directly eastward into 15 or 16 fathoms, and then steer along the south-east edge of the shoals in 16 or 17 fathoms. If when the lighthouse should be discerned, it bears S.S.W., or more westerly, the vessel will be clear to the eastward of the shoals. Having steered round the shoals so far as to bring the lighthouse S. by W., do not come under 16 or 17 fathoms in passing along their southern part; for they are there steep-to, decreasing from 16 to 12, and from 12 to 3 fathoms at a cast, on some of the patches, with the lighthouse bearing from S.E. $\frac{1}{2}$ S. to S. by E. South island just open to the southward of South point, bearing about W. by S. $\frac{1}{2}$ S., leads clear to the southward of all the Ramunia shoals.

* In one instance, a W.N.W. current of $1\frac{1}{2}$ miles an hour was experienced near the entrance to Singapore strait.

Although Pedra Branca rock is steep-to on the north side, it should not be approached very closely, for vessels are liable to estimate their distance from it sometimes greater than the truth; and as the tide runs strong, they are in danger of being drifted quickly towards the rock without warning, if they borrow near it in light winds.*

Having passed between Ramunia shoals and the lighthouse, and bound to Singapore road, the course is about W. by S., taking care if on the north side of the channel to have Tanjong Stapah open of South point, before South island, of the Ramunia group, is brought to the eastward of N. by E. When near Johore shoal, Ramunia South island kept open of South point will lead south of it; thence to the road the course is about W. $\frac{1}{2}$ S. The vessels in the road will be a guide in approaching the anchorage, and as Tanjong Katong is neared, the flagstaff on Fort Canning hill overlooking the town should not be brought to the westward of W. by N. $\frac{1}{4}$ N.

If the tide be running to the westward it is the usual practice for vessels to keep well over on the north side of the channel, especially in light winds, for, neglecting this precaution they have often been swept by the rapid current past Singapore road and the St. John islands (the deep water, 45 or 50 fathoms, rendering it difficult or impossible for them to anchor) into the western part of the strait.

At Night keep a good look-out for Horsburgh light, which, being visible in clear weather at 15 miles, will be in sight before the vessel can get too near the dangers at the entrance of the strait.

If when entering the strait from the southward or south-eastward, the light is seen bearing to the southward of West, a course may be shaped to pass about 2 miles to the northward of the light, proper care being observed to allow for the set of the tide, so that the light is not neared under 2 miles, on a West or N.W. bearing, to avoid the dangers extending to the east and south-east from it. Should the light when first seen bear about W. by N. or W.N.W., a vessel will be within 2 or 3 miles of Brakit rock, and from which the light bears W. by N. $\frac{1}{3}$ N. 11 $\frac{3}{4}$ miles.

If when entering from the northward the light is made bearing anything to the southward of S.S.W., haul to the eastward until it bears S.S.W. which will lead outside North patch; approach the light upon this bearing until about 2 miles from it, when a W.S.W. course may be shaped until the light is brought E. by N., when keep it on that bearing, steering W. by S. until the fixed light on fort Canning at Singapore, which is visible southward of a W. $\frac{1}{2}$ S. bearing, comes in sight, but in case it should not be distinctly made out by the time Johore hill bears N. by E., do not come under 16 or 17 fathoms towards Johore shoal, and if a cast of

* This remark of Horsburgh's should be carefully attended to; for several sailing vessels have been very nearly set on this rock in light winds, and one totally lost.

12 or 11 fathoms should be had haul quickly to the southward, for this shoal is steep, and should not be approached under that depth. Fort Canning light may be approached on a West bearing until the eastern extreme of Singapore island (Changhi point) bears North; from whence the light should gradually be brought to bear to the northward of W. by N., as Tanjong Katong is approached.

It is necessary to observe the precaution of keeping on the north shore of the strait when nearing Singapore road at night, for although a vessel may have entered the strait with a strong north-east monsoon, yet as she nears the road, the wind will, in the night, generally draw off the land from the north-westward, making it always very difficult and sometimes impossible to fetch into the road or get into a convenient depth of water for anchoring.

If bound into the strait of Malacca, when abreast Johore shoal, with fort Canning light in sight, course may be altered to about W.S.W. for St. John islands, observing that Raffles light is visible from about 5 miles eastward of those islands, when bearing westward of S.W. by W. $\frac{3}{4}$ W. A vessel should steer to pass within a short distance of St. John island, avoiding the south side of the strait, and proceed through the western part of the strait according to the directions give at page 101; the Raffles light bearing W.S.W. is the fair channel mark.

South Channel is sometimes convenient for vessels from the eastward which fall to leeward of Horsburgh lighthouse during thick weather, as they have no occasion to anchor outside. If the wind be north-easterly, they may run down until within 4 or 5 miles from the Bentán shore, remembering that Barbukit hill must be kept four times its own breadth open northward of Horsburgh lighthouse, or the lighthouse kept westward of W. by N. to clear Brakit rock; then haul to the westward, and pass nearly in mid-channel between the shore and the lighthouse in 11 to 13 fathoms of water. With the wind at N.W. or North, it will be advisable to borrow nearer to South ledge than to the Bentán shore, observing not to approach too closely to South ledge, as it is covered at half-tide. By borrowing towards the weather side of the channel, vessels will be enabled to reach well into the entrance of the strait; and if the wind be scant and the tide against them, they will have smooth water and good bottom for anchorage, until the tide is favourable for proceeding to the westward.*

The difficulty and danger attending the navigation of this channel arises from the risk of wrongly judging the distance from the lighthouse when endeavouring to keep clear of South ledge. In making sure of being to the southward of this ledge, vessels have frequently got too far over on the

* Horsburgh.

Bentán coast, and been lost upon some of the dangers there ; others have also been lost upon some of the dangers near Brakit point, in endeavouring to get out of the strait by this channel in the north-east monsoon.

A detailed description of the dangers and bearings to clear them have been given at pages 129 to 130, to which the navigator is referred in case he uses this channel. There seems to be no advantage in using this channel when leaving the strait ; it is much better to keep to the northward in the north-east monsoon, as close as possible to Ramunia islands, and stand out through Middle channel.

NORTH CHANNEL (the Great Inner channel of Horsburgh) is bounded on the east by Ramunia shoals, and on the west by the dangers which lie eastward of Ramunia islands. The channel is about $3\frac{1}{2}$ miles wide ; there is a bank of $4\frac{1}{2}$ fathoms and another of 5 fathoms lying in its fairway, but there does not appear to be any less water, and it is frequently used by those locally acquainted.

From the Southward.—In proceeding through North channel from Singapore, after passing South point, Stapah point must be kept just open of South point to avoid the dangers southward of Ramunia islands. When the largest of those islands bears N.N.W. and Horsburgh lighthouse E. by N., steer N.E., to pass about three-quarters of a mile outside Congalton Skar ; but if the tide be setting to the westward, avoid bringing Peak rock in line with the North end of Large island, until the right extreme of Tanjong Punji bears N.N.W. $\frac{1}{2}$ W. With these marks on the vessel will be in about 13 or 15 fathoms water, and may steer N. by E., through centre of North channel.

A vessel will avoid the $4\frac{1}{2}$ fathoms bank and cross the banks in not less than 6 fathoms water, by keeping Horsburgh lighthouse astern, bearing S.E. $\frac{1}{4}$ S.

From the Northward.—Coming from the northward, and wishing to proceed into Singapore strait by North channel, pass about midway between North patch and the shore, and with False Barbukit hill bearing West, and Barbukit hill S.W. by W. $\frac{1}{4}$ W. ; or in case Barbukit cannot be discerned, the south extreme of Tanjong Punji, about S.W. $\frac{1}{4}$ W. ; a course S. $\frac{1}{2}$ W. will then lead through in mid-channel and probably over the $4\frac{1}{2}$ fathoms bank, after passing which the depth will soon increase to 8 or 10 fathoms, and then suddenly to 13 and 15 fathoms, when she will be in Singapore strait. This $4\frac{1}{2}$ fathoms bank may be avoided and the banks crossed in not less than 6 fathoms water, by steering for Horsburgh lighthouse bearing S.E. $\frac{1}{4}$ S., when Barbukit hill bears about W. $\frac{1}{2}$ S.

Having crossed the banks, the S. $\frac{1}{2}$ W. course should be continued to avoid getting too near Congalton Skar. Vessels should be careful not to bring the east extreme of Tanjong Punji to the northward of N.N.W. $\frac{1}{2}$ W. until Peak rock is open northward of Large island. The vessel will then be to the southward of Congalton Skar, and may steer S.W., until Tanjong Stapah comes open of South point, when she will be to the southward of all the dangers near Ramunia islands, and may steer W. by S., through Singapore strait.

In Working through the southern part of North channel, Horsburgh lighthouse should not be brought to the southward of S.E. $\frac{1}{2}$ S. when standing towards the south-west extreme of Ramunia shoals; nor to the eastward of S.E. by E. $\frac{1}{2}$ E. when standing towards Congalton Skar or Jones reef. The soundings are not to be depended upon to guide a vessel when near these dangers for the bottom is irregular, and the shoals are steep-to.

The Inner channel, between Ramunia point and the islands, cannot be considered safe, and we refrain from giving any directions which might have the effect of tempting vessels to use it. But it is of no great importance, as vessels can proceed more easily and safely by North channel.

OLD STRAIT OF SINGAPORE OR SALAT TEBRAU (TAMBROH).

This strait not being now used in proceeding to or from China, the approaches only have been mentioned in describing the northern shores of Singapore strait; the following brief description will however be useful to vessels trading to ports in the Old strait; these are said to enter and leave by the eastern or Johore channel only, but the services of a pilot are necessary.*

Vessels load granite at Pulo Ubin, and timber at New Johore.

Old Strait of Singapore, the channel between the northern shores of Singapore island and the Malay peninsula, was formerly the passage by which all vessels proceeded between India and China, when the strait at present in use was not known to be navigable. Its western entrance has very much filled up, even since Horsburgh's time; he gives $3\frac{1}{2}$ fathoms as the least water, but the Admiralty chart (1878) shows a bar of sand, with but 2 fathoms water, stretching across from Tanjong Gul to Tanjong Bulus.†

* See Admiralty charts:—Singapore strait, No. 2,403; scale, $m = 0.66$ of an inch; and plan of Sirangún harbour, and Johore channel, No. 1,734; scale, $m = 2$ inches.

† This depth was corroborated by H.M.S. *Fly* in 1883, see footnote, page 151.

New Johore (Tanjong Putri).—The town of New Johore extends about $1\frac{1}{2}$ miles along the north shore and contains 3,000 inhabitants. It is situated about half way through the strait, close west of Tanjong Putri in Johore; the present Sultan is striving to bring it into importance, having erected extensive saw mills there, for the purpose of cutting up the timber as it is brought from the adjacent forests. The principal buildings are the Istana, or palace of the Sultan, and the public offices, the latter on a hill overlooking the town. Good roads communicate with the interior, and there is telephonic communication with Singapore. At the town, and also opposite on Singapore island, is a pier, and a ferry across the strait.

Anchorage.—There is anchorage off the palace in $9\frac{1}{2}$ fathoms, mud, with the palace flagstaff bearing N. by W. $\frac{1}{4}$ W.; and the public offices N.E. $\frac{1}{4}$ E.

Sirangún harbour.—The eastern entrance of Old strait is between Tanjong Changhi, and Tanjong Kopo on the Malay peninsula, and is divided into two channels by Pulo Ubin. The coast inside Tanjong Changhi trends to the westward for about $1\frac{1}{2}$ miles, when it recedes forming a bay, 3 miles wide, named Sirangún harbour. About a mile inside Tanjong Changhi is a small river, with a few bungalows and a police station near it.

Several small rivers discharge themselves into Sirangún harbour, the principal of which, the Sirangún, is at its western extremity. About $1\frac{1}{2}$ cables westward of the east point of the harbour, are two white rocks, named Batu Putih, with 13 fathoms close to them. The depths in the harbour are from 7 to 14 fathoms, decreasing rather suddenly under 6 fathoms, so that caution is necessary when approaching the shore.

Sirangún island lies about one mile northward of the entrance of Sirangún river, but the mud-bank which fronts all this part of the coast of Singapore extends outside this island, leaving the channel between it and the west end of Pulo Ubin barely half a mile broad.

Pulo Ubin or Oubin, is about 4 miles long, in a W. by N. and E. by S. direction, and one mile broad. A shoal bank extends from its east end, three-quarters of a mile in an easterly, and one mile in a south-easterly direction, close to which are depths of 8 to 9 fathoms. Nearly half a mile S.S.W. from its east end is a dangerous rock, named Papan, which always shows, inside of which is the small islet Pulo Sikodo having a reef extending 2 cables westward of it. A 3-fathoms patch also lies about 2 cables off shore, southward of the saw mills and quarries, with 6 fathoms between it and the shore. Westward of the south point of Pulo Ubin is a small island, named Pulo Kitam, off the north-west extreme of which some patches of reef extend half a mile in a north-west direction.

DIRECTIONS.*—The eastern entrance of Old strait, between the shoal extending south-eastward from Pulo Ubin and Tanjong Changhi is half a mile wide, with depths of 13 or 14 fathoms in mid-channel, decreasing to 11 and 9 towards either shore. Eastern Kapala rock in line with Johore hill bearing E. $\frac{3}{4}$ S. leads through in mid-channel. The breadth of the channel is nearly the same between Papan rock and the opposite coast, as also between the 3-fathoms patch and Batu Putih; but between the south point of Ubin and the head of Sirangún harbour the distance is one mile, narrowing again between the north-west end of Pulo Kitam and the shoal bank, to three-quarters of a mile. Between Batu Putih and Pulo Ubin the depths are 18 fathoms in mid-channel, but shortly after they decrease to 9 or 8, and then deepen again southward of Pulo Kitam, to 13 or 14 fathoms, and for some distance they are thus irregular.

Vessels proceeding to New Johore, or through the strait, after passing Tajam point, the west extreme of Pulo Ubin, should steer across for Baru village, and keep the Malay coast on board distant from 2 to 3 cables, the lead giving sufficient warning if too close. From abreast Pulo Kitch Bungsee, a mid-channel course, inclining to the Malay shore, will lead to New Johore.†

Westward of Johore, about 5 miles, is the narrowest part of the strait, and which is less than half a mile wide, with some rocks in mid-channel, eastward of it; from thence the strait takes a S.S.W. direction to its western entrance, a distance of 9 or 10 miles.

The western entrance of Old strait is the channel formed between Singapore island and Pulo Marambon. From Pulo Marambon, a shoal bank, with from one to 2 fathoms water, stretches in a N.N.E. direction more than 2 miles, and a rocky bank fronts the coast of Singapore island opposite to it, and extending nearly half a mile, reduces the width of the navigable channel to one-third of a mile. Abreast of Tanjong Kampong the depths are 4 and 5 fathoms, deepening to 6 fathoms towards Pulo Marambon. At about three-quarters of a mile outside of the island, the depth is reduced to 2 fathoms, on the bar which extends across the entrance. Beyond the bar the depths are from 9 to 11 fathoms, deepening to 14 or 16 fathoms, mud, a little farther out.‡

Beacon.—A red stone beacon, with basket, marks the coral patch lying on the east side of entrance, one mile south-west of Tanjong Rawang, and $1\frac{1}{2}$ miles eastward of Pulo Marambon.

Water.—Fresh water may be obtained in several of the rivers in the Old strait.

* See page 128 for (Johore channel) the approach to the entrance.

† H.M.S. *Charybdis*, 1878.

‡ Lieutenant C. Pritchard, H.M.S. *Fly*, 1883, states, that he found no difficulty in navigating to New Johore by the western entrance of Old strait.

CHAPTER III.

WEST COAST OF SUMATRA AND OFF-LYING ISLANDS.

 VARIATION 2° 15' E. in 1886.

GENERAL DESCRIPTION.—The western coast of Sumatra is mountainous, and in many parts the ranges which traverse the islands from one extremity to the other approach near the coast, leaving between their bases and the sea a narrow plain which is broader in the northern half than in the southern.

This coast was cursorily surveyed in 1833 by Mr. Endicott, and in 1834 by Mr. Gillis, and from their charts and remarks, Horsburgh's sailing directions, as well as recent Dutch survey of small and isolated portions, these directions have been drawn up. Much caution is necessary when navigating this coast; a good look out should be kept aloft when in the vicinity of the shore; and as there are probably many shoals, yet unknown, too much confidence must not be placed in the charts.*

Caution.—Vessels visiting places on the west coast of Sumatra, and many other outlying places in the China seas should be on their guard against being surprised by the natives, and never allow armed parties to come on board, nor unarmed ones in any number.†

WINDS and WEATHER.—On the west coast of Sumatra the winds are subject to great irregularities, owing probably to the meeting of the N.W. and S.W. monsoons with the S.E. trade, also to the numerous islands in the vicinity, and also to the two extremities of the island being far distant on either side of the equator. The same winds therefore do not prevail along the whole of the coast. Thus from October to April, whilst the north part of the coast enjoys fine weather with variable winds, N.W. winds with rain and squally weather prevail on the south part; and in the opposite season, when the S.E. trade is blowing on the south part of the coast, N.W. winds prevail with squalls and rain, close to the coast in north latitude.

North of the Equator.—From October to April the winds are variable with land and sea breezes and fair weather.

From May to September, the period of the S.W. monsoon in the bay of Bengal, the winds inshore of the outlying islands are from N.W., light with calms, rain, and bad weather. N.W. winds cause a considerable sea in many of the roadsteads. Gales are of rare occurrence, and seldom blow

* For the description of Sumatra island, see page 10.

† The crew of the S.S. *Hok Canton* were overpowered by the natives, when at anchor off Rigas, in June 1886, and most of the Europeans murdered. "Shipping Gazette," 24th August 1886.

directly on shore ; north-westers, with few exceptions, are the only winds that blow with violence. Westward of the outlying islands the winds are from S.S.E. to S.W. The rainy season ends in August.

South of the Equator.—From October to April the N.W. monsoon of the Indian Ocean prevails on the west coast of Sumatra south of the equator, and is ushered in by thunderstorms and heavy rain. Land and sea breezes are occasionally experienced, and bad weather with rain and heavy squalls occur at night. Near the equator the winds are variable with frequent calms.

During the period from May to September the S.E. trade wind prevails on the west coast south of the equator, and blows from S.S.E. to S.S.W. with fine weather. In this season N.W. winds with bad weather are occasionally experienced at full and change of the moon. Land and sea breezes occasionally blow in May and September.

Cyclones, occur in the South Indian Ocean between the months of November and April, but none are recorded as being met with on the west coast of Sumatra. The nearest approach is one noted in November 1871, at about 100 miles S.W. of the Pagi islands. In July the same year (a most unusual period) one is recorded at 300 miles westward of Siberūt strait, thence taking the usual westerly direction. No others are recorded within 500 miles of the coast. They are not unknown at the Keeling islands.* See page 226.

CURRENTS.—On the west coast of Sumatra the current is influenced greatly by the winds, and seldom runs to the northward, in either monsoon, except when the wind is blowing strong from southward. When N.W. winds prevail, the current runs with the wind to the S.E., and it generally sets in this direction along the coast in both monsoons particularly in north latitude, but seldom exceeds 12 to 18 miles a day. To the northward of the equator, when the current is setting to the southward betwixt the coast and the islands, it is frequently at the same time running to the northward in the open sea, far outside of them.

In October, November, and December, it is often tedious getting to the northward, particularly from the equator to Achi head, for baffling N.W. winds and southerly currents are often found to extend a considerable distance from the coast in these months, particularly in the channels among the large islands in the offing, where the current sets to the South and S.W. ; but in June and July, between Analabu and Achi head, the current has been found to set to the N.W. from 20 to 30 miles per day.

To the southward of the equator, when at times the southerly winds blow with considerable strength from June to October, a drain of current is impelled to the northward, at which time it is difficult to work to the southward along the coast.

* See Admiralty wind and current charts.

TIDES.—The rise of tide does not exceed 3 feet at springs, and in places not far from the equator it is high water full and change at about 6 hours. On most parts of the coast there is generally a considerable surf, which is highest in the southerly monsoon, during spring tides.

ROUTES. — The channels, or routes, along the west coast of Sumatra may be considered as three in number:—(1) That to the westward of all the islands, in the open sea, and named the Outer route; (2) the space between the chain of large islands, in the offing, and those small islands adjacent to and interspersed along the coast, which may be called the Middle route, and ranges from 10 to 30 miles distant from the shore of Sumatra; (3) the Inner route, lying close along the coast and between some of the islands near; it is connected with the Middle route in some places.*

Outer Route, to the westward of all the islands, in the open sea, is the best of the three; for there, S.W. and southerly winds often prevail, when N.W. squalls and variable baffling winds may be experienced close to the land. A quicker voyage to the northward will thus be made during either monsoon.

Middle Route.—The middle route should not be followed when bound to the northward, nor at any time, if it can be avoided without inconvenience; for although it is wide, and may be adopted by night or day, when the weather is clear and favourable, vessels are liable to be drifted by currents when the winds are light and baffling, there being no anchorage; and in some parts towards the main, dangerous coral shoals are situated near the edge of soundings.

Inner Route.—The Inner route has been generally recommended to navigators, but it probably is meant to apply to vessels trading between the different places on the coast, and it should seldom be chosen by vessels bound to the northward in either monsoon; but as there are in many places moderate depths for anchoring, it is preferable in that respect to the Middle route. On account, however, of the numerous small islands and many dangerous shoals, the true positions of which are not correctly determined, it is, to persons unacquainted, an intricate and embarrassing passage. Vessels proceeding by it are generally obliged to anchor during the night.

Coral reefs.—It has been said, that all the shoals on this coast are white coral rocks, discernible from the masthead about one mile off in the daytime, even when they are 3 fathoms under water. On the contrary, many of the shoals consist of black rock, not discernible until close to them, although covered only with 8 or 10 feet water; and several vessels have grounded upon these shoals in the daytime before they could be perceived,

* Horsburgh.

A good look-out from the masthead is nevertheless useful, particularly when the sun shines, for many of the dangers will then be discernible before they are approached very close.

General Directions.—Vessels bound to parts of the coast situated betwixt Benkulen and Tapanuli may, in coming from seaward, pass through some of the channels formed by the principal islands in the offing, adopting a safe and convenient one, according to the season and prevailing winds. A description of these channels will be found with that of the islands.

Vessels bound to the northern part of the coast, anywhere betwixt Tapanuli and Achi head, should pass northward of Pulo Simalu, and make the land near their port; but when northerly winds prevail, they ought to keep well to windward, and after making the land, coast along at a moderate distance to the place whence they are bound.

ACHI (ACHEEN) HEAD, the north-west extreme of Sumatra, has been described at page 16 of this work.*

Karang Baba bay lies 3 miles south-eastward of King point, on the south side of a low green point. The shore of the bay is low, covered with trees, and fronted by a reef. At a distance it has the appearance of a strait and is sometimes mistaken for such. In this bay is a rocky islet, and at its south point two rocks above water, on which the sea breaks; there are depths of 12 to 14 fathoms near the rocks.

RITIËNG BAY.—**Siddoh harbour** situated on the east side of Siddoh point, the southern extreme of Ritiëng bay, lies 10 miles southward from King point. The entrance is narrow, its shores being fringed with reefs. Cattle may be obtained at Siddoh.

There is anchorage north-eastward of Siddoh point in 8 fathoms.

At one mile southward of the point are some rocky islets, the largest of which is named Batu Mandi.

Amboina bay, 2 miles southward of Siddoh point, is about one mile broad, and affords anchorage in from 5 to 9 fathoms.

Riau bay, 5 miles southward of Amboina, is open to the south-west, about half a mile broad and one mile deep. The west point of entrance attains a height of 3,280 feet. The bay is apparently free from danger, and anchorage may be found in the entrance in 8 fathoms.

Pulo Russa, an island nearly circular, and about half a mile in diameter, lies near the entrance of Riau bay.

The shore between Amboina and Riau bays is fringed by several small islands, and sunken rocks extend about three-quarters of a mile off from the south-west point of Amboina bay, and from the shore southward of it.

* See Admiralty chart:—Sumatra, west coast, sheet 1, Achi head to Tyingkok bay, No. 2,760, scale, $m = 0.1$ of an inch; also Achi head to Diamond point No. 219, scale $m = 0.2$ of an inch. For north and east coasts of Sumatra, see pages 12–34.

BANKS.—Arl bank, with from 6 to 10 fathoms, and $1\frac{1}{4}$ miles in extent in a north-east and south-west direction, lies with Ujong Ritieng bearing E. $\frac{1}{2}$ S. distant 5 miles.

Guhurn patches, of 8 and 9 fathoms, lie with Batu Mandi bearing E. $\frac{1}{2}$ N., 3 miles, and E. by N. $\frac{3}{4}$ N. $3\frac{1}{2}$ miles.

Sindoro bank, about one mile in extent, with a least depth of 5 fathoms, lies with Batu Mandi bearing N.E. $\frac{3}{4}$ E. distant $5\frac{3}{4}$ miles. Also the northern end of a bank, with 9 fathoms, the extent of which is not known, lies with Pulo Russa bearing N.E. by E. $\frac{1}{4}$ E. distant 6 miles. These banks are apparently steep-to, and less water may exist.

KLUANG BAY, situated about 9 miles southward of Riau bay, is formed by Tanjong Dawa, a bold conspicuous rocky headland projecting from the coast. At about half a mile W. by S. from the headland lies a cluster of rocks above water named Batu Burung; there appears to be a clear passage between the rocks and the point, with not less than 6 fathoms water. The rocks are steep-to all round except on the north-west side, where a coral reef extends a quarter of a mile.

Kluang bay, north-eastward of the headland, is about one mile across, with depths of from 5 to 8 fathoms, sand and coral. The south side of the bay is shoal for about 2 cables from the shore. Pulo Kluang, about 3 cables in diameter, is situated about 3 cables off the southern point of the bay, between which are depths of 5 to 7 fathoms.* The best anchorage is eastward of the island in about 7 fathoms, sand and coral.

Lamtui river, with the village of Gedei at its mouth, empties itself into the northern part of the bay, at the foot of Kluang hill.

A reef extends about half a mile off Tanjong Buding, situated $3\frac{1}{2}$ miles northward of Kluang bay.

DAYA.—Between Tanjong Daya and Tanjong Po, the next point to the south-east, a bay is formed, where there is probably safe anchorage with the wind northward of north-west.

Tanjong Po is formed by two peninsulas, the outer one which is the extremity of the point is a small round green hill without trees. The surf generally breaks over the rocks which join the two peninsulas.

On the shore of this bay stands Tambaga hill, isolated, conspicuous, and visible from a great distance. When bearing N. by W., the sides appear steep and inaccessible, and the top level; when bearing N.E. by N. the top appears narrower, and the north-west side has a longer slope.

Daya village is situated in the south-east corner of this bay, within Tanjong Po, with depths of $4\frac{1}{2}$ to $6\frac{1}{2}$ fathoms off it.

The **COAST** from Daya to the village of Noh, 12 miles to the southward, is low; the high land, however, approaches near to the coast,

* See plan of Kluang bay, on Admiralty chart No. 219.

leaving only a narrow strip of low land, which from the offing is in some parts not perceptible, the hills appearing to be close to the beach.

Inshore of *Daya* the chain of mountains, which extends the whole length of *Sumatra*, is completely broken by a valley which extends in a north-east direction; the mountain peaks are higher, sharper, and more numerous on the north-west side of the valley than on the opposite quarter.

Reefs.—From *Daya* the coast, as far as *Lambusi* river, is skirted by foul ground, with depths of from 2 to 8 fathoms, and 14 fathoms, mud, near its outer edge, to the distance of one mile from the shore. A reef named *Batu Pulintas*, stretches off nearly three-quarters of a mile from *Lubuk* river, and an isolated reef lies between *Lambusi* and *Lubuk* river at $1\frac{1}{2}$ miles S.W. $\frac{1}{2}$ S. of the former.

At one mile westward of *Pulintas* reef is a dangerous reef, one mile in extent north and south. Its southern extreme lies about $1\frac{1}{4}$ miles West from *Pulo Limpang*. Its outer edge lies 2 miles off shore, and should be carefully avoided when approaching the coast between *Pulo Limpang* and *Lambusi*.

Pulo Limpang, S.S.E. about 2 miles from *Lambusi* river, is small and though lying close to the mainland is easily distinguished by its red cliffs, which are about 60 feet high, and surmounted by a cluster of trees. The islet forms an excellent mark and one scarcely possible to mistake. A coral reef projects a short distance to the westward of the islet.

Anchorage.—Off *Unga* village, within *Pulo Limpang*, there are depths of 5 and 6 fathoms, apparently sheltered from southerly winds.

BABA AWI BAY is formed between *Tanjong Subang*, one mile south of *Pulo Limpang*, and *Tanjong Bangka*. In this bay are several coral shoals, which must be carefully avoided. The shoal with about 12 feet water, and 11 fathoms close to, the outer extreme of which lies S.W. by S., one mile from *Subang* point, is about half a mile in extent, and generally breaks. This shoal is called by the natives *Loongcarp Subang*. A small detached shoal with a least depth of 13 feet, lies nearly one mile south-east of it, and the same distance off *Jenamprong* river.

Baba Parot Shoal.—The most extensive and dangerous shoal, lying in the fairway of vessels, is the one off *Bangka* point, named *Baba Parot*, or *Loongcarp Baba Parot*. This shoal is a mile long, east and west, and about three-quarters of a mile broad; the least water found was 16 feet, but there is probably less. Its centre bears W. $\frac{1}{2}$ N. from *Bangka* point from which its outer or west extreme is distant 2 miles. Heavy breakers appear when there is any swell. Between the shoal and the point there is a clear passage one mile wide with soundings of 14 fathoms, mud, in mid-

channel. A coral reef projects seaward from Bangka point about 2 cables; there are depths $4\frac{1}{2}$ fathoms near the outer edge of the reef, deepening in a westerly direction to 9, 11, and 13 fathoms, coral.

Anchorage.—The best anchorage in Baba Awi bay is in 11 fathoms clay, with Bangka point bearing S.E. by S., about $1\frac{1}{4}$ miles. A vessel in this position will be about the same distance from Baba Awi village; nearer to the village the bottom is not so clear. In the bay there are four villages, from which pepper is exported.

Directions.—Bangka point is low, sloping with an irregular outline from a hill one mile in the interior; the extremity of the point there is a cluster of trees remarkable when bearing north or south, but when abreast are not easily distinguished.

The passage into the bay, north of Baba Parot, is about $1\frac{1}{2}$ miles wide with depths of from 11 to 14 fathoms, mud.

Approaching Baba Awi from the southward with a fair wind, it seems always advisable to pass between Bangka point and Baba Parot; Pulo Limpang should be kept bearing N. $\frac{3}{4}$ W. until Bangka point bears E. by S., then steer about N.E. direct for the anchorage.

Between Bangka point and Pulo Rajah there appears to be no danger beyond half a mile from the shore.

PULO RAJAH (Riah) about 5 miles southward of Baba Awi bay, is about $3\frac{3}{4}$ miles in circumference, 300 or 400 feet high, and covered with trees. On the south and south-west sides there are several steep rocky cliffs, from 30 to 80 feet high. Pulo Maneh, is a small islet of yellow sandstone, 40 feet high, close to the west extreme of Pulo Rajah. It is surrounded by a coral reef, which always breaks, and in some places is 2 cables from the shore.*

Telok Kruet.—In the bay formed by Pulo Rajah and the coast to the northward there are several pepper ports; the chief one, named Telok Kruet lies within the point abreast of Pulo Rajah.

Directions.—**Anchorage.**—A vessel bound there from the northward may pass midway between the north-west side of Pulo Rajah and the main, and anchor in 9 fathoms mud, with Pulo Maneh bearing S.W. and the eastern extremity of Pulo Rajah S.S.E. $\frac{1}{2}$ E.

In this position, with a north-west gale, a vessel could, in case of necessity, proceed through the passage between the island and the mainland. It is not advisable to anchor nearer in, as the bottom becomes sandy.

* See Admiralty chart:—No. 219; and plan of Rajah passage, on Admiralty chart No. 2,760; scale, $m = 2\cdot56$ inches.

A vessel may also anchor south-eastward of Pulo Rajah quite as near the town, and sheltered from north-west winds.

A vessel from the southward should not round Pulo Maneh nearer than 4 cables, and when Telok Kruet point is seen, or when Pulo Maneh bears E. by S., a direct course may be steered for the anchorage.

The channel between Pulo Rajah and the mainland is about $3\frac{1}{2}$ cables wide, but is narrowed to one cable in breadth, by three or four small rocks, about the size of a haycock, with 2 to 6 feet water on them, lying nearly in mid-channel in the north-west part of the passage. Close to the rocks, on the side nearest to Pulo Rajah, the soundings are 7 fathoms, deepening to 8 and 9 fathoms. Within half a cable of the sandy point which forms the north-east point of the island the water shoals suddenly to 3 and 2 fathoms. A vessel passing through this passage should keep about one-fourth the width of the passage from the island; and at this distance there will probably not be less than 7 fathoms. Between the rocks and a point of sand, which extends 50 fathoms from the main, there are $4\frac{3}{4}$ fathoms coral. A ridge of coral with $4\frac{1}{4}$ and 5 fathoms, extends from the rock in a S.S.E. direction parallel to the main, nearly through the passage.

BABA NIPA POINT (Tanjong Glass) is the first point to the south-east of Pulo Rajah, and may be known by its ash-coloured cliffs, and by a small rock separated a few feet from the point.

Baba Nipa point is fringed by a reef which extends about one-third of a mile, with 10 fathoms close to.

Village.—The village of Baba Nipa, one of the pepper ports, is about half a mile inside the point of that name; several of the houses can be seen, also a cluster of cocoa-nut trees. There is a river close to the village with good water; between the river and the point coral reefs extend a quarter of a mile from the shore.

Anchorage in 10 fathoms, mud, may be obtained with Baba Nipa point bearing S.S.E. distant three-quarters of a mile. The bottom is of hard sand as Pulo Rajah is approached.

Between Baba point and Pulo Kas at a moderate distance from the shore there appears to be no danger; do not shoal less than 10 fathoms.

PULO KAS, distant 6 miles south-eastward of Pulo Rajah, is considerably elevated, and like all the islands between Pulo Rajah and Keta-pang Pasier, is a mass of black rocks having the appearance of iron ore, and covered with trees. The south-west side of the island is steep to, there being 10 fathoms, mud, close to the rocks; on the north-east side a

coral reef projects half a cable from the shore, with 5 or 6 fathoms close to the edge of the reef, which is in most places distinctly visible.*

Anchorage.—The best anchorage near Pulo Kas is in $7\frac{1}{2}$ fathoms mud, with the south-east point of the island bearing S.S.W. Anchor nearer to the island than the main land in order to avoid a sand spit which projects a short distance from the shore. Here a vessel is sheltered from all winds, which blow with much violence on this coast, and in weighing may pass out on either side of the island. With Pulo Kas bearing East, distant one mile, there is good holding ground in 12 fathoms.

Bound into the anchorage do not round the south-east point of Pulo Kas at less than half a cable distant, as a reef, on the outer end of which there is a depth of 3 fathoms, extends nearly that distance. There is $9\frac{1}{2}$ fathoms close to the edge of the reef.

Passing out to the north-west from the anchorage, the least water in mid-channel is $5\frac{1}{2}$ fathoms, in the narrow part between Patih point and the north-east point of the island.

Patih (Patty) is a small pepper port on the mainland, north-east of Pulo Kas; joining the town is a small green hill covered with cocoa nut trees, which can be seen by a vessel from the southward, at a considerable distance.

A reef with rocks above water, border the bight in which Patih is situated.

Pulo Kechil is a small wooded islet about half a mile from Pulo Kas; a cluster of rocks above water extend from the island a quarter of a mile in a westerly direction, with a depth of 7 fathoms close to the outer rock. On the south side of Pulo Kechil there are depths of 3 or 4 fathoms, coral, deepening towards Pulo Kas.†

A vessel anchoring on the south side of Pulo Kechil should keep nearer to Pulo Kas than to the rocks, where the bottom is soft, in about $8\frac{1}{2}$ fathoms.

From Pulo Kas to Pejabah islands there appears to be no danger. About $1\frac{1}{2}$ miles S.S.E. from Pulo Kas there is a rocky bank about one mile in extent, on which the least water is 7 fathoms.

Between Daya and Ketapang Pasier, excepting on the shoals, the bottom is soft.

PEJABAH ISLANDS form the harbour of Telok Kalumpang, one of the most considerable pepper ports on this part of the coast. The islands are small and lie close together about a mile from the main; the largest is named Pejabah Besar, the smallest and outer one Pejabah

* See Admiralty chart, No. 2,760; scale $m = 0.1$ of an inch.

† Pulo Kechil is apparently the islet on the reef fronting Patih.—Ed.

Kechil; these two islets are nearly the same height. Pejabah Kechil has a round appearance on the top with a smooth outline, the trees being more uniform in height than in the other islet, which has several high trees of irregular height. There is a coral reef with 12 feet water, extending about $1\frac{1}{2}$ cables from the inshore side of these islands. Two cables S.W. by W. from the outer island is a rock 15 feet high, with 11 fathoms close to on the seaward side; there is also a rock nearly awash and which always breaks bearing S. by E. from the same island, distant a third of a mile.

Between Pejabah islands and the main land is Pulo Kluang; this island is 300 or 400 feet high, larger and higher than the Pejabahs, and covered with trees, but lying close to the land is not so conspicuous as the other islands; it is bold to all round except on the eastern side.

Telok Kalumpang (Gulumpang) point or peninsula is a green hill nearly the same height as Pulo Kluang, with only a few scattered trees and a house on the summit; it is based by rocky cliffs and connected with the mainland by a low sandy isthmus, and on some bearings has the appearance of an island.

Anchorage.—Vessels bound to Telok Kalumpang usually pass between the Pejabahs and Pulo Epu Tyikem. The only danger in this track is the small rock before mentioned, which bears S. by E. from little Pejabah island distant one-third of a mile; close to the cliffs of Telok Kalumpang there is a depth of 8 fathoms.

The best anchorage is in 10 fathoms, mud and sand, with the Pejabahs bearing N.W., and Pulo Kluang N.E. by N., but vessels shipping pepper anchor much nearer the town, and in 8 fathoms, half way between Telok Kalumpang and Pulo Kluang. During the period of April to September, vessels should moor open hawse to the north-west; the bottom is sand, and there is no room to drive nor to put to sea.

Pulo Tyikem (Cheekem) is a high bluff island $2\frac{1}{2}$ miles south-eastward of Pulo Pejabah, in appearance like a Scotch cap; rocks above water extend one cable in a S.S.E. direction from the south-east part; there are depths of $8\frac{1}{2}$ fathoms close to the outer rock. A coral reef with 12 feet water extends $1\frac{1}{2}$ cables from the north-east part of the island.

Pulo Epu Tyikem situated $1\frac{1}{2}$ cables to the westward of Pulo Tyikem, is much lower than the latter island. Bearing N.N.E. it presents a wedge-shaped appearance, though the outline is rather uneven; there are 10 or 11 fathoms close outside the island.

About three-quarters of a mile east from Pulo Tyikem are three black rocks 10 feet high, having $5\frac{1}{2}$ and 7 fathoms close to on the seaward side; on the eastern side there are a few small rocks awash.

Rahnu, a considerable pepper port, is situated $1\frac{1}{2}$ miles eastward from Pulo Tyikem. The best anchorage at this port is in 10 fathoms, sand, with Pulo Tyikem bearing N.W. by N., the southern black rock N.E. $\frac{1}{2}$ E., and Rahnu E. $\frac{1}{2}$ N. one mile distant. Nearer to the town the bottom is sand, interspersed with coral and shells.

About half a mile south-eastward of Rahnu is a small island named Epu Rahnu, lying within a few yards of the shore, and joined to it by rocks. Its appearance is entirely different from that of the coast, the shore from Telok Kalumpang point to Rigas being quite low, the trees growing close to the sandy beach; Pulo Epu Rahnu on the contrary is a pile of rocks about 50 feet high, of a kind similar to the other islands, with trees on its summit; there is also a rock above water on the north-west side nearly joining the island.

Gillis reef.—Three-quarters of a mile W. by S. $\frac{1}{2}$ S. from Pulo Epu Rahnu is a dangerous reef which seldom breaks. The least water is 11 feet, but the shoalest part is not more than 40 or 60 yards in extent and very uneven, with 11 fathoms close to its outer edge. From the shoalest part the outer points of Pulo Epu Tyikem and Pulo Pejabah Kechil are in line; by keeping the Pejabahs in sight to the westward of Pulo Epu Tyikem will lead outside the reef, and Pulo Epu Rahnu and the peak of Rigas hill kept in line will lead about a quarter of a mile south-east of the reef.

There is also a cluster of rocks above water lying a third of a mile S. $\frac{3}{4}$ W. from Pulo Epu Rahnu; close to them on the outside are soundings of 8 fathoms. Between Pulo Epu Rahnu and Rigas point there is a bay encumbered with coral shoals; in this bay is a small pepper port named Jabih.

RIGAS BAY.—**Rigas Point**, the north-west point of entrance to Rigas bay, is low, rocky, and covered with trees; the extremity is a little more elevated than the adjoining land. A short distance inland there are one or two hills partly cleared, and a number of scattered trees. In the channel between Pulo Rangas and Rigas point there is a depth of 11 fathoms.*

From Rigas point the shore is fringed with a coral reef as far as Rambung point a steep hill forming the inner north-west point of Rigas bay; nearly all the land in the bay is high with the exception of marshy land at the north-east part of the bay. About half a mile east of Rigas point the reef projects in one place 2 cables from the shore, this part is dry in some places with a small detached rock which always breaks; the passage between Rambung point and Pulo Rusum is about a quarter of a mile wide, with several rocks above water.

* See plan of Rigas bay, on Admiralty chart, No. 2,760; scale, $m = 1$ inch; also footnote, page 152.

Pulo Rangas, is a pile of rocks 50 or 60 feet high, and covered with trees. The highest trees on this island are visible on a clear day 17 miles; on the north-east side of the island a coral bank with $3\frac{1}{4}$ fathoms water projects a cable distant, with a depth of 12 fathoms close to its edge. At a cable distant from the north-west point there is a small rock which always breaks, elsewhere the island is bold having 12 or 13 fathoms close to it. On the south-east side of the island there are two high rocks, steep-to all round, and nearly joining the island. A small rock 4 feet high, lies E. by S. half a mile from Pulo Rangas.

Anchorage.—A vessel may anchor on either side of Pulo Rangas within a quarter of a mile, in 12 or 13 fathoms, mud. There is also good anchorage between Pulo Rangas and Rigas point, and between Pulo Rangas and Pasier Besar, in 11 fathoms, mud and fine sand. See foot note, p. 152.

Rigas Islands.—**Pulo Rusum**, the largest of these islands, is half a mile long north and south, and lies across the entrance to Rigas bay; it is high on the west side, with steep rocky cliffs and covered with trees; on the east side there is a small space of low land with a number of cocoa-nut trees. Rusum rock lies three-quarters of a mile S.W. $\frac{1}{2}$ W. from the centre of Rusum island; a quarter of a mile N.W. from Rusum rock is a small rock steep-to, having $2\frac{1}{2}$ fathoms water.

Rocks.—Two rocks lying close together, with a least depth of 2 fathoms, and 6 fathoms close to, lies with the east point of Pulo Rusum bearing N.E. by N. distant $3\frac{1}{2}$ cables; and a rock, with probably less than 6 feet, which breaks in bad weather, lies with the same point bearing N. by W. $\frac{1}{2}$ W., distant $2\frac{1}{2}$ cables.

Pulo Engang lies a cable eastward of the south-east point of Pulo Rusum, and is a pile of steep rocks covered with trees.

Pulo Samete, lying to the north-east of Pulo Rusum, is low and has a number of trees on it.

Pulo Pogase consists of two rocks joined, surmounted by a few bushes or small trees.

Selung peninsula, forming the south part of Rigas bay, is 400 or 500 feet high with high rocky cliffs; like all the land in the vicinity of Rigas, excepting that under cultivation, it is covered with trees from summit to the cliffs. The peninsula is joined to the mainland by a low sandy isthmus and therefore appears very much like an island.

Tanjong Selung forms the southern point of Rigas bay. **Tanjong Batu Tutung**, also rocky and high, is about three-quarters of a mile northward of Selung point; between these points is formed a bay a third of a mile deep, with a sandy beach.

Rigas harbour is formed between Pulo Engang and Pulo Samete on the west, and **Tanjong Batu Tutung** on the east; it is about half

one mile in length and a third of a mile in breadth. Though Rigas bay is 4 or 5 miles in circumference this is the only safe anchorage it contains, nearly the whole of the remainder is covered with coral reefs which are dry in many places at low water. Inside Pulo Rusum, between the reefs which join that island and those extending from Pulo Pogase, there is a clear space with $3\frac{1}{2}$ and 4 fathoms, sand, where there is sufficient room for a vessel to heave down, and where the water is always smooth. By buoying the channel a vessel could easily be warped between Pulo Rusum and Pulo Engang; there is also a passage round the north side of Rusum, but more difficult of access. In an easterly direction from Batu Tutung point is a small cove where a vessel might perhaps heave down to the rocks on the shore.

Town.—The town of Rigas on the north-west side of Rigas bay, is a considerable pepper port.

Directions.—Anchorage.—A vessel bound to Rigas should pass between Pasier Besar and Pulo Rangas. The entrance to the harbour is between Pulo Rusum and Selung point, passing about one cable from the point which is steep-to, with the south extreme of Pulo Samete N.N.E. $\frac{3}{4}$ E., to avoid the rock north-west of the point, distant about 3 cables. From abreast the point course may be altered to about $1\frac{1}{2}$ cables off Batu Tutung, where there is anchorage in about 5 fathoms, with Tanjong Batu Tutung S.E.

Between Pulo Engang and Pulo Samete there is a line of coral reefs, dry in some places at low water, which forms the north-west boundary of the anchorage. A vessel in Rigas harbour is nearly land-locked; it is considered to be one of the best on the coast, but is well known to be one of the most unhealthy.

For the latter reason it is advisable for a vessel waiting to load pepper or other produce to anchor in a clear space eastward of Rusum rock in 9 fathoms, where the bottom is dark green sand, or sand and mud, at about $1\frac{1}{4}$ miles from Rigas (and no farther off the town than from the anchorage in the harbour), with the rocks on Rigas point just touching the inner point of Pejabah Besar. Pejabah Besar may be known by its being the first island which will come in line with Rigas point after shutting in Pulo Epu Rahnu, and by a clump of trees on the inner extremity; the rest of the island appears low and level. A vessel in this berth appears to be very near Rusum rock, but she swings in that direction only with the land wind. Vessels should moor with a good scope of cable, else the currents and variable winds will soon cause the vessel to foul her anchor. From October to April the heavy anchor should be placed to the southward and the stream to the north-west; and the reverse after April has commenced as N.W. winds are then expected.

On this coast gales are of rare occurrence, and they seldom blow directly on shore, but more frequently along the coast. With north-westers (which, with few exceptions, are the only winds that blow with much violence) there would not be so much sea as to prevent a vessel riding in safety—if there should be, there is abundance of room to slip and go into the harbour or to sea.

Landing.—In passing to and from the shore, boats should be cautious to avoid a coral spit which projects from the north-west part of Pulo Rusum; this breaks sometimes, as also does a small rock which lies near the edge of the reef between Rigas and Rambung points; the rock is nearly awash.

Rigas hill or Bukit Kwali.—This is one of the best marks on the coast of Sumatra as it is isolated and can be seen a distance of 40 miles in clear weather; nearly the whole of the south side is cleared and has the appearance of land under cultivation. The peak is covered with trees and bears from Rigas town N. by W., distant $1\frac{1}{2}$ miles. On a south-easterly bearing Rigas hill shows two peaks—the northern being lower and smaller than the other; each side of the hill slopes very gradually, the south-east side terminating in Rigas bay; when bearing north-west, Rigas hill shows only one peak, the sides appearing much steeper than when bearing south-east. This hill can be seen in clear weather from near Tanjong Bukuan; it then appears to be the western extremity of the coast and shows as an island.

Pasier (Pahsee) Islets are two small groups of rocky islets with trees on them, lying south-eastward of Selung peninsula, the farther one being distant $1\frac{1}{3}$ miles. The passage between the islets and the peninsula is intricate and unsafe; there appears to be no danger near them on the seaward side, except Pasier rock, which is above water, and 3 cables S.S.W. of Pasier Besar. The sides of this rock are perpendicular, having 10 or 11 fathoms within a few feet of it; there are also depths of 10 or 11 fathoms near the islets.*

Selung (Ketapang Pasier) bay inshore of the Pasier islets is easy of access and affords shelter from north-west winds. A vessel seeking shelter during a N.W. gale could anchor anywhere between Pasier islets and the main, in smooth water of a moderate depth. Johore reef, of coral, one cable in diameter, and with a depth of 4 feet, lies with the south-east extreme of the promontory of Selung bearing W. by N. $\frac{1}{2}$ N., distant $1\frac{3}{10}$ miles; other shoals may exist.

Ketapang Pasier, a village on the mainland, with a cluster of cocoa-nut trees near it, is situated E. by N., nearly $2\frac{1}{2}$ miles from the largest of the Pasier islets.

* See plan of Rigas bay, on Admiralty chart, No. 2,766.

PANGAH, a small pepper port, is situated 4 or 5 miles to the south-east of Ketapang Pasier village. The adjacent coast is low, with a sandy beach, and there is no mark as a guide to the situation, except a small break in the trees.

Tenom.—Between Ketapang Pasier and Bubu bay the coast which is imperfectly known extends south-eastward about 35 miles, and is nearly straight, it is, however, said to be safe to approach within a moderate distance; no shoals are known to exist, except a reef which extends about one mile off Tenom village, situated 16 miles north-westward of Bubu bay, though it is said there is one near Waila (Wylah) river not far from the shore.* The coast is quite low with a sandy beach, and without any remarkable objects; near the shore grow arroon trees (similar in appearance to the pine); they commence near Ketapang Pasier and extend to Waila river a distance of 27 miles, the whole extent of trees presenting a regular and uniform appearance.

From Waila river for a distance of 2 miles south-eastward, there is an opening where there are no high trees, except a conspicuous clump of five or six very tall ones, standing in the centre of the opening; there are also a few cocoa-nut trees, and several houses a short distance south-east of them, but the latter cannot be seen far. From this break the arroon trees commence again, and extend in the same close uniform order 4 or 5 miles farther, and terminating close to Tanjong Bubu. This is the best mark to distinguish this point as there is not one arroon tree between it and Analabu.†

BUBU BAY.—Tanjong Bubu, the western extreme of Bubu bay, is a low point, with a small group of tall cocoa-nut trees near it; they stand northward of the extremity, and are not visible, except the tops over the other trees, when the point bears N.N.W.

Bubu bay is about 2 miles broad, one mile deep, and affords anchorage in 5 fathoms with shelter from winds between West through north to East. Nearly in the centre of the entrance of the bay there is a reef about $3\frac{1}{2}$ cables in extent; and at one mile S.E. of Tanjong Bubu is the northern extremity of another reef which extends nearly three-quarters of a mile in a south-easterly direction, and has 12 feet least water.

ANALABU or MALABU is a pepper port situated in a bay, 48 miles south-eastward of Rigas bay. It may be recognised by the grove of cocoa-nut trees which stand on Analabu point, on the west side of the

* The crew of the wrecked steamer *Nisero* landed at Tenom, and were detained as prisoners by the Rajah of Achi.

† Horsburgh.

bay, and which makes as an island when first seen. The land is low on this part of the coast.*

The village is unimportant. The Dutch had a fortified post here in 1883, but the resident and the troops have been withdrawn. The mail steamers running between Olehleh and Batavia (twice a month), called here at that time.

Trade.—In 1883 the value of the exports amounted to 29,000*l.*, pepper alone amounting to 24,000*l.*; imports, 11,000*l.* Six sailing vessels (schooners) entered the port in that year.

Shoals.—From Analabu point a reef which has 5 feet water and is steep-to, extends S. by W. a quarter of a mile; there are depths of 5 or 6 fathoms close to the outer edge of the reef, which does not break except in bad weather. In the vicinity of the point there are four other shoals. The one most in the track of vessels entering the port is named Loongearp Ujong Karang, and lies with Analabu point bearing N.N.E. $\frac{1}{2}$ E. distant half a mile; the shoalest part found was 11 feet. Another shoal lies with the same point bearing East, distant half a mile; it has very little water, but there are depths of $6\frac{1}{2}$ fathoms, mud, a quarter of a mile outside it. A third shoal, which breaks, lies N. by E. $\frac{1}{2}$ E. distant 2 cables from the last-mentioned shoal; and a fourth shoal lies with Analabu point bearing E. by S. $\frac{1}{2}$ S. distant $1\frac{1}{2}$ miles; it has not more than 5 or 6 feet water on it.†

Anchorage.—The anchorage off Aualabu is in 5 fathoms, with the mouth of the river bearing N.W., distant half a mile. In approaching the anchorage, Analabu point should be rounded in about 10 fathoms, and when it bears N.N.E. haul into the bay.

The COAST.—Directions.—The depths off the coast between Achi head and Rigas bay are in some places irregular over a rocky bottom, and generally from 18 to 30 fathoms at 3 to 9 miles off shore. In this space vessels should during the night, keep 6 or 8 miles from the land, to give a proper berth to the rocks and islets scattered along the coast. From Rigas bay to Analabu the soundings are more regular, and the bottom soft, where the shore may be approached to 11 or 12 fathoms, and occasionally to 9 fathoms; but not under this depth in passing Analabu point.

From Analabu to cape Felix (Tanjong Rajah) the coast trends in a general south-east direction for 35 miles, and may be approached to depths of 11 or 12 fathoms, from 3 to 8 miles off shore. Between these places there appears to be anchorage off Senagum, Trong, Tadu, and south of Trepah. Near cape Felix, at about 4 or 5 miles from the shore, the water

* See plan of Malabu or Analabu, on Admiralty chart, No. 2,760; scale, $m = 1$ inch.

† Gillis, 1834.

deepens suddenly to 26 or 28 fathoms, and from the cape the coast trends eastward to Susu.

Shoals.—At about $2\frac{1}{2}$ miles off shore, midway between Tadu and Trepah, a shoal is said to exist, but the exact position is doubtful. Also at about 4 miles S. by E. from Trepah, and 2 miles off shore is a shoal of 3 fathoms.

CAPE FELIX (Tanjong Rajah) is a low level headland, bold to approach; it forms the western extremity of the bay in which stands the town of Susu (Soesoe). The cape is difficult to distinguish, but there is a small flat house half a mile to the eastward of the cape, by which, if the vessel be within 2 miles of the shore, it may be known.

A small coral shoal is said to lie close inshore just northward of the cape.

Outlying shoals.—A shoal of 4 fathoms lies with cape Felix bearing E. by N. $\frac{1}{2}$ N., distant $14\frac{1}{4}$ miles.

A reef nearly circular 2 miles in diameter and having 5 fathoms of water, lies with cape Felix bearing N.E., distant $13\frac{1}{2}$ miles.

A reef of similar extent to the last-mentioned reef, with a depth of 4 fathoms, and no bottom at 55 fathoms close to, lies with cape Felix, bearing N $\frac{1}{2}$ W., distant 13 miles. At about $1\frac{1}{4}$ miles N.W. of this reef is a smaller patch of less than 3 fathoms, with deep water between.

At 15 miles S.E. from cape Felix is a patch with less than 3 fathoms, and at $1\frac{1}{2}$ miles N.E. and S.E. from this patch are others of 3 and 5 fathoms. These patches appear to be the westernmost of many isolated patches extending from cape Mungin. Much caution is necessary in approaching this part of the coast.

Crimea patch, with a depth of $4\frac{1}{2}$ fathoms, and 30 fathoms close to, lies with cape Felix, bearing N.W. by W. $\frac{3}{4}$ W., about 12 miles, and Lama Muda N. $\frac{1}{2}$ W.

About midway between cape Felix and Kwala Batu is a shoal at $1\frac{1}{2}$ miles from the shore, and nearer the latter the shoals extend $3\frac{1}{2}$ miles off shore, for which the chart will be found the best guide.

KWALA BATU, about 13 miles to the eastward of cape Felix, is during the N.W. monsoon, one of the safest and best roadsteads on this coast.* Coasting from cape Felix, at 4 or 5 miles off shore, in 28 or 30 fathoms, a vessel may steer about E. $\frac{1}{2}$ N. in this depth, (which will lead between the shoals extending $3\frac{1}{2}$ miles southward of Kwala Batu, and Crimea patch), until two clumps of trees showing like islands, about a mile apart, are seen; these are Pulo Kio and Ujong Seranjah the extremes of

* See plan of Kwala Batu and Susu, on Admiralty chart, No. 2,760; scale, $m = 1\cdot25$ inches.

Susu bay; when the clump on Ujong Seranjah bears N.E., steer towards it until the houses at Kwala Batu bear N. by W., then steer direct for them, which will lead between Potomak and Pulo Kio reefs, and about a quarter of a mile eastward of Potomak; the sea generally breaks on the shoals.

The anchorage at Kwala Batu is in from 20 to 22 fathoms, with Pulo Kio bearing E.S.E., and the mouth of the river N. $\frac{1}{2}$ W. Small craft frequent this place, to procure pepper and other articles of trade: but it is prudent to be always guarded against the perfidy of the natives, who have several times been successful in assaulting and taking possession of vessels which came to trade with them. *See foot note, page 152.*

Susu Bay contains several dangerous shoals, with from one to 3 fathoms water; there is also much foul ground in it, with overfalls from 20 to 10 fathoms; but the channel is wide and safe between the shoals on the west side of the bay, and those to the southward of Susu point. The point appears with two or three trees close to the houses, like a small island. A vessel bound into the bay should steer in (as for Kwala Batu), with the clump on Ujong Seranjah bearing N.E., and keep a boat ahead to sound; when abreast of Pulo Kio reef, steer N.N.E. until the clump bears E. by N. $\frac{1}{2}$ N., distant about 3 cables, where there is anchorage in from 10 to 15 fathoms, between Ujong Seranga and Deli rock. The latter lies with Pulo Kio, bearing N. $\frac{1}{4}$ W., and Ujong Seranga E. $\frac{1}{2}$ N., and has a depth of $2\frac{1}{2}$ fathoms.

There is also anchorage in 18 or 10 fathoms, about 2 miles off shore, with the houses of Susu bearing N.E. by E.

Mungin.—At about 8 miles south-eastward of Susu, on the south side of North Telok Pan point, a bluff having arroon trees, there is a place named Mungin, off which there is anchorage in 9 fathoms, inside a rocky shoal of 2 fathoms, lying about $1\frac{1}{2}$ miles south-west from the point. Off North Telok Pau point is another shoal which usually breaks, with a passage of 10 fathoms inside of it.

Labuan Hadji, about half-way between Mungin and Mukkie, is also an anchoring place for vessels shipping pepper; there is a sandbank and other dangers fronting it, also several isolated coral heads, extending 11 or 12 miles off shore.

MUKKIE is a small place, where coasting vessels stop at times to trade.* Between cape Felix and Mukkie, a vessel should not shoal less than 27 fathoms water, as there are several dangerous shoals within this depth; also many shoals beyond this depth, some of which are also dangerous.

Shoals.—There are two shoals off the entrance to Mukkie, the northern one, Gar Bua with 3 fathoms, or less, lies with Ujong Alloa Lang, the

* *See plan of Mukkie, on Admiralty chart, No. 2,760; scale, m = 1 inch.*

southern bluff of Mukkie bay, bearing E. $\frac{1}{2}$ S. distant one mile. The southern, Gar Nee, with 2 fathoms, lies $1\frac{1}{4}$ miles southward of Gar Bua, with Ujong Alloa Lang, N.E. distant $1\frac{1}{2}$ miles.

Directions.—The western point of Mukkie bay, bearing N.E. by E., leads northward of Gar Bua, and avoiding outer shoals, may be steered for on that bearing, until within a quarter of a mile of it, when course may be altered to about E.S.E., where anchorage will be found in from 10 to 17 fathoms the anchorage is said not to be good within the point.

A course S.W. $\frac{1}{2}$ S. from Mukkie will lead between the shoals, and when in 27 fathoms the vessel is outside of them. Native fishermen say there is a shoal of 11 feet, S.S.W. from Mukkie point, 6 or 7 miles distant, it is probably the 5 fathom patch marked on the chart near that position.

About midway between Mukkie and South Telok Pau there is a small island, named Pulo Súrvodung, close to the shore, between which and Telok Pau lies a 3-fathom shoal. It is about one mile off shore, and bears S. by W. $1\frac{1}{2}$ miles from the island.

COAST.—South Telok Pau 7 miles south-east from Mukkie, is a place where pepper may sometimes be obtained. The best anchorage is with the point N. by E., in 17 fathoms, under which depth the ground is frequently foul.

There is a remarkable white rock 2 miles south-east of South Telok Pau, named by the natives Batu Belajar. Between this and Tampat Tuan are the small pepper ports of Sama Dua, Eah Mudung, and Telok Kattapung. Along this coast the soundings are very deep, but it is said to have many shoal rocky heads from 3 to 8 miles off shore.

TAMPAT TUAN BAY.—Tampat Tuan point, the southern extreme of the high land seen from Susu, from which it is distant 37 miles, is the west point of Tampat Tuan bay.*

Rocks.—Batu Kuseah, a rock above water, lies one cable S.W. of Tampat Tuan point; and Batu Tongkat a small round rock steep to, and shaped like a boat, lies with Tampat Tuan point bearing East, distant nearly one mile. A rocky patch of 3 fathoms lies N. by W. $\frac{1}{2}$ W., 3 cables from Batu Tongkat. A coral shoal of 3 fathoms or less lies with Tampat Tuan point bearing E. by N. distant $1\frac{1}{2}$ miles. In Tampat Tuan bay, at about a quarter of a mile eastward of the village, and the same distance N.E. of the point, is a shoal with a depth of $1\frac{1}{2}$ fathoms, named Gusong Puka. On the eastern side of the bay, at a quarter of a mile S.W. of Ujong Batu Mera, is a bank of $2\frac{1}{2}$ fathoms, named Gusong Golu, which sometimes breaks.

* See plan of Tampat Tuan bay, on Admiralty chart, No. 2,760; scale, $m = 1.25$ inches.

Anchorage.—There is anchorage in 15 to 22 fathoms, with Tapat Tuan point bearing West, and the village N.W. $\frac{1}{2}$ N., distant about one-third of a mile. The north-eastern part of the bay, towards the village of Benkuan, has depths of 10 to 14 fathoms, and appears to be well sheltered from winds as far southward as West.

OUTLYING SHOALS.—Tua or Labon point is 60 miles south-eastward of cape Felix; and in sailing between them great care is requisite to avoid several shoals interspersed along the coast. As before mentioned, several isolated shoals lie as much as 14 miles off the coast between cape Felix and Tapat Tuan.

Westward of Tapat Tuan with that point bearing E. by N. distant 9 miles, is a bank of 3 fathoms. Midway between this bank and the point, and also at the same distance northward of it are similar banks of 4 fathoms.

Also at 4 miles S.S.E. $\frac{3}{4}$ E., and with Tapat Tuan point bearing N.E. $\frac{3}{4}$ E. distant 9 miles, is a bank of $1\frac{1}{2}$ fathoms, probably the bank on which the brig *Sophia* struck.

Also with Tapat Tuan point bearing N. $\frac{1}{3}$ E. distant nearly 11 miles, is a bank of 10 feet, probably the bank on which the *Lord Castlereagh* struck. Another shoal, also dangerous, and which breaks, lie about 6 miles S.S.W. of the last mentioned, with Tapat Tuan Great hill bearing N. by E. There is also a shoal of 3 fathoms about 17 farther to the S.S.W., with Tapat Tuan Great hill N. by E. $\frac{1}{2}$ E. and Pulo Monkie E.N.E.; it has 34 fathoms close-to. At about 9 miles E. by S. are two isolated shoal patches, with a depth of 12 fathoms between them. Westward of Pulo Monkie, with the islet bearing E. by N., about 6 miles, is an isolated shoal of less than 3 fathoms, also with the islet bearing N. by E. $\frac{1}{4}$ E. distant 9 miles lies an isolated patch of $1\frac{1}{2}$ fathoms. Between this and Sebadie point are several isolated shoals, and at $3\frac{1}{2}$ miles westward of the $1\frac{1}{2}$ fathom patch is a bank of from 3 to 5 fathoms.

These shoals are all steep to, and vessels in their neighbourhood should keep a careful lookout from the masthead.

Between Tapat Tuan and Pulo Monkie, a vessel should keep $2\frac{1}{2}$ or 3 miles off shore in from 10 to 25 fathoms.

Pulo Monkie in about lat. $20^{\circ} 55' N.$, is an islet having a few cocoanut trees, about $1\frac{1}{2}$ miles off Ujong Kamarang, with a channel between having a depth of 6 fathoms. A sandy island or bank lies one mile S.E. from Pulo Monkie.

Between Tapat Tuan and Pulo Monkie there is commonly a heavy surf dangerous to land in, except in the native boats. The coast has generally proved unhealthy, and frequently fatal to boats' crews who have been obliged to remain overnight.

BAKŪNGON BAY, about 4 miles eastward of Pulo Monkie, where vessels may lie sheltered from north-west winds, has some rocks off its western extremity. The river and village of Bakūngon may be known by two small islands, situated south of the mouth of the river, the northernmost named Pulo Dua, the other Pulo Kayu. There is also a mountain close to the sea, formed like a saddle, with the highest end to the southward, and Bakūngon lies close under its northern end, and 3 or 3½ miles north-eastward of Sebadie village. A large vessel may anchor in 15 fathoms, soft bottom, with the entrance of the river (at the head of the bay) bearing N.N.E. distant half a mile. In this position she will be sheltered from N.W. winds; vessels sometimes touch at this place to trade.

Directions.*—In approaching Bakūngon bay from the southward much care is requisite, as there are several dangerous shoals. To avoid these, bring Bakūngon bazaar to bear N. by W., and run in on this bearing till Pulo Monkie bears West; then steer more to the westward, and anchor in from 14 to 15 fathoms, three-quarters of a mile off shore, with the bazaar bearing North.

If bound from the northward, the passage between Pulo Monkie and the main may be adopted, by keeping about half a mile from the latter and standing along shore at that distance till Bakūngon village bears from North to N. by E., then anchor. Should the passage to the southward of Pulo Monkie be preferred, bring the opening between Pulo Dua and Pulo Kayu to bear East; run for it till Bakūngon bazaar bears N. by W.; and observe the same directions as for approaching the bay from the southward.

Pulo Dua Anchorage.—Inside Pulo Dua is the best harbour amongst the northern pepper ports, being well sheltered in 13 fathoms, with that island bearing West about half a mile. There is a safe channel of 10 or 12 fathoms water between Pulo Dua and Pulo Kayu. About half a mile W. by N. from Pulo Dua there is a shoal.

Pulo Kayu.—There is a shoal at one mile S.S.E. from Pulo Kayu, and at one mile S.S.W., is Kampong Arra, a small islet with reefs. There is a passage between Pulo Kayu and Arra isle, but nearly in mid-channel lies a shoal of 4 feet; another shoal, which always breaks, lies E. ¼ S. from Arra isle, distant three-quarters of a mile.

Sebadie Anchorage.—Off the village of Sebadie, which lies East 2 miles from Pulo Dua, there is good anchorage in 12 fathoms sheltered from N.W. winds, about one mile from the shore. If bound into this road,

* The Bakūngon referred to in these Directions appears to lie about 4 miles eastward of Monkie point; this would agree with the position assigned to it by *Endicott*, as being 3 miles N.W. by N. from Pulo Dua, and not as being situated about 3 miles northward of Sebadie.

and being 3 miles off shore in 25 fathoms, bring the village to bear N. by E., steer in with this bearing, and anchor in 10 or 12 fathoms, at one or $1\frac{1}{2}$ miles distant from the village.

Shoals.—Within a distance of 13 miles in a S.W. $\frac{1}{2}$ W. direction from Pulo Dua there are four shoals, with apparently deep water close to, and described on page 171.

TRUMON from which a large quantity of pepper is exported, lies 9 miles south-eastward of Pulo Dua.*

Shoals.—At $2\frac{1}{2}$ miles N. by W. $\frac{1}{2}$ W. from Pulo Trumon, is a shoal of 9 feet, on which the sea sometimes breaks, having 8 fathoms close to. Also W. $\frac{3}{4}$ N. about $1\frac{1}{2}$ miles from the same islet is another shoal. Other shoals exist southward of the last-mentioned, for which a careful look out should be kept for from the mast-head.

Anchorage.—In approaching Trumon bay, Pulo Trumon, which lies nearly 3 miles S.W. of the village, should be brought to bear E.S.E., then steer towards it, and pass at a moderate distance round its northern end, from which a spit projects about half a cable. The anchorage is usually in 7 fathoms, sandy bottom, off the mouth of the river, but good ground tackling is requisite, as the anchorage is exposed to north-westerly winds. There is also anchorage close under Trumon island, in 6 fathoms.

Inner Passage.—There is a channel eastward of Trumon island, between the reefs extending 5 miles southward of the island and the shore, but it is seldom used. This inside passage is said to be safe by rounding the point 8 miles southward of Trumon in 5 fathoms, and from thence the track close along shore, inside of all the shoals, to Singkel is safe, and preferred by some to the off shore route from Jawi Jawi island.

Bulo Sama, in lat. $2^{\circ} 34' N.$, is a pepper port; there is anchorage in $5\frac{1}{2}$ or 6 fathoms at about one mile off shore.

Reefs.—**Ayer Itam reef** lies 5 miles southward of Pulo Trumon, at about one mile off shore, with a remarkable tree in line with a hill in the interior.

Heria reef lies N.W., about 3 miles from Bulo Sama, and a smaller reef lies nearly 3 miles beyond it, in the same direction.

Amboina reef.—Southward of Bulo Sama, is Ambonia reef of $2\frac{1}{2}$ fathoms, which lies with Pulo Jawi Jawi bearing S.S.W. $\frac{1}{2}$ W., and Tanjong Patikala S.E. $\frac{3}{4}$ S. About midway between this reef and Bulo Sama, is a reef of 5 fathoms, and probably less.

BANJAK ISLANDS, are a cluster of islands extending about 40 miles westward of Singkel. The three largest are Pulo Bangkaru,

* See plan of Trumon, on Admiralty chart, No. 2,760; scale, $m = 0.3$ inch.

Tunangku, and Batu. There are many small islets with deep water channels interspersed with rocks, between them.

Pulo Bangkaru, the outer and S.W. islet, has a shoal lying nearly one mile off its west side. Chameleon bay, on its south-east side affords shelter from N.W. winds.

Between Pulo Bangkaru, and Pulo Topak 24 miles to the westward, the channel is considered to be free from danger; but it is recommended to keep to the Bangkaru side.

The channel between Pulo Bangkaru and Tunangku is nearly 5 miles wide with deep water, there being no danger apparently beyond half a mile from either islet.

Pulo Tunangku, the largest islet, is nearly 20 miles in length, with a conspicuous sugar loaf peak named Gunong Trusa on its northern end. Close westward of this peak is a bay which affords shelter from southerly winds in from 6 to 13 fathoms, the entrance to which is between Pulo Mandong Katti, and Gunong Batio Lanteh, the west point of the bay. Numerous islets extend about 6 miles north-eastward of the north point of Pulo Tunangku, between which and Pulo Ujong Batu is a deep navigable channel about 3 miles in width.

Pulo Ujong Batu lies nearly 9 miles north-eastward of Tunangku. It is about 5 miles in length, with islets extending about the same distance southward, between which and Great Pulo Balambak there is the deep channel before referred to.

Eastward of the reefs extending about 2 miles north-eastward of Batu, is a channel about 4 miles wide, which is one of the best passages between the Banjaks, though there are some detached shoals in it.

Jawi Jawi or Passage Island, the north-eastward of the Banjak islands, lies 10 miles eastward of Pulo Ujong Batu, and 7 miles westward of Tanjong Palikala on the main. It is low and sandy with a few shrubs, but there is one large banian tree which may be seen from a distance of about 12 miles. Passage island is situated on the east end of a reef which is 5 miles long in an east and west direction, and 3 miles broad.*

A Shoal having a depth of $4\frac{1}{2}$ fathoms, reported by H.N.M.S. *Surabaya*, lies with Jawi Jawi bearing S. by W. $\frac{1}{2}$ W. distant about $1\frac{3}{4}$ miles.

DIRECTIONS.—Vessels from the northward bound to any of the ports north of the equator should proceed by one of the passages between Banyak islands and the main. The channel between Passage island and the coast of Sumatra is rendered intricate by dangerous rocky shoals

* See Admiralty plan of Banjak islands and adjacent coast, No. 855; scale, $m = 0.28$ of an inch.

situated nearly midway betwixt the island and the main. Although there is a safe passage inside these shoals by keeping close to the Sumatra shore, yet the channel between Passage island and the shoals has been usually adopted.

Passage island channel.—In steering for this channel keep about 9 or 10 miles off the coast until Passage island is seen, then steer towards it, observing never to bring it more easterly than S.E., to avoid getting near the shoals and irregular soundings, extending about 5 miles to the westward of it.

Having approached Passage island within 3 miles, bring it to bear S.S.E., which will lead westward of the $4\frac{1}{2}$ fathom patch, and when three-quarters or half a mile off the island, alter course to pass about that distance eastward of it, to avoid the shoals midway between it and Tanjong Palikala; the encircling reef of Passage island is dry all round to the distance of a cable at low water, and projects about a quarter of a mile, or rather more in some places, but is not visible at high water. By preserving the distance mentioned the soundings will be tolerably regular, and the depths never less than 10 or 12 fathoms, mostly rocky bottom.

A good look-out from the masthead is requisite when passing through this channel, as the coral shoals may be discerned in clear weather, but the flat surrounding Passage island cannot be always distinguished. When through the channel, which is about 2 miles in length, the island must be kept between the bearings of N.N.W. and N.W. by N., in steering to the southward, where a vessel may anchor if the wind or tide be unfavourable; but northward of the island do not anchor under 20 fathoms, for the ground there is rocky under that depth.

Inshore channel.—Within 2 miles of the land in the vicinity of Tanjong Palikala there are several rocky shoals, having only 2 to 3 fathoms in some parts, with a safe channel of 8 and 9 fathoms between them and the Sumatra shore. A vessel may venture within half a mile of the shore in some places. The shoals on the western side of this channel occasionally break.

Outer channels.—There is a channel between Passage island and Pulo Ujong Batu. Vessels should keep near Pulo Ujong Batu as several dangerous shoals extends two-thirds of the distance across the channel from Passage islands. In approaching from the northward, do not bring little Pulo Balambak to bear southward of S. $\frac{1}{2}$ E.; even then, if the water should shoal suddenly, tack immediately, as the shoals are steep to. The soundings in this channel are irregular, from 17 or 18 to 33 fathoms, and it is about 2 miles wide in the narrowest part abreast the eastern side of Pulo Ujong Batu. In proceeding through this channel, a good look-out should be kept from the masthead.

The channel westward of Ujong Batu, between it and the small round islet, named Pulo Kassik, appears to be easy of navigation, though the chart of the Netherlands Government Survey of 1876 does not show soundings in its northern end. From the northward, Pulo Kassik may be approached bearing S. by E., and when within 2 miles of it, course should be altered to pass one mile south of Pulo Rongit, and when the latter bears N. $\frac{1}{2}$ E., steer E. $\frac{1}{2}$ N., keeping Trusa peak, the summit of Pulo Tunangku, just northward of the two islets on the north-west part of the flat extending from Pulo Balambak; when little Pulo Balambak bears S. by W., course may be altered to S.S.E. See view of islands on plan.

SINGKEL.—The town of Singkel, situated about 15 miles south-eastward of Passage island, was formerly a place of considerable trade, the principal exports being benzoin, camphor, wax, and gold. It stands on an island within the mouth of the river, nearly encircled by a low spit, extending from the north bank of the river, round its west and south sides.

Coal.—The Dutch Government have a small coal depôt here.

Shoals.—Egmond shoal of 5 fathoms, lies W. by S. $\frac{3}{4}$ S. distant 4 miles from the conspicuous tree on the low land north-westward of Singkel. Daphne rock lies S. by E. $\frac{3}{4}$ E. distant 4 miles from the same tree, and 2 miles off shore. Singkel spit, a long sand bank stretching about 4 miles south-westward from Singkel, is said to be extending and dangerous to approach, and should therefore be carefully avoided.

Outer Anchorage.—A vessel bound to Singkel from the northward, should, after clearing Passage island channels, keep Passage island bearing about N.W. by N., which leads about 3 miles westward of Singkel spit, and having brought a large tree on the low neck of land north-westward of the town, to bear N.E., course may be shaped to pass between Daphne rock and the spit, and anchor in from 12 to 13 fathoms, with the mouth of the river N.E., distant one mile.

Singkel Road is the bight formed between the south point of the river and the mainland. It is about $1\frac{1}{2}$ miles broad, with depths apparently of 5 to 8 fathoms, and only open to winds between south and south-east.

Reefs which break project a short distance from the entrance points of the river. When a vessel has anchored the traders will come off, but no armed persons should be permitted on board, and caution is necessary in dealing with them.

Se Muara Gusong Telega bay, situated about 9 miles eastward of Singkel river, is sometimes chosen by vessels trading to Singkel on account of its shelter. In approaching from the westward, Ujong Bawang, the west point of the bay, should be passed at about 3 miles distant, in 8 or 9 fathoms, hard bottom, to avoid the flat which extends

nearly 2 miles off it. Eastward of the point the bottom becomes soft, when course should be altered to N.N.E. to pass westward of Pulo Kassi, a low sandy island, and anchor between it and the western shore. If the vessel intends remaining a considerable time she should anchor in 5 fathoms, mud, on the west side of the small island of Se Maura, which is covered with trees, where she will be sheltered by the land from westerly winds, and by the reefs at the entrance of the bay from S.E. winds.

Pulo Lakotta, situated 30 miles south-eastward from Singkel river, is a small low island, covered with trees. A reef with a depth of 4 fathoms, lies with the centre of Pulo Lakotta, bearing E.N.E. distant one mile; also a reef of $4\frac{3}{4}$ fathoms lies with the same islet about N.E. distant 6 miles. Pulo Burong or Bird island, a low islet or sandbank, with 36 fathoms water close to, lies 5 miles N. by W. of it. Bird island is visible about 9 miles, and surrounded by a reef which is three-quarters of a mile long in an east and west direction.

Shoals.—A shoal with a depth of one fathom lies with Pulo Lakotta bearing S.S.E. $\frac{1}{2}$ E., distant 2 miles. A shoal of 11 feet, lies with Bird island S.W. 4 miles, and Lakotta S.S.W., with from 30 to 25 fathoms around it.

A shoal patch lies nearly midway between Pulo Burong and Singkel with the former bearing S.E. $\frac{1}{2}$ E., distant 12 miles. Within a distance of 10 miles eastward of Pulo Lakotta there are numerous outlying shoals, for which the chart must be the guide.

The best track for vessels is midway between Pulo Lakotta and the main land, and where soundings of 25 fathoms will be obtained. The ground to the west and south-west of Pulo Lakotta is comparatively unknown. The coast between Se Muara Gusong and Baros is fringed by shoals, which in some parts extend 10 miles off shore.

BAROS, an open port, in lat. $2^{\circ} 1' N.$, is a place of some trade. The principal exports are camphor and benzoin; fresh water may be procured, but it is dangerous for a boat to enter the river without a native guide. Wood and water may also be got at Pulo Lassi, near the west point of Tapus bay, off which there is anchorage with the island bearing N.W. by W., distant about one mile.*

A shoal extends about one mile in a S.S.W. direction from the east point of the river, on which the town of Baros stands.

Directions.—A vessel bound from Singkel to Baros should steer for Pulo Burong, avoiding the shoal lying midway, and about 2 miles westward of this line; the islet may be approached on the north side within one or $1\frac{1}{2}$ miles. The water deepens near it, but the soundings are not regular;

* See plan of Baros, on Admiralty chart, No. 2,760; scale, $m = 0.8$ inch.

the best track to keep is from 26 to 30 fathoms water. As there are numerous shoals in this vicinity, great caution must be exercised, and navigation at night should not be attempted. Having passed eastward of Pulo Burong, steer E. by S. or East for the mainland, and leave Pulo Karang, a small island covered with trees, a mile distant on the port hand, or less if requisite, and anchor in Baros road in 10 fathoms mud, with the flagstaff bearing N.N.E., and Pulo Karang, West about 2 miles.

Pulo Sorkam is a small island lying near the coast, 15 miles S.E. by E. from Baros; a vessel may pass on either side and anchor to the eastward of it.

TAPANULI (Siboga) BAY lies 30 miles south-eastward of Baros. Between Tanjong Batu Buru and Tanjong Mama, the bay is 9 miles across. Tanjong Batu Buru, the northern point of the bay, is of considerable height. Pulo Nassie Satunkus, or Sugar Loaf, a conical-shaped islet, lying off Tanjong Mama, is a conspicuous object when approaching or leaving Tapanuli bay by the southern channel.

The northern channel between Pulo Mansalar and the main, leading to Tapanuli bay, is 7 miles wide, with depths of from 12 to 18 fathoms.

The southern channel, between Pulo Mansalar group and Pulo Nassie Satunkus, is free from danger, with regular depths of about 24 fathoms.

The west side of Pulo Nassie Satunkus is clear of danger, but rocks extend about one cable eastward of it.

Shoals.—Bordering the north channel, at about 6 miles southward of Pulo Sorkam, and $1\frac{1}{2}$ miles off shore, is a rock named Karang Gadang, with a depth of 9 feet. Argo shoal lies one mile off Tanjong Pandang, and has from 9 to 10 fathoms close to. A rock lies about 3 cables off Tanjong Batu Baru, the south-west point of the entrance to Tapanuli harbour. Banda shoal of 5 fathoms, steep-to, lies midway between Pulo Mansalar and the main, and nearly 5 miles W. by S. $\frac{1}{2}$ S. from Tanjong Pandang.

Tapanuli harbour* is an extensive inlet on the north side of Tapanuli bay; it is subdivided into many coves or harbours by islands, where a large number of vessels may lie sheltered from all winds. It is an open port, and the seat of the Dutch residency, but it has little commerce, the natives around are barbarous, and the country a mere forest.

Towns.—The town of Tapanuli is at the northern part of the bay, $3\frac{1}{2}$ miles from the entrance; thence the bay is continued to the westward by a narrow channel that opens into a large lagoon, with depths of 2 to 3 fathoms. Siboga, the Dutch residency, lies on the eastern shore, 3 miles southward of Tapanuli.

* See Admiralty plan of Tapanuli bay, and Pulo Mansalar, No. 855; scale, $m=0\cdot28$ of an inch.

Coal.—The Dutch Government have a small supply of coal here.

Water.—There is a good watering place in the bay to the north-east of Pulo Panjang.

Islets.—Pulo Ponchang, the largest islet, lies between the entrance points of the harbour, near the eastern shore. It has some steep hills covered with large timber, near the foot of these there are several springs of fresh water. The island is encircled by a reef, with some solated rocks about 2 cables off its eastern side. Pulo Ponchang Kechil lies nearly one mile north-westward of Pulo Ponchang, with depths of 8 to 10 fathoms between. The island is low, and has a fort with a flagstaff, on a rock 50 feet high. Pulo Seroudouy lies one mile north-eastward of Ponchang, with 6 to 8 fathoms between. Pulo Panjang lies northward of Pulo Ponchang Kechil, with depths of 6 to 8 fathoms in the channel between. The north end of Pulo Panjang is nearly connected to the shore by reefs.

Anchorage.—Eastward of Pulo Panjang, and northward of Siboga town, the anchorage ground is about one square mile, with depths of from 4 to 7 fathoms. There is also good shelter westward and south-westward of Pulo Panjang, in depths of 5 and 6 fathoms. Northward of Pulo Panjang reefs project from both shores and also from the islets in the northern arm of the bay; there are, however, safe passages and good shelter among them, in depths of from 3 to 5 fathoms. There is also good anchorage north-eastward of Ponchang islet, in 7 and 8 fathoms. An excellent cove lies eastward of Pulo Seroudouy, having depths of 4 and 5 fathoms.

Tides.—It is high water, full and change, at Tapanuli at 6 hours; springs rise about 6 feet.

Directions.—Tapanuli bay and harbour may be safely approached by passing on either side of Pulo Mansalar group, thence passing westward of Pulo Ponchang, and either side of Pulo Ponchang Kechil according to circumstances, when anchorage may be taken in 7 or 8 fathoms, soft bottom, between that islet and Siboga, with the fort flagstaff bearing S.W. by W. and the east point of Pulo Ponchang S.E. by S.; or in any of the positions previously mentioned.

PULO MANSALAR is 11 miles long in an east and west direction, and lies in the entrance to Tapanuli bay. The island is high, with several inlets on the north side, the largest, Ronto bay, is 3 miles across, with depths of 15 to 19 fathoms; near its south-east end there is a group of islets which form a bay having a depth of 16 to 22 fathoms, soft white mud. This bay, known as Mansalar harbour, also affords excellent fresh water, and the adjacent islands abound with proa

spars, fit for masts or yards of any size that may be required. Vessels should not attempt to pass between Pulo Tembarez and Pulo Mansalar.

At the north-west end of Mansalar there is a waterfall issuing from a high hill.

Pulo Dua, a small islet, lies about 18 miles south-westward of Pulo Mansalar. A bank of $4\frac{3}{4}$ fathoms lies E. $\frac{1}{2}$ N. distant $4\frac{1}{2}$ miles from Pulo Dua, with a patch of less than 3 fathoms at $1\frac{1}{2}$ miles south-eastward of it; and a dangerous rock, which sometimes breaks, lies E. by N. distant $6\frac{1}{2}$ miles from the same islet. A patch of $1\frac{1}{4}$ fathoms lies N.W. $\frac{1}{2}$ W. distant 4 miles from Pulo Dua.

Karang Kima (Claudine reef) named after the *Claudine*, which struck on it, lies about 6 miles southward of William island. Its eastern edge, awash, with 38 fathoms at a cable distant, lies with Pulo Nassie Satunkus (Sugar Loaf) bearing N.E. $\frac{3}{4}$ E. about 28 miles, and Pulo Dua N.W. From this position the reef was seen to extend a considerable distance to the south-westward.*

William island, low, barren, and small, lies S.E. $\frac{3}{4}$ E. distant 7 miles from Pulo Dua, nearly midway between the latter and Claudine reef.

William rock, white and above water, on which the sea breaks, lies about $8\frac{1}{2}$ miles E.N.E. of William island; at 2 miles northward of William rock is a dangerous patch of less than 3 fathoms, which sometimes breaks.

PULO ILIR, an island near the main, about a mile in length, moderately high and flat, lies about 18 miles south-eastward of Tapanuli bay. It affords wood and good water. There is temporary anchorage between the island and the main.

Success reef having less than 3 fathoms water, and 35 fathoms close to lies S.W. $\frac{1}{4}$ W. distant 21 miles from Pulo Ilir, and about the same distance south-eastward of Karang Kima. This reef which is about 2 miles in extent, east and west, does not break, and is therefore dangerous to approach.

Karang Lawe, breaks heavily, and lies about 15 miles south-eastward of Success reef.

Karang Panjang, a shallow circular reef about 2 miles in diameter, lies about 12 miles W. $\frac{3}{4}$ S. from Success reef, and 22 miles E. by N. from Sama Sama on Pulo Nias. It always breaks.

Amelia rock with a less depth than 3 fathoms, occasionally breaks. It lies about W. by S. $\frac{1}{2}$ S. distant 6 miles from Karang Panjang. A rock which breaks, lies 3 miles S.E. by E. from Amelia rock.

* See Admiralty chart :—Sumatra, West Coast, No. 2760.

Directions.—As other rocks may exist in the vicinity, vessels passing eastward of Pulo Dua and William island, should keep close over to Pulo Mansalar, which is steep-to, and the mainland southward of it.

TABUJONG ROAD is situated in lat. $0^{\circ} 50' N.$, nearly 30 miles southward of Pulo Hir. It is partially sheltered by the Sikaladi or Keladee islands, three in number, lying in a north-west direction from the south-west point of the roadstead. The north-west island is nearly 3 miles off-shore, and a reef named Batu Simunu lies $1\frac{1}{2}$ miles beyond it in the same direction. Vessels in passing westward of Pulo Sikaladi should give it a berth of 3 miles.

There is anchorage in from 3 to 5 fathoms in the road, and shelter from N.W. winds southward of Pulo Tabujong, the southern island. A rock, with 3 fathoms close-to, and lying about half a mile north-west of the village, must be avoided if approaching within that distance.

Good water and cocoa-nuts may be obtained from the islands.

Amboina reef, about one cable in extent with a depth of $1\frac{1}{2}$ fathoms, lies with Tabujong point bearing N. $\frac{1}{2}$ E. and Pulo Rinjaman north point E. by S. $\frac{1}{4}$ S. There is a depth of 6 fathoms close-to, but as the water is not discoloured, caution is necessary in approaching Tabujong road from the southward.*

The Coast between Sikaladi islands and Kara-kara point, 15 miles to the southward, is generally avoided, as several shoals lie at a considerable distance from it, with Pulo Rinjaman, Telok, and Kapetjong, three small islands, lying in the bight inside of them.

Banks.—**Sirene bank**, one of the outermost and most dangerous of these shoals, bears S. $\frac{3}{4}$ E., distant 11 miles from Sikaladi island; it has 7 feet water, and 20 fathoms close-to, and does not always break in fine weather. There is a passage inside the bank, with anchorage, by keeping in 14 and 15 fathoms, but it is preferable to pass outside.

To avoid Sirene bank, a vessel after passing Sikaladi islands at 4 or 5 miles distant, should keep the outer island to the eastward of North, and not to shoal less than 23 or 24 fathoms until Kara-kara point bears E.S.E., which will lead 2 or 3 miles outside the shoal.

There is also a reef in about lat. $0^{\circ} 30' N.$, long. $98^{\circ} 48' E.$, with Kara-kara bearing E.N.E., distant about 21 miles. Several banks lie between this reef and the coast.

Two coral reefs, about one mile apart, and which sometimes break, lie with the east end of Pulo Pinie bearing South, and Gunong Kara-kara N.E. $\frac{3}{4}$ N. The channel eastward of these reefs appears to be clear.

NATAL ROAD, situated about 20 miles southward of Tabujong, is open and exposed, and has many dangerous shoals, the outermost of

* See plan of Tabujong road on Admiralty chart, No. 2,760; scale, $m = 0.4$ inch.

which is $8\frac{1}{2}$ miles off shore. The shore is skirted by a shallow bank, on which a depth of 3 fathoms is found at $1\frac{1}{2}$ miles off shore.*

Gunong Karakara, a hill 1,053 feet high, is situated near the northern extreme of Natal road, and with Natal hill is a useful mark for clearing the shoals when entering the roadstead.

Gunong Natal, 374 feet high, situated on the north side of the river, appears like a wedge when bearing S.E. by E., and may be known by its barren aspect, and having low land on each side.

Natal is in about lat. $0^{\circ} 33' N.$, and long. $99^{\circ} 6' E.$ It stands on the open coast, and was founded by the English in 1762, but with the rest of this portion of Sumatra was relinquished to the Dutch. It is an open port; camphor, benzoin, and gold-dust are the principal articles of export; the imports are, opium, iron in flat bars, salt, piece goods of various kinds, stick-lac, and gunpowder.

Karang Bayam is a small shoal with 2 fathoms least water, and 10 fathoms close-to; it lies about 7 miles due West of the centre of the bay, with Gunong Kara-kara bearing N.E. $\frac{1}{4}$ E., distant 6 miles. It seldom breaks.

Karang Kapal, with from one to 2 fathoms, coral, lies $2\frac{1}{2}$ miles south-eastward of Karang Bayam, with Gunong Kara-kara bearing N.N.E., distant $6\frac{1}{2}$ miles. It seldom breaks.

Karang Laut, having a least depth of 6 feet, lies S.W. by W. $\frac{1}{3}$ W., 4 miles from Karang Kapal. It seldom breaks. Karang Pongjong, a rocky patch of 8 fathoms lies N. by W. distant 2 miles from Karang Laut.

Kara-kara shoal, having a depth of 3 feet coral, lies half a mile off the shallow bank fringing the shore, and about one mile S.W. by S. from Pulo Kara-kara, the small island at the north-west corner of the bay. Two other patches lie between the shoal and the island.

Karang Pemuda, with a depth of $3\frac{1}{2}$ fathoms, lies with Pulo Kara-kara bearing E. $\frac{1}{2}$ S. distant 2 miles.

Shaftesbury shoal, is an extensive patch of foul ground lying to the westward of Ujong Rakit, the south point of Natal bay. The shoal has patches of 2 to 4 fathoms, and is $1\frac{1}{2}$ miles long, by nearly a mile broad. Karang Brambang, having a depth of 2 fathoms, is the south-west extreme of Shaftesbury shoal, and lies with Tanjong Rakit bearing East distant about 2 miles. Karang Tete, a shoal having a depth of 16 feet, lies three-quarters of a mile N.W. by W. $\frac{1}{2}$ W. of Karang Brambang.

Anchorage.—Natal roadstead is one of the worst on the coast, being much exposed to north-west and westerly winds.

The usual anchorage is in from 5 to 6 fathoms, with the flagstaff bearing about East and distant $2\frac{1}{2}$ miles.

* See plan of Natal road on Admiralty chart, No. 2,760; scale, $m = 0.6$ inch.

Directions.—Vessels from the northward, bound to Natal road may, after Kara-kara point bears E. by S. $\frac{1}{2}$ S. and being in a depth of 19 or 20 fathoms, steer to pass south-west of the point at 3 miles distant, by bringing Natal flagstaff to bear about E. by S.; this mark will lead between Karang Pemuda, and Karang Bayam, and nearly in mid-channel between Shaftesbury and Kara-kara shoals.

When near the roadstead, edge a little to the southward, and anchor with the flagstaff bearing East.

Vessels from the southward may pass either inside or outside Karang Bayam; if they keep in 12 or 13 fathoms, soft ground, they will pass inside, or by keeping in 19 fathoms they will pass outside; when Natal hill or the flagstaff bears from E. by S. to E. by S. $\frac{1}{2}$ S., and being in 14 fathoms, steer for the road as before directed.

TELOK BRAMBANG is the bay 8 miles in length situated between Ujong Brambang and Pulo Temang.

Batahan village lies in the south-east corner of the bay, on the north point of a small river.

Shoals.—The 3 fathom edge of the shoal water fringing Natal bay, extends upwards of half a mile seaward of Ujong Rakit and Ujong Brambang, and then south and east into Brambang bay.

Karang Sigale, a small shoal of 15 feet, lies S. by W. $\frac{1}{4}$ W., one mile from Ujong Brambang, the north point of Brambang bay. At one mile eastward of Karang Sigale is Durien shoal, which always breaks.

Karang Rajah Inda, a small shoal of 3 fathoms, lies S. $\frac{3}{4}$ E. $2\frac{3}{4}$ miles from Ujong Brambang.

Karang Tompe, a patch of 6 fathoms, with from 7 to 9 around it, lies S. $\frac{1}{2}$ E. distant $2\frac{1}{2}$ miles from Rajah Inda. As less water may exist, it should be avoided.

Anchorage.—Pulo Temang is situated at the south-east extreme of Brambang bay, three-quarters of a mile from the coast. The island is surrounded by a reef, which in places extends 2 or $2\frac{1}{2}$ cables from the shore, with 6 fathoms close to. A patch of 6 fathoms lies half a mile westward of the island. There is good anchorage in 8 or 9 fathoms, between the island and the main. A well containing good water is situated on the low land, abreast the anchorage; near a small white sandy beach firewood may be obtained.

Directions.—Small vessels bound from Natal road to the anchorage at Pulo Temang sometimes pass inside the shoals, keeping near Ujong Rakit, taking care not to deepen above 6 fathoms till past the Shaftesbury shoal which has 7 fathoms close to. A large vessel should steer to the westward through the proper channel into 14 fathoms, northward of

Karan Bayan, and preserve this depth until Pulo Temang is brought to bear E.S.E. or E. by S.; she may then steer for the north part of that island, and after rounding it at a moderate distance, anchor in $6\frac{1}{2}$ or 7 fathoms, with the north point of Pulo Temang bearing W.N.W., distant a quarter of a mile.

There is a safe passage between the island and the main. Small vessels coming from the southward, intending to enter Natal road by the inner passage, may pass in mid-channel between Pulo Temang and the main, in 6 to 11 fathoms. When through, the course is about N. by W. observing not to shoal less than 9 fathoms in steering across Brambang bay so as to pass westward of Rajah Inda and Sigale shoals.

The Coast.—From Pulo Temang the coast trends southward for 6 miles to Pulo Robia, with a bight between, thence south-eastward for 3 miles to Biang hill 170 feet high. Gunong Bagomba, 1,227 feet high, lies 4 miles eastward of Biang, thence the coast trends due east to Ayer Bangies bay. Isolated shoals extend for a distance of 5 miles off many parts of this coast.

AYER BANGIES or BONGAY BAY, is about 9 miles across in an east and west direction, between Ujong Balayar and Ujong Sawang Buding. It contains seven islands and several isolated shoals.* The village of Ayer Bangies is situated in the eastern shore of the bay, off which the depth is about $3\frac{1}{2}$ fathoms at one mile distant. Southward of the village the water deepens.

Shoals.—In entering Ayer Bangies bay the following isolated patches must be guarded against, viz.:—A rock lying about 6 cables W. by N. from the north end of Pulo Begada. A similar rock lying 3 cables south-eastward of Pulo Panka. Also two detached rocks which break, lying about 8 cables north of Pulo Tillo, and Karang Sikabou, two rocks, lying $2\frac{3}{4}$ miles E. by S. $\frac{1}{4}$ S. from the same island.

South-eastward of Karang Sikabau, isolated shoals extend about 7 miles, the most distant being situated 13 miles W. $\frac{1}{4}$ S. from Pasaman, a village near the equator, in the bay of that name.

The Anchorage in Ayer Bangies is with the river bearing E. by N. distant 2 miles, in $4\frac{1}{2}$ or 5 fathoms, good holding ground, and eastward of Pulo Panjang, which has a reef with breakers extending about a mile to the northward of it.

DIRECTIONS.—If intending to take the in-shore route from Pulo Temang to Ayer Bangies, steer southward along the coast in 9 or 10 fathoms, which will be about $1\frac{1}{2}$ or 2 miles off shore. By keeping in

* See plan of Ayer Bangies road on Admiralty chart, No. 2,760; scale, $m = 0.3$ inch.

these depths, the offlying shoals will be avoided, and the shore, which in this space contains some bays, is safe to approach to $5\frac{1}{2}$ or 6 fathoms. Enter Ayer Bangies northward of Pulo Begaga and Panjang, and anchor abreast of the latter in 5 to 7 fathoms, or continue on to the village passing between Pulo Panjang and Kassi avoiding the reefs extending from those islets. This passage seems undesirable for large vessels, but vessels of every description, by whatever channel they enter Ayer Bangies bay, must keep a good look-out for the numerous shoals which exist.

Vessels from the northward proceeding to Ayer Bangies bay outside the shoals, or to the southward, should from abreast Pulo Temang, distant 7 or 8 miles, steer about S.S.E., and keep in from 26 to 30 fathoms water, and nearer to Pulo Pinie than to the main, to avoid an extensive bank of 4 fathoms, probably less, and steep-to, lying near mid-channel, about 13 miles S.S.W. from Pulo Temang. A dangerous shoal, with rocks above water, named Ular, lies about 4 miles N.N.E. $\frac{3}{4}$ E. of Pulo Sembulaling, the centre of the three islets lying off the south-east end of Pulo Pinie.* Having avoided these shoals, course may be shaped, if bound to Ayer Bangies, to pass north or south of Macassar shoals, lying about S.W. by W. $\frac{1}{2}$ W., distant 6 miles from Pulo Panka. The sea breaks on some of the shoals off Ayer Bangies bay, when there is much swell, and between most of them there are safe channels, but the shoals are not always discernible when the sea is smooth. Pulo Panka bearing East leads north of Macassar shoals, and between them and a dangerous reef lying 5 miles to the north-west; Pulo Panka bearing N.E. by N. leads southward of Macassar shoals. Thence pass on either side of Pulo Panka to the anchorage, avoiding the shoals in the road previously mentioned. The best channel is northward of Pulo Panka, where the depths are 10 to 11 fathoms, soft bottom.

A vessel having entered the bay by the most convenient passage may steer for Ayer Bangies flagstaff, situated on a bluff point or hill at the south-east part of the bay, close to the north end of which is the river and landing-place, anchoring abreast the river.

Proceeding to the southward from Ayer Bangies road inside the shoals, where the lead is a good guide, and the anchorage safe, a vessel should keep in from 5 to 8 fathoms, within 2 miles of the shore, until abreast of Gunong Sikabau, and pass it about one mile distant; then, in daylight, borrow towards the shoals to 12 fathoms, but when turning to windward not under 9 fathoms towards the main, after the point bears N.N.E. When 10 miles south-eastward of Pulo Telok stand out to 15 or 16 fathoms, and keep in these depths, or steer a course for Ujong Masang,

* Directions for proceeding to the southward, continued at page 192.

without hauling into Pasaman bay under 12 fathoms, or approaching too near the shoals in the offing, observing not to come under 17 fathoms in passing Ujong Masang.

Vessels from Ayer Bangies proceeding westward and southward of Sikabau shoals for Tiko road, when well clear of the shoals, should steer south-eastward to make the Masang hills, steering for them until within 3 or 4 miles of the shore, thence passing Ujong Masang at that distance in 17 or 18 fathoms, keeping in the same depth steering for and passing westward of the outer Tiko island, at the distance of one mile. As before observed much caution is necessary and a good look out kept for reefs, some of which will be mentioned below.

COAST.—Gunong Ophir, in about lat. $0^{\circ} 5' N.$, long. $99^{\circ} 58' E.$, 9,472 feet high, situated 17 miles eastward of Pasman, appears like a cone, separated from the chain of other mountains, and may be seen 110 miles in clear weather, it being the highest mountain on Sumatra visible from the sea. A volcanic mountain (Singalang), 18 miles to the southward, is 9,629 feet above the sea.

Ujong Masang, situated about 25 miles S.S.W. of Gunong Ophir, has a reef stretching out about one mile, which should not be approached under 17 fathoms. Near the point are the three Masang hills, the middle or largest having a flat summit, and the others resembling haycocks. Between Ujong Masang and the bluff south point of Ayer Bangies bay, the coast is low, and forms Pasaman bay.

Reefs.—Southward of the shoals lying in the south-eastern approach to Ayer Bangies, and westward of Pasaman and Ujong Masang, are many out-lying reefs, some of which occasionally break. Van Speijk shoal, probably the one on which H.M.S. *Drake* struck, lies with Pulo Telok, bearing N. $\frac{1}{2}$ E. distant 10 miles; Moller reefs, $1\frac{1}{2}$ miles apart, one of which breaks, lie south-eastward about 4 miles from Van Speijk shoal. Other patches lie between these and Pasaman.

Drakes and Pylades reefs lie from 15 to 22 miles southward of Moller reefs, and from 20 to 30 miles westward of Ujong Masang. The south-western patch (Drake) is in lat. about $0^{\circ} 26' S.$, long. $99^{\circ} 17' E.$ A reef is also shown as lying N.W. distant 13 miles from this position. South-westward of these reefs, and S. by W. $\frac{1}{2}$ W. distant 16 miles from Ujong Masang, is Montrado reef, which breaks. Discoloured water was seen S.S.E. about 6 miles from this reef. Numerous reefs exist between these and Tiko 16 miles to the eastward, and south-eastward for about 60 miles, from 10 to 20 miles off shore; also others probably exist westward of Montrada reef. Much caution is requisite when navigating in this locality, which is considered the most dangerous part of the coast, and is but imperfectly known.

TIKO ISLANDS, distant 9 miles south-eastward of Ujong Masang, are three in number, extending in a south-west direction from Tiko. They are small and woody, about three-quarters of a mile apart, and the innermost is a quarter of a mile from Tiko village on the main.*

Between Pulo Tapiés and Pulo Tengah, the inner and middle islands, there is a channel on either side of Kassi, a small coral bank, about one cable in diameter, situated midway between the islands, and steep-to all round. Between the coral bank and the middle islet there is a depth of 7 to 9 fathoms, but a one fathom patch lies 2 cables north of that islet. North of the coral bank the depth is 6 to 7 fathoms, soft bottom, with a patch of 2 fathoms near the edge of the shoal extending $2\frac{1}{2}$ cables from the north islet.

Between Pulo Tengah and the outer islet there is a channel on either side of a reef which always breaks, to which a proper berth must be given.

Anchorage.—Vessels sometimes run under these islands for shelter from N.W. winds. There is a depth of 3 to $3\frac{1}{2}$ fathoms at 2 cables eastward of Pulo Tapiés or inner islet; and 7 to 8 fathoms the same distance eastward of Pulo Tengah or middle islet.

Directions.—In approaching Tiko road, the outer islet should be approached bearing about East, or southward of that bearing, passing within one mile of its west and south sides, where there are depths of from 15 to 17 fathoms, to avoid the numerous shoals lying from 3 to 15 miles south and south-westward of it, over some of which the swell may be seen to roll if there be any sea.

COAST.—Directions.—Pulo Kasi, situated about 14 miles south-east of Tiko islands, is small, covered with trees, with a sandy beach, and distant about 2 miles from the main. Rocks extend in places to the distance of one or two cables from the beach. The coast between it and Tiko islands is hilly. The passage from Tiko to the southward, inside the principal shoals, is generally considered the best, by keeping in from 16 to 10 fathoms, and the coast is safe to approach to 6 or 7 fathoms in many places. Some navigators state that there are no shoals in depths under 16 fathoms on this part of the coast; others assert that some shoals are situated near it in 5 or 6 fathoms. The best guide, therefore, is, after leaving Tiko islands, to keep in from 16 to 10 fathoms, soft ground; for the bottom is all soft, except near the shoals.

Karang Durian.—South-westward of Pulo Kasi are several isolated reefs which break in bad weather, with deep water between; the nearest to the island is distant $1\frac{1}{2}$ miles. Karang Durian, the outer reef, lies with Pulo Kasi bearing N.E. by E. $\frac{1}{2}$ E. distant about 4 miles.

* See plan of Tiko road, scale, $m = 1\frac{1}{2}$ inches on Admiralty chart, No. 2,760.

The channel between Pulo Kasi and the reefs is clear, with depths of 15 to 17 fathoms, and the island should be passed at the distance of about half a mile. On the east side of Pulo Kasi there is also a safe channel, with 6 fathoms near the island, decreasing regularly to 3 and 2 fathoms about one mile from the main.

PRIAMAN ISLANDS, three in number, lie in a N.N.W. and S.S. direction abreast of the settlement of the same name on the main, about $1\frac{1}{2}$ miles distant, and afford shelter from N.W. or westerly winds; Pulo Anso, the northernmost, has a well of fresh water, from which vessels are supplied. A reef projects about 2 cables from the south-west part of Pulo Anso, having 7 fathoms close to; and a patch of $4\frac{1}{2}$ fathoms lies half a mile W.N.W. of the islet. Pulo Tengah, the middle island is distant nearly one mile from Pulo Anso, with $3\frac{1}{2}$ to 6 fathoms water in the channel between. The channel eastward of the island has about 3 fathoms near the island, decreasing gradually towards the shoals off Priaman.*

Pulo Ujong, the southern islet, is distant three-quarters of a mile from Pulo Tengah, and each of them is about one cable in diameter. Gusong Sibarot is a breaking reef situated half a mile south-west of the south islet.

Priaman.—The town or village of Priaman, in lat. about $0^{\circ} 38' S.$, is situated on the south point of a small river, the entrance to which is so shallow that a boat cannot enter until near high water. At about half a mile off the mouth of the river, within the 3 fathom line, are several rocky patches with a depth of 2 fathoms, sand, between them and the shore.

Directions.—Approaching from the northward, having passed within a short distance either side of Pulo Kasi, a vessel should enter Priaman road by the channel between Pulo Anso and Tengah; anchoring in from 3 to 5 fathoms inside under shelter of either of them.

COAST.—Directions.—Vessels not entering Priaman road, bound to Padang or south-eastward, from abreast Pulo Tengah must steer to avoid the breaking reef, half a mile west of the south islet, thence steering along the coast at a moderate distance until Pulo Sauh is approached, there being no known danger in this part. There is a channel on either side of that islet, but that to the westward is the best and most direct, care being taken to avoid the shoal lying three-quarters of a mile W.S.W. of it. When southward of Pulo Sauh, a direct course may be steered for Padang flagstaff, or for the anchorage under Pulo Pisang Besar should unfavourable weather be apprehended, where vessels are sheltered from N.W. and westerly winds.

* See Admiralty chart, Priaman to Ujong Indrapura, No. 709; also plan of Priaman road on Admiralty chart, No. 2,760; scale $m = 0\cdot7$ inch.

PADANG.—Northern approach.—Padang Islands, seven in number, interspersed with numerous reefs, lie from 8 to 12 miles off Padang, and the coast northward of it.*

Pulo Bando (Tuju), in about lat. $0^{\circ} 46' S.$, long. $99^{\circ} 59' E.$, the northernmost, is small and encircled by a reef which is steep-to. A coral bank steep-to, lies N.W. $\frac{1}{2} N.$, 4 miles from Pulo Bando. Other dangerous reefs lie N.W. distant 11 and 14 miles from the islet.

Pulo Pie (Annam) lies 9 miles south-east of Pulo Bando, between which there are a considerable number of shoals having deep water close-to.

Stort reef, having about $3\frac{1}{2}$ fathoms water, is one mile long north and south, and lies with Pulo Pie bearing E. by N. $\frac{3}{4} N.$ distant 7 miles.

Marion reef, with a depth of about 5 fathoms, lies between Pulo Pie and Stort reef, with the former bearing N.E. by E. $\frac{3}{4} E.$ distant 5 miles, on which there is a lighthouse.

Pulo Pandang (Ampat) lies S.S.E. $\frac{3}{4} E.$, 5 miles from Pulo Pie. It may be approached to a distance of 2 cables. Nearly midway between the two islands there is an extensive shoal having $2\frac{1}{2}$ fathoms least water.†

Pulo Thoren (Tega) is the southern and largest of the Padang group, and has a pyramidal stone beacon on it.

Dorothea reef, having 2 fathoms least water, lies nearly midway between Pulo Pandang and Pulo Thoren, three miles south-east of the former.

Pulo Ayer (Lima), one of the innermost islands, lies East, distant $6\frac{1}{4}$ miles from Pulo Pie. A reef with 5 fathoms or less, lies midway between the two islets, at about half a mile northward of a line joining them. A similar reef lies one mile south-eastward of Pulo Ayer.

Pulo Sibontar (Sato), the easternmost, is small, high, and flat, distant $4\frac{1}{2}$ miles S.S.E. of Pulo Ayer, and 7 miles west of Apenberg. Its north-east and east sides are foul to half a mile distant. Karang Sipakal, a shoal of 5 fathoms or less, lies 2 miles N.E. $\frac{1}{2} E.$ of Sibontar, with deep water between.

Pulo Bindalang (Dua), is a little larger than Sibontar, and lies 2 miles south-west, having a safe passage between them. A shoal, with a depth of 2 fathoms, lies S.E. $\frac{3}{4} E.$ 2 miles from Bindalang. A similar shoal lies nearly 2 miles south-west of this, at $2\frac{3}{4}$ miles E. by N. of Pulo Thoren.

Pulo Sauh, is a small islet 6 miles N.W. of Padang head and 2 miles off shore, with a reef projecting about a quarter of a mile from its south end. A shoal lies W.S.W. three-quarters of a mile from the islet.

Bellona shoal, with a depth of 5 fathoms or less, lies S.E. by S. distant $3\frac{1}{2}$ miles from Pulo Thoren, the southern islet of the Padang group. Between Thoren and Bellona shoal, and S.E. $\frac{3}{4} E.$ 2 miles from the islet, there is a rock above water.

* See Admiralty chart :—Padang road, No. 212; scale, $m = 4.7$ inches.

† See light, page 192.

SOUTHERN APPROACH. — **Pulo Niamok** or **Muskito**, situated about 18 miles southward of Padang head, and 6 miles off the coast, is the outer and south-eastern island in the approach to Padang from the southward. It is a low island covered with trees, with a square-shaped beacon 26 feet high on its south-west side. Reefs extend to the distance of about half a mile from the north and south sides of the island.

Karang Laut lies about $10\frac{1}{2}$ miles N.W. from Pulo Niamok and 6 miles southward of Pulo Thoren, the southern Padang island. It was formerly a breaking reef, but trees have since grown up, and a beacon has also been erected.

Between Pulo Niamok and Karang Laut lies Iskander shoal, with Pulo Niamok bearing S.E. $\frac{1}{2}$ S. distant $3\frac{1}{2}$ miles. A similar shoal lies E. by S. 4 miles from Karang Laut.

Pulo Merak (Marra) lies $4\frac{1}{2}$ miles N.N.E. of Niamok, and 2 miles off shore. It is $1\frac{1}{4}$ miles in extent, inhabited, and affords good water.

Pulo Bintangor and Pulo Seronda are small islets lying northward of Pulo Merak. There is anchorage in from 10 to 20 fathoms on the east side of all these islets, and shelter from N.W. and West winds. The best route to Padang from the southward is westward of Pulo Merak and close to on either side of Pulo Bintangor and Seronda.

Dolphin and Serinda shoals.—Dolphin shoal lies nearly 3 miles N.W. by W. from Pulo Merak; and Karang Serinda W. by N. distant 2 miles from Pulo Bintangor, with deep water between.

Pulo Senaro lies 4 miles N.W. from Pulo Seronda, and is covered with cocoa-nut trees. A shoal lies nearly midway between these islets. A shoal of about 3 fathoms lies N.E. by E. about $1\frac{3}{4}$ miles from Pulo Senaro; and a reef with a rock above water lies W.N.W., distant $2\frac{1}{2}$ miles from Pulo Senaro. The above are the principal dangers in the southern approach to Padang, but it is necessary to keep a careful look out aloft when in the vicinity of any of these reefs.

PADANG is the chief settlement of the Dutch on the west coast of Sumatra or the head residentie of the district. Its principal portion, with a fort, is situated on the north bank of the river, one mile within Apenberg head. It is generally considered healthy. There are no regular wet and dry seasons; rain most frequently falls during the night, but sometimes it rains for two or three days in succession.

Padang is an open port and connected with Batavia by a telegraph cable.

Supplies.—Provisions, bullocks, poultry, fruit, vegetables, and fresh water, are abundant.

Coal.—The Dutch Government have a small coal depôt here.

The principal exports are coffee, gold dust, benzoin, nutmegs, and cinnamon; and the imports are opium, cloth, and other dry goods. Every three months there is a coffee sale, most of which goes to New York.

Padang river is only navigable by boats or small vessels in fine weather, the depths at low water being 8 and 9 feet at the entrance, and from 9 to 14 feet a little way inside; the rise of tide is about 4 feet at springs. It is dangerous to enter the river when the wind blows strong from West or N.W., for the sea then breaks entirely across the entrance and a continuous breaker extends from Padang head to the south-west point of the shoal that stretches nearly from it to within half a mile of the north end of Pulo Pisang.

Padang or Apenberg head, the south point of entrance to Padang river, is a high bluff headland, having a flagstaff on its summit. Whale rock lies close westward of the head. In approaching from the offing, Padang head will easily be known by its bluff aspect, and the coast southward of it being bold high land; whereas the land near the sea to the northward of the river is low, and all the coast is low thence to Priaman, but far in the country the land is generally high.*

A vessel arriving when the weather is favourable, and intending to remain a short time, may anchor in 12 or 13 fathoms, soft ground, with Apenberg flagstaff bearing E. $\frac{1}{2}$ N. or East, distant from the bluff headland $1\frac{1}{4}$ or $1\frac{1}{2}$ miles. If the weather be threatening it will be prudent to proceed to the proper road, eastward of Pulo Pisang.

Pulo Pisang Besar, about $1\frac{1}{2}$ miles S. by W. $\frac{1}{2}$ W. from Padang head, is a small island, about half a mile in diameter, with a short landing pier on its eastern side. A coral bank extends about 40 yards from the shore of this island, and is steep to all round.*

There is a safe passage of 6 and 7 fathoms inside Pulo Pisang Besar, but it is narrow in some places, particularly betwixt the north end of the island and the extensive shoal bank that occupies most of the space between Padang head and Pulo Pisang Ketchil, and which extends to within 2 cables of Pulo Pisang Besar, on the shoalest part of which the depth is but 10 feet, hard sand; this passage is seldom used by large vessels. The deepest water is close to Pulo Pisang Besar.

Water may be obtained by digging wells four or five feet deep at the foot of the hills on Pulo Pisang Besar; the water, although soft and pleasant to taste, is said to be impregnated with saltpetre, and not very wholesome; the firewood is also indifferent.

Padang road.—Anchorage.—The best and most sheltered anchorage is about one cable eastward of Pulo Pisang Besar, known as Padang road, in depths of from 4 to 6 fathoms, soft clay, mooring east and

* See light, page 192.

west, and with the north point of the island bearing not more westerly than N.W. Temporary anchorage may be taken off Apenberg head as before mentioned.

LIGHTS.—From an iron lighthouse, painted white, erected on Pulo Pandang, is exhibited, at an elevation of 108 feet, a *fixed* white light visible in clear weather for a distance of 19 miles.

A *red* harbour light, 16 feet above high water is exhibited from the north-west side of Apenberg, visible between the bearings of E. by N., through south to S.W. from a distance of 4 miles.

On the south west point of Pulo Pisang Besar, from an iron support 75 feet above high water, is exhibited a *fixed* white light, visible in clear weather from a distance of 10 to 12 miles.

Tides.—The rise of the tide is from 5 to 6 feet.

DIRECTIONS.—From the Northward.—Vessels bound to Padang from the northward, and having passed between Pulo Pinie and the main (*see* page 185), should steer to the southward to pass westward of Drake and Pylades reefs; and then make for Pulo Banda, the northern Padang island. This route is preferable to the passage inside the reefs when the wind is fair, but as the current runs with the wind, this route is not so convenient for sailing vessels in contrary winds, there being no anchorage. Vessels taking the inshore route must keep a careful look-out aloft; directions for this route will be found with the description of the various places along the coast. Having made Pulo Bando bearing about E. by S. $\frac{1}{2}$ S. it may then be steered for and passed on either side at about half a mile distance; this course should be continued until about 5 miles eastward of Pulo Bando, whence steer for Padang road, passing between Pulo Ayer and Pulo Sauh.

Entering Padang road from the westward, which appears to be the best route, it is advisable to approach Pandang lighthouse bearing East, to avoid Stort and Marion reefs, thence passing close south of Pulo Pandang, and between Sibontar and Bindalang to the anchorage in Padang road under Pulo Pisang Besar.

Large vessels should always use the south channel in proceeding to the anchorage under Pulo Pisang Besar, passing south of the island at about a quarter of a mile distant, and then steering for the berth recommended off the pier, where they will be sheltered from West and N.W. winds. When these winds prevail, boats cannot pass between Padang river and the vessels under Pulo Pisang, on account of the breakers stretching across the passage.

Vessels entering by the north channel must round the north end of Pulo Pisang Besar in 7 or 8 fathoms at a cable distant; the water will shoal as she runs in, to 6 and 5 fathoms, which is the least near the island; but

towards the main, and Pulo Pisang Kechil, the depths decrease to 4 and 3 fathoms, hard sand.

From the Southward.—Vessels approaching Padang from the southward, with a favourable wind, should make Pulo Niamok (Muskito) a low islet with trees from 30 to 50 feet high, with a square tower 26 feet high on its south-west extreme. The island should not be brought to bear westward of N. by W. $\frac{1}{2}$ W., to avoid the shoals between it and Pulo Panyu, nor approached within one mile as reefs extend about 5 cables from it. Having passed Niamok at about one mile distant, on either side, course should be shaped to pass the same distance west of Pulo Merak, and at about half a mile westward of Pulo Bintangor and Seronda to avoid Dolphin and Seronda shoals. There is also a narrow and safe passage eastward of Pulo Bintangor and Pulo Seronda with depths of 20 to 30 fathoms, and which is generally considered the best. Having passed Pulo Seronda by either channel, it should then be brought to bear South, steering North for Pulo Pisang Besar lighthouse, which course will lead about midway between Marlborough shoal and the 3-fathom shoal lying $1\frac{1}{2}$ miles north-eastward of Pulo Senaro, to Padang road. The general course by this channel being about North it would not be available with the wind near N.W.

There is also a straight channel to Padang road, close southward of Pulo Thoren beacon; between it and the dry rock south-eastward of it.

An apparently safe channel in which the course is about N.E. is to make the low islet Pulo Laut, on which there is a beacon, and passing it on either side thence steer N.E. $\frac{1}{2}$ E. between Pulo Senaro and the small low islet lying $2\frac{1}{2}$ miles north-west of it, steering for Pisang Besar light when bearing N.E. by N. To make an East course from seaward to the road, the channel south of Pandang lighthouse must be taken. A sailing vessel may take either of the routes described which will give her a leading wind. A good look-out aloft should be kept.

The Coast, from Padang to the distance of 30 miles southward, is intersected by numerous bays and inlets, several of which, being protected from the sea by the islands contiguous to them, form excellent harbours. The land near the sea is generally of moderate height, and, farther in the country, more elevated. Mount Talang, 8,330 feet in height, at about 18 miles from the coast, should be a conspicuous object and a good landmark when approaching the neighbourhood of Padang in clear weather.

BONGAS BAY, situated 5 miles south-eastward of Padang road, is a safe harbour, with 14 or 15 fathoms in the entrance, and from 10 to 6 fathoms inside. Pulo Cassie, a small islet, lies near the middle of the northern arm of the bay, with a shoal about 3 cables N.N.E. of it. A shoal is said to lie about the same distance eastward of the islet. In

approaching Bongas bay, the north point of entrance kept bearing East, or the middle of a small hill at the bottom of the bay, in line with a high hill inland, leads clear southward of Marlbro' rock; when in the entrance, borrow towards the northern side to avoid the shoals off Pulo Cassie, and anchor between it and the island, where there is good shelter. At the south-east angle of the bay there is anchorage in 6 to 12 fathoms water, secured from nearly all winds; shoal water extends off the point and island that form the north-east side of this anchorage, and there is also a shoal nearly in the middle of the entrance. There are several villages in this bay, and towards Padang.*

Brandywine bay is shallow, and lies between Padang road and Bongas bay. It affords shelter from North and West winds near its head to light-draught vessels, northward of a $2\frac{3}{4}$ -fathoms bank, where depths of 3 to 4 fathoms, mud, will be obtained.

Shoal water extends about half a mile southward of Ujong Batu Pileh the western point of the bay, and the depth is but 4 fathoms between it and Pulo Telūr.

Marlbro' rock, in the southern approach to Brandywine bay, lies W. by N. $\frac{3}{4}$ N. $1\frac{1}{4}$ miles from the north point of Bongas bay, and three-quarters of a mile S. by W. $\frac{1}{2}$ W. from Pulo Telūr, with 15 and 16 fathoms close-to. Between Marlbro' rock and Pulo Telūr there is a safe passage.

Sungi Pisang bay lying close southward of Bongas bay, is about one mile across, and open to westerly winds. Two rocks lie in the entrance, with depths of $1\frac{1}{4}$ and 2 fathoms; abreast the rocks, close to the northern shore, there is narrow passage with 15 and 17 fathoms, decreasing inside to 8 and 9 fathoms; there is also a narrow passage between Pulo Kuah off its entrance, and the southern point of the bay.

Sungi Pinang bay lies southward of Sungi Pisang bay, and north-eastward of Pulo Merak. It is free from outlying dangers. In this bay vessels are sheltered from almost every wind, it being only open to S.S.W., and the depths are from 26 fathoms in the middle, decreasing to 11 and 6 fathoms at its head.

TRUSSAN HARBOUR, formed eastward of the large island Pulo Tyabeda or Sabadda, is about 5 miles in extent, and safe, with general depths of from 8 to 16 fathoms, soft bottom. It is a place with considerable trade. There are two passages into the harbour, on either side of Pulo Tyabeda; the northern one, about one-third of a mile wide, bears East from the north end of Pulo Merak, and lies close to the southward of Sungi Pinang bay. Entering by this channel, the northern shore must

* See Admiralty chart:—Priaman to Ujong Indrapura, No. 709; scale, $m=0.28$ of an inch.

be kept, to avoid a 2-fathoms shoal lying about 3 cables west from the north-west point of Pulo Tyabeda in line with the north-east point. The latter point brought well open leads clear. Within the entrance the channel is safe.

The entrance, southward of Pulo Tyabeda, has three islands. Pulo Trussan, the largest, lies in the middle of the entrance; the others, on the north side, are connected to the shore by reefs. There is a channel about $1\frac{1}{2}$ cables wide, between Pulo Trussan and the northern islets, with depths of from 10 to 20 fathoms.

The channel southward of Pulo Trussan is said to be a very narrow passage with only 3 feet water, but this statement is doubtful, as the chart shows 18 fathoms in it.

Pulo Saytan, in the middle of Trussan harbour, is nearly surrounded by shoal water and dry rocks; E. by N. from it, upon the main, and close to the shore, there is a watering-place. A line of shoals extends north-eastward from Pulo Saytan to the head of the harbour.

TYINGKOK BAY lies about 10 miles south-eastward of Trussan bay, and has regular soundings and good anchorage at its N.W. part, near Lūmpūr village, and also in Painan harbour. It is the northernmost of four bays in the extensive bight formed between Ujong Baton and Ujong Telok Kersik. Several islands and shoals lie off this portion of the coast.

Islets.—**Pulo Ayer Besar**, the largest of the islands, lies about $8\frac{1}{2}$ miles south-west of Tyingkok bay. It is the residence of a Malay chief, and has a conspicuous round hill; on the south side of it is Pulo Ayer-keehil, also inhabited, and a reef projects from it nearly to the larger island.

Pulo Kombang and Pulo Babi lie nearly mid-way between these islands and the mainland to the northward, and Pulo Semanki, a group of rocks, lies off the entrance to Tyingkok bay.

Wood and water, poultry and sheep, may be procured at Pulo Babi.

Panyu, the outer islet, lies 8 miles south-west of Ayer Besar, and 10 miles off shore. All these islands have deep water within a short distance.

Reefs.—A reef with a depth of 2 fathoms, which sometimes breaks, lies with the hill on Pulo Ayer Besar bearing E. $\frac{3}{4}$ S. distant $5\frac{1}{2}$ miles; and a patch of about 4 fathoms half a cable in extent, lies $2\frac{1}{2}$ miles W. by N. of it.* Vessels should pass well to the westward of a line joining Pulo Niamok and Pulo Panyu.

Erasmus reef with a depth of 4 fathoms, lies N.N.W. distant $1\frac{1}{2}$ miles from Pulo Panyu; a reef also lies N.E. by E. distant 4 miles from the same islet. When there is much swell the sea is seen to roll over it.

* A similar patch is charted half a mile north-west of this 4 fathoms patch, but they are probably identical.

These reefs are all steep-to and must be carefully avoided.

Directions.—Anchorage.—Approaching Tyingkok bay from the northward, vessels may pass on either side of Niamok, thence steering for Pulo Kombang to avoid the shoals south-eastward of Niamok.

Between Pulo Kombang and Ayer Besar, the depths are from 16 to 25 fathoms. From between these islands the flagstaff of Pulo Tyingkok (Painam) or Chenco may be seen upon a round hill to the north-eastward, and which should be steered for, passing south of the Semankie group, and anchor off Pulo Tyingkok in 12 fathoms.

Painam harbour lies eastward of Pulo Tyingkok, with a depth in the channel south of the island of 9 and 10 fathoms, and from 4 to 7 fathoms in the harbour. Painam is a place of considerable trade, and has a wharf for the convenience of lading and unloading goods.

COAST.—**Batuwang bay** and **Telok Kersik**, are two small bays lying southward of Tyingkok bay. Both afford good anchorage in moderate depths, but open to westerly winds. About 6 miles south-eastward is situated Batang Kapas bay, having also good anchorage ground, but open to S.W. winds.

Off-lying Islets.—The islets and reefs lying between Pulo Panyu and Ujong Indrapuru, from 5 to 15 miles off the coast, will now be described.

Pulo Ayer Karaba Kechil, lies 9 miles south-eastward of Pulo Panyu, and 5 miles from Ujong Radya on the main. Two miles northward of Ujong Radya, and one mile off shore lie some rocks, dry at low water.

Pulo Ayer Karaba Besar is 4 miles south-westward of Karaba Kechil. A shoal lies W.N.W. $2\frac{1}{4}$ miles from Karaba Besar and there is said to be another about $1\frac{1}{2}$ miles to the southward.

Pulo Kersik or Sandy island lies south-eastward about 7 miles from Pulo Ayer Karaba Besar. Within a distance of 6 miles of Pulo Kersik, and between the bearings of W.S.W. and S.S.W., there is a cluster of shoals, some of which break occasionally.

Pulo Katang Katang, or Tree island, bears nearly South, distant $10\frac{1}{2}$ miles from Pulo Kersik, and is nearly 15 miles off shore. A sand-bank lies E.N.E. distant 3 miles from it.

Pulo Baringin, the southernmost of the chain of islands in this locality, lies 4 miles E. $\frac{3}{4}$ S. from Pulo Katang Katang.

A shoal lies $1\frac{1}{2}$ miles S. by W. $\frac{1}{2}$ W. distant $1\frac{1}{2}$ miles from Baringin; and another at 4 miles South from the same islet.

Karang Semedang is a reef 3 miles off the coast, with mount Linga bearing E. by S. distant 6 miles, and on which the sea breaks in bad weather. Between the distances of $2\frac{1}{2}$ and 5 miles N.W. by N. from

Karang Semedang, and 2 miles south-westward of Palangi village are four shoals. Also abreast Lakitan hill at one mile off shore, there is another shoal.

Ayer Adye river may be known by mount Linga or Volcano mount, a remarkable round hill covered with trees near the sea, about 3 miles to the northward. It is not easily made out, but a flag is sometimes hoisted near the entrance. It is best to anchor in not less than 8 fathoms, about $2\frac{1}{4}$ miles off shore, with the flagstaff bearing East. If N.W. or West winds are apprehended, a vessel should anchor in 12 or 13 fathoms, in order to clear Indrapura point, should she be unable to remain, as this anchorage, which is little visited, is not considered safe with those winds.

The bar is dangerous for boats at low water, and at all times when there is a swell. The village is 2 miles up the river.

Pangsan village is situated on the coast at about 2 miles northward of Ayer Adye, and Passier Ganting or Indrapura, another village, lies just south of Indrapura river, at 4 miles southward of Ayer Adye.

INDRAPURA POINT, distant 14 miles southward of Ayer Adye, is low, and its extremity covered with trees. From hence to Benkulen there are no islands near the coast, Pulo Baringin being the southernmost of the chain, which may be said to commence at Passage island, near Singkel.

COAST.—Directions.*—Proceeding southward from abreast Tyngkok bay it will be prudent if coasting along, to keep 4 or 5 miles off shore when southward of Ujong Radya, to avoid Karang Semedang and other reefs northward of it.

Mount Lakitan about 2 miles within Ujong Radya, Lakitan hill 8 miles to the south-eastward, and Mount Linga 11 miles farther in that direction, will be of much assistance in fixing the position of a vessel when navigating in this locality. At about 27 miles inland are the high peaks of Gunong Korintji (3,700 feet) and Patah Sembilan. There appears to be no danger inshore between Karang Semedang and Ujong Indrapura, other than the shelving shore bank in the bight northward of that point.

Southward of Indrapura point, if the wind be steady, and the vessel bound to Benkulen, a direct course may be steered along the coast, keeping from 6 to 15 miles off; but with light winds it will be proper to preserve moderate depths, from 15 to 25 fathoms for anchoring, if requisite; never exceeding 30 fathoms, nor borrowing under 10 fathoms towards the shore, in case of getting into rocky ground.

* See also Admiralty chart:—Sumatra West Coast, sheet II., Tyngkok bay to Sunda strait, No. 2,761.

In the daytime, with a good look-out, most of the dangers will be visible; at night, a vessel should keep well outside all the islets.

Moko Moko, in about lat. $2^{\circ} 34\frac{1}{2}'$ S. and 28 miles south-eastward of Indrapura point, lies in a small bay, and was once an English settlement; it is a place of some trade. The two points that form the bay are covered with tall trees, and about 12 or 15 miles north-westward a remarkable gap in the trees may be discerned. Approaching Moko Moko from the northward, the position of the doubtful shoal, referred to in the foot note, and which is about 6 miles off shore, should be passed with caution, keeping within 3 or 4 miles of the shore. When the houses and flagstaff at Moko Moko village are seen they may be steered for, anchoring in 10 fathoms, soft ground, with the flagstaff bearing E. by N. distant $2\frac{1}{2}$ or 3 miles, and Moko Moko peak, which is remarkable, N.E. $\frac{1}{2}$ N. Small vessels may, if requisite, anchor closer in.

Surf.—The native boats must be employed in landing, on account of the surf. The coast in the neighbourhood is a sandy beach on to which a heavy swell is generally sent, as is usually the case on most parts south of the equator.

A shoal extends from Moko Moko, to the distance of 7 miles, southward, and to about $1\frac{1}{2}$ miles off shore.*

Ayer Dikkit, about 10 miles southward of Moko Moko, and a little southward of a bluff point covered with trees, may be recognized by the denseness of the trees on each side of the mouth of the river. The bar of the river is dangerous and unnavigable, even for boats. There is anchorage off its mouth in 8 or 10 fathoms.

Bantall River, is 7 miles south-eastward of Ayer Dikkit, and may be known by two white cliffs a little to the northward, appearing from the offing like boats under sail.

The best anchorage in the road is in 8 or 9 fathoms, ooze and sandy bottom, with the white cliffs N.N.E., and the river N.E.

Between Bantall and Ipu are three rivers, Tramang, Ayer Itam, and Ayer Ruta; Tramang, the northernmost, has a small red cliff on the north side of the entrance: the coast, embracing those rivers, may be approached to 12 or 14 fathoms regular soundings in most places.

Ipu, in lat. $2^{\circ} 59'$ S., may be known by three red cliffs to the southward, and three green hills near the sea. Large vessels may anchor in 9 or 10 fathoms, with the central cliff bearing N.E. by E.; here the road is tolerably clear; further in the bottom is foul. The coast southward of

* There is said to be a bank of rocks and sand, having $2\frac{1}{2}$ or 3 fathoms water on the shoalest part, at about 10 or 12 miles W.N.W. from Moko Moko.—*Horsburgh*.

A shoal, the existence of which is also doubtful, lies S.W. by W. distant 7 or 8 miles from Moko Moko.

Ipu consists of reddish cliffs, and is fronted by a coral bank which stretches out 4 or 5 miles, with depths of 6 to 10 fathoms on its outer edge; it extends from Ipu to Ketaan, a distance of 32 miles, and should not be approached under 10 or 12 fathoms, as it is steep to. Near its northern edge is Swallowfield rock, bearing S.W. $\frac{3}{4}$ W. about 5 miles from Ipu, with a depth of 14 feet, and from 8 to 16 fathoms all round. Ipu bearing E.N.E., leads clear to the northward of the bank and rock.

Ketaan (Caytone), in lat. $3^{\circ} 25' S.$, has a white cliff to the southward like a castle.

Nearly midway between Ipu and Ketaan there is the small village of Sablat, appearing like an opening betwixt reddish cliffs; Ketaan has a similar appearance.

Laye and Pali are two small villages situated at 14 and 20 miles south-eastward of Ketaan, with red cliffs between them.

From Ketaan the distance is 33 miles to Benkulen, and the coast in this space is safe to approach occasionally to 11 or 12 fathoms, the soundings being more regular than farther to the northward; from 12 to 20 fathoms are good depths to preserve when coasting.

BENKULEN an open port, was formerly the principal British settlement on this coast, but with the advance of Singapore, trade declined so much that it was finally given up. The settlement was first formed on the banks of the river, but the locality being so unhealthy, it was removed to Ujong Karang or Tapu Padrie, the south point of the bay, where fort Marlborough was built on ground a little more elevated in the year 1685.*

It is now a Dutch possession.

The town is unhealthy. Rain is frequent during the months of January and February.

Supplies.—Coal.—Bullocks, poultry, fruit, and vegetables of various kinds may be obtained here, and water from a cistern near the landing place. A few tons of native coal may probably be obtained, but it is of a poor quality.

There is a bi-monthly steamer from Batavia and Padang, belonging to the Dutch Indies Steam Company.

Benkulen river, falls into the bay about $1\frac{1}{2}$ miles north-eastward of the town, has from 4 to 6 feet on the bar, and from 8 to 12 feet inside.

North-eastward of the river the land is high and rugged, one of the hills, named the sugar loaf (Bunku) about 1,000 feet high, is a conspicuous mark in some directions from seaward.

BENKULEN ROAD* may be considered as that portion of the coast lying between Ujong Pedattie 5 miles northward of Benkulen, and Ujong

* See plan of Benkulen road on Admiralty chart, No. 2,761; scale, $m = 0.7$ of an inch.

Siabung or Buffel point at about 7 miles to the southward, forming on either side of the town a large bay. The usual anchorage is between the town and Pulu Tikus, in about 12 fathoms, at about 2 miles N.N.E. $\frac{1}{2}$ E. from the island. Under that depth the bottom is generally rocky, and also farther out it is foul in places. Close to the entrance of Tikus island basin, and fronting it to the distance of one mile north-eastward, the bottom is mostly soft, and where vessels in the southerly monsoon may anchor in $13\frac{1}{2}$ or 14 fathoms under shelter of the reef.

When N.W. winds, which prevail from September to March, blow strong, a heavy sea sometimes rolls into the road, which necessitates weighing or slipping the cables and running for Pulo bay in the south part of road, and hereafter described.

In this season, vessels that do not go into Pulo bay, or Tikus island basin, should anchor eastward and within a mile of Tikus light-house, in about 15 fathoms, where the sea will be partly broken by the reef. The same business may be done from this position in favourable weather as if a vessel were in the usual anchorage in the road; for sailing boats, passing to and from the town, are confined to one trip in 24 hours by the land and sea breezes.

Weather Signal.—A blue flag is hoisted on the iron standard of the harbour light at the town, whenever it is dangerous for boats to go in or out.

Inner road.—The inner road, with 4 and $4\frac{1}{2}$ fathoms water, lies north-westward of the fort, and inside Patah Sambilan reefs; it is sometimes frequented by small vessels in the fair season, for the convenience of loading and unloading. Vessels or boats should not venture inside without a pilot as the North and South breakers are not always visible when the sea is smooth; then a high surge is only at times seen to roll over the rocks, which would prove fatal to any boat that unfortunately got into it.

Close outside Patah Sambilan, the North and South breakers, there are depths of 7 and 8 fathoms, and 6 fathoms inside of them. Nearly abreast the fort, a little outside the landing-place, there is a patch of $3\frac{1}{2}$ fathoms, at a short distance from the edge of the shore reef, which extends about 3 cables off shore. The landing-place is protected from the sea by a rocky ledge fronting it at a distance of 150 yards: boats pass round the eastern point of this ledge, and then haul in to the southward for the wharf, which is about 60 feet long, with a depth alongside of about 3 feet at low water.

Buoys.—A red buoy, with staff and cage, marks the north extreme of the North breaker, but it is not to be depended on; also an iron mooring buoy lies in the inner road in $5\frac{1}{2}$ fathoms, for the use of boats warping in and out.

Pulo Tikus or Rat island Basin.—Pulo Tikus lies about 5 miles south-westward of Benkulen. It is surrounded by a coral reef about 2 miles in extent in a north-west and south-east direction, partly dry at low water, affording shelter from on-shore winds. Detached patches of $4\frac{1}{2}$ fathoms lie E.N.E. off the main reef, at about three-quarters of a mile from the lighthouse. The island is low and small, with a lighthouse, a few palmyra trees 80 feet high, forming a clump, and a useful landmark; also some houses for receiving pepper, and a small battery for its protection. On the north side of the island are two mooring huoyes, convenient for vessels using the landing-stage.

There is an excellent basin in the north-east side of the reef, with depths of 5 to 7 fathoms, soft mud, and 3 to $2\frac{1}{2}$ fathoms at its upper end. The passage in is close to the edge of the reef on the west side; several detached rocky patches lie off the east side, with 7 and 8 fathoms water close-to.

Vessels requiring repair, or having a cargo to receive or deliver at fort Marlborough, generally warp into this basin, where they moor head and stern to anchors laid upon the reef, which is steep to. From this basin goods may be conveyed to or from fort Marlborough, with the same facility as from the road, the boats being able to make one trip daily with the land and sea breezes. Here a vessel is completely sheltered from the sea by the reef; whereas it often runs so high in the road that goods are unsafe in the boats alongside, and they are frequently forced to run for shelter into Pulo bay, the N.W. winds sometimes giving very short warning of their approach.

Tides.—It is high water at Benkulen at about 6 hours, rise from 3 to 5 feet.

LIGHTS.—On Pulo Tikus, from an iron frame painted white, is exhibited at an elevation of 44 feet above the sea a *fixed* white light, which should be visible in clear weather from a distance of 12 miles.

At Benkulen, on Tapu Padri point, the southern extremity of Ujong Karang, is exhibited for the guidance of small craft, a fixed *red* light elevated 59 feet above the sea, visible between the bearings of E. by N. and South, from a distance of 3 to 4 miles.

Shoals.—**Gusong Sungi Lamu**, lying about $1\frac{1}{2}$ miles south-west from Ujong Pedattie, is the northernmost shoal in the approach to Benkulen. The least water is $2\frac{1}{2}$ fathoms, with 5 to 7 fathoms at a short distance. From the centre of the patch, the Sugar Loaf is in line with Ujong Pedattie.

Patah Sambilan, or North and South breakers, are the dangerous reefs which lie from a half to $1\frac{1}{2}$ miles off the town. They do not always break, but as they are liable to do so suddenly, boats should not attempt to cross them. The outer one, within a depth of 5 fathoms, is two-thirds of a mile long, north and south, and separated from the eastern

one by a narrow channel having a depth of 6 fathoms. The eastern shoal is a mile long north and south, and separated from the reef fringing Ujong Karang by a narrow channel having 6 fathoms water.

Middle Shoal, with a depth of about 4 fathoms and 8 to 9 fathoms close to, lies nearly midway between the South breaker and Gusong Larpuyang, with the Sugar-loaf bearing about N.E. by N.

Gusong Lampuyang, or Black Rock, about $1\frac{1}{2}$ miles south-eastward of Middle shoal, is generally discernible by the sea breaking on it; between the rocks and the shore, distant 2 miles, the depths are 8 and 9 fathoms, with the same depth in the channel betwixt it and False Black Rock, which lies about half a mile West from the other, with $3\frac{3}{4}$ fathoms water. These shoals are avoided by keeping in more than 11 fathoms water. Vessels may pass inside of them by keeping in 8 fathoms.

Karang Bayan and Karang Ikan Tandu are two reefs nearly connected, with depths of 5 and 6 fathoms, bearing from Rat island between West and W.N.W., distant 2 or $2\frac{1}{2}$ miles; between these shoals and the reef surrounding Rat island there is a passage nearly one mile wide, with 16 and 17 fathoms water.

Karang Lebar or Asia shoal, is the southern shoal in Benkulan road. It is about one mile in extent, with a depth of 4 fathoms, probably less, coral and sand, and lies about 4 miles westward of the west point of Pulo bay. There is a heavy ground-swell on it, which sometimes breaks in bad weather; it ought therefore to be carefully avoided, more particularly as it lies much in the way of vessels approaching the road from the southward.

DIRECTIONS.—Approaching Benkulan road by the Northern channel, Tikus island should not be approached between the bearings of East and E.S.E., within the distance of 3 miles, to avoid Karang Bayan and Ikan Tandu. The Sugar-loaf, bearing N.E. $\frac{1}{2}$ E., or eastward of that bearing, until Tikus island lighthouse bears S.E. leads clear and northward of them, whence course may be taken for the anchorage in the road according to the season. In working to or from the road by this channel, a vessel may stand near the edge of Rat island reef, and to 13 fathoms towards Sungi Lamu rock and the main.

Coming from the westward, the trees on Pulo Tikus will be seen before the Sugar-loaf, which is a conspicuous hill on a nearer approach.

Approaching the road from the southward, a vessel should not bring Tikus island to the westward of N. $\frac{1}{2}$ W. until within 3 miles of it, which will lead westward of Asia shoal; then she may steer N.N.E. for the road, or due East for Pulo bay, if bound there. There is a channel 3 miles wide, eastward of Asia shoal, with general depths of 17 or 18

fathoms. Vessels using this channel should keep within 2 miles of the west point of Pulo bay until it bears East, and may then steer for Tikus island or Pulo bay; the point may be approached within half or three-quarters of a mile occasionally, in working; but a reef projects from it about a third of a mile, with 3 fathoms on its edge, and 13 to 14 fathoms close to. Asia shoal may be seen by the overfalls on its edges.

Pulo bay, 8 miles to the southward of Benkulen, is an excellent land-locked harbour, 2 miles in length by one mile in breadth. The entrance at its north east extreme is about 2 cables wide, with a depth of $3\frac{1}{2}$ fathoms, and lies between the eastern extreme of the low peninsula forming the harbour, and the main.

When vessels at anchor in Benkulen road are unable to remain during strong north-westers, they slip their cables if it is daylight, and run for Pulo bay. In doing so they should steer to the southward in not less than 12 fathoms, until the entrance of Pulo bay bears eastward of S.E. by E. $\frac{1}{4}$ E., to avoid Lampuyang reefs, as they may not be always discernible in blowing weather, when the sea breaks much in the channel. Then, haul to the eastward for Sillebar river, and the depth will decrease gradually to 8 fathoms as the low sandy entrance point is approached; this point, at low water, may be rounded close to, and at high water, at the distance of a cable; then haul up under the south side of it, and anchor in 7 fathoms, with the extremity bearing N.N.E., distant from the Crown pepper house nearly half a mile.

The south side of Pulo bay, near the shore, is shoal and rocky, and there is a 4-foot shoal on the western side, the only one in the bay. If a vessel happen to lose all her anchors, she should haul close round the entrance point, and when well inside, run on shore in the mud, opposite the nearest tree, having previously prepared the boat with a hawser to make fast to it. The bay, being surrounded with low swampy ground, is unhealthy, and the water also is bad; it is, therefore, little frequented.

Vessels driven from their anchorage in the night cannot run for Pulo bay without the risk of getting on the outer low sandy point, for it will not be visible, nor is the lead of any assistance, there being 8 fathoms close to, and the same depths in a direct line to the N.N.W.; it therefore seems advisable, if a vessel cannot ride it out during the night, to run to sea.

Sillebar River, about one mile north-eastward of Pulo bay, has 4 feet water on its bar, from whence it stretches both northward and southward, near and parallel to the shore, the southern branch leading to a great lake contiguous to the sea, south-eastward of Pulo bay.

COAST.—Ujong Kungkaai or False Buffel point, a round bluff headland covered with trees, discernible from Benkulen road, is about $2\frac{1}{2}$ miles southward of the west point of Pulo bay. From thence the

coast of Sumatra extends in a south-easterly direction 180 miles to Sunda strait. Throughout its extent it is almost entirely without shelter, and being beaten by heavy surf the few frequented places are dangerous for landing. The country is also deficient in some of the productions which are found north of the equator. As little is known of this portion of the coast it must be navigated with caution. It is generally bold and safe to approach, and the land mountainous a short distance in-shore. Between Benkulen and Manna, regular depths over a sandy bottom are found, where, if it fall calm and the current be unfavourable, a vessel may occasionally anchor in moderate depths; but farther to the southward the coast becomes more steep, moderate depths extending out only a short distance, until Little Fortune island, near Flat point is approached, where they extend 8 miles from the main.*

About 4 miles south-eastward of Buffels point there is a narrow spit with a depth of 7 fathoms rock, and 12 fathoms soft ground between it and the shore, from which it is distant about two miles.

Pring, situated about 30 miles south-eastward of Buffels point, is a small pepper port; the best anchorage is in 12 fathoms, mud. In less depth the ground is foul and rocky. A shoal, which breaks in bad weather, projects about 2 miles off shore.

Manna Point, situated about 42 miles south-eastward from Buffels point, projects considerably and may be known by a small hill with palmyra trees on it.

A reef extends 3 miles westward of Manna point, to which a wide berth should be given.

Manna town, formerly an English settlement, lies north-east of the point. The anchorage is in 10 or 12 fathoms. Senu, another pepper port, lies about 4 miles northward of Manna, and Pethang at about 18 miles south-eastward. A small cascade falls perpendicularly from the steep cliffs which line the shore near Manna, but landing should not be attempted as a tremendous surf generally prevails along this coast.

KAWUR or SAMBAT BAY, situated 3 miles south-eastward of Manna, is about 5 miles in width. In the north part of the bay, west of Sambat river, there is good shelter from N.W. and westerly winds, in 9 or 10 fathoms, sand and muddy bottom. From Sambat river on the east side, to Bundar point the western extremity, this bay is about $2\frac{1}{2}$ miles wide, having the village of Bandar or Bundar between, where also is a small river.†

* See Admiralty chart :—Tyingkok bay to Sunda strait, No. 2,761.

† See Admiralty chart :—Kawur or Sambat, No. 871; scale, $m=0\cdot7$ of an inch.

On the south-east side of the bay is the settlement of Kawur, in a small bay half a mile wide, where small vessels close in find shelter from southerly winds.

The anchorage at Kawur is in 11 or 12 fathoms, with the Resident's house bearing about E.N.E., distant one mile. The boat passage leading to the factory is between two coral banks, with breakers on each side, and very narrow.

PULO PISANG HARBOUR.—Pulo Pisang Kroé lies 35 miles south-eastward of Kawur, and $1\frac{1}{4}$ miles off shore; the intermediate coast is steep-to. Between this island and the main, there is good anchorage and shelter from N.W. and westerly winds, in from 12 to 15 fathoms, with the rocks near the east part of the island bearing South, distant about 3 cables, and from the main three-quarters of a mile.

Pulo Pisang Kroé is a quartz rock about a mile in diameter, and nearly round. A reef, which extends in places about one-third of a mile, and on which the sea continually breaks, fronts the southern half of the island, with depths of 36 to 40 fathoms about a quarter of a mile off. Shoal water of from 3 to $4\frac{1}{2}$ fathoms over the visible patches of coral rock, extends from the north part of the island in a N.N.E. direction towards the main. Tanjong Ponyong lies 8 miles north-west of Pulo Pisang Kroé, and mount Ponyong a high and remarkable mountain, about 8 miles eastward of the point, may be discerned a considerable distance from the offing.*

In 1881, the Dutch Government proposed to establish a light on the summit of Pulo Pisang Kroé; but it is not yet begun.

At about one mile northward of Pulo Pisang Kroé is a reef of rocks, on which the sea generally breaks, having from 12 to 20 fathoms close to, and apparently connected with the shore, which is distant about $1\frac{1}{2}$ miles; other patches lie between this reef and Tanjong Ponyong.

Directions.—Large vessels should approach the anchorage under Pulo Pisang Kroé, from the southward; there appears to be no dangers to avoid excepting the reef extending a short distance from the island. Small vessels may enter by the northern channel by keeping at about 2 cables distant from the island shore.

Kroé road, lies 6 miles south-eastward from Pulo Pisang Kroé, at the head of a bay which has deep water, there being about 30 fathoms at less than half a mile off shore. The town is situated at the bottom of the bay, on the bank of a small river navigable by boats at high water, and close to the northward of Sillalu rock, which rock appears like an island when seen from the offing. Foul ground extends off from the rock for a distance

* See Admiralty plan of Pisang harbour and Kroé road, No. 872; scale, $m = 0.65$ of an inch.

of 2 cables, with deep water close to, and a shoal of $2\frac{1}{2}$ fathoms, steep to, lies N.N.W. one mile from the rock, and half a mile off the mouth of the river.

The anchorage in Kroé road is in from 14 to 18 fathoms, at about half a mile northward of Sillalu rock, and west from the Resident's house. It is safe in the S.E. monsoon, being well sheltered from these winds by Karang Pingan, the south point of the bay. In approaching the bay, the Resident's house should be kept open of Sillalu rock, to avoid the reef extending off Karang Pingan point.

Supplies.—Bullocks, good water, and some other supplies may be procured here.

Tinnambang bay lies about 8 miles south-eastward of Kroé road. Shoal water extends about one mile off shore between its north point and Kroé road. The anchorage is in about 10 fathoms near the head of the bay, but it affords little shelter. Landing may be effected in S.E. winds on the south side of the bay.*

Benkumat bay lies about 25 miles south-eastward of Kroé road; Benkumat village lies on the north side of a low point having on it palmyra trees; the bay here is interspersed with rocks, and a long shoal lies from 3 to 4 miles off, but there is a passage for small craft close along the shore. A patch of 4 fathoms lies about 5 miles southward of Benkumat bay, at 3 miles off shore. Siggen point, the north-west extremity of the bay, has a projecting reef, with 20 fathoms close to. The coast here and farther to the southward is generally low fronting the sea, but inland the country is mountainous. A vessel intending to touch at Benkumat should anchor well out to avoid the rocky ground.

Between Benkumat and Little Fortune island depths of from 10 to 20 fathoms will be found at 2 or 3 miles off shore.†

ISLANDS OFF THE WEST COAST OF SUMATRA.

GENERAL REMARKS.—A chain of islands extends parallel to the west coast of Sumatra at the distance of about 60 miles between the parallel of 3° N. and 2° S., covering a space nearly 700 miles in length. They are for the most part unsurveyed, and with the exception of a little recent information resulting from the visits of H.N.M. vessels of war, the account herein given is from old authorities.

PULO SIMALU (Pulo Babi), or Hog island, the northernmost of the large islands, lies about 63 miles south-westward from

* See plan on Admiralty chart:—No. 2,761; scale $m=0\cdot8$ of an inch.

† For the description of Fortune island, and coast from Flat cape, see Sunda strait, page 242.

cape Felix. It is about 55 miles long, 11 miles broad, moderately high, hilly, and covered with trees, and may be seen from 30 to 40 miles distant in clear weather. The north point is just southward of the parallel of 3° N.*

It is thinly inhabited by emigrants from Achi (Acheen), who carry on a trade in cocoa nut oil and nuts.

Pulo Assu or Dog island lies about 5 miles off the east side of Pulo Simalu, and N.W. by N. distant 13 miles from the east point. Jansen reef with a depth of 2 fathoms and steep-to, lies with the north point of Pulo Assu bearing W.S.W. distant $1\frac{1}{2}$ miles. There are other islets along the shores of Pulo Simalu but so close in that it is difficult to distinguish them.

On both sides of Pulo Simalu there are sudden overfalls on coral patches that lie from 4 to 6 miles off shore. One of these lie about 5 miles westward of the north point of the island, and two miles from the islets off that point, with a depth of 4 or 5 fathoms, or perhaps less water.

As there is no inducement for a vessel to stop at this island, nor any safe anchorage about it known to navigators, it has been rarely visited and is little known.

Cocos islands, lying about 25 miles westward from the north point of Pulo Simalu, are two small low islands $1\frac{1}{2}$ miles apart, covered with trees, and visible from 12 to 15 miles. A shoal is said to extend about 12 miles in a S.S.E. direction from the islands, some parts of which are dangerous. In passing eastward of the Cocos islands, the southern islet should not be brought northward of N.W. until distant at least 12 miles, and caution must be exercised.

Pulo Tapak or Flat islands, lie 14 miles south-eastward of Pulo Simalu; between them and the south end of Pulo Simalu, there is a good passage, in which no danger has yet been found.

These islands are bold to approach, the north side being clear beyond the distance of a cable. At about 2 miles eastward of the northern island is a coral reef of 4 or 5 fathoms seen by the ship *Suffolk*, with apparently shoaler water towards the island. The passage between the Banjak islands and Suffolk reef is considered clear.

The BANJAK ISLANDS are described at page 173.

PULO NIAS, the largest of the islands off the west coast of Sumatra is 73 miles in length in a north-west and south-east direction, and from 18 to 25 miles in breadth, separated from the Banjak islands by Pulo Nias north channel, 30 miles in breadth. It consists of ranges of hills reaching

* See Admiralty chart:—Sumatra west coast, sheet 1, No. 2,760.

to 800 feet in height, with a fertile soil. It is subject to earthquakes, one of which (1843) swallowed up a hill and a village.

It is thickly populated by an agricultural people who raise rice, cotton, and other useful products, and by their civilization form a marked contrast to the half-savage tribes who thickly inhabit the other islands. They are estimated at 170,000.

The Malays, though small in number are the dominant race; they live on the shores, their chief place being Sitolie on the north-eastern side.

North shore.—At about 5 miles eastward of Tanjong Letang the north-west point of Pulo Nias, is a detached rock, at about one mile off shore.

Lapau bay affords shelter from northerly winds, under Pulo Panjang.

Pulo Babi lies in the North channel, at about 11 miles north-north-eastward of Tanjong Lojong, the north point of Nias island. The channel between is safe. A sunken rock is said to lie 5 miles north-eastward of Pulo Babi.

West shore.—**Bunga islands** are situated about 13 miles southward of the north-west point of Pulo Nias. A reef extends about $1\frac{1}{2}$ miles north-west of the North islet, and a detached reef lies nearly midway between the north island and the shore northward of it.

The channel between the Bunga islands and Pulo Nias is 5 miles wide, and has from 10 to 36 fathoms water.

Nako islands, a group fronting Serumbu bay, are situated about 25 miles south-eastward of the Bunga islands. The channels between most of them have deep water, but that between Langu and Mangit is said to be foul.

There is anchorage in the Nako islands, between Nako, Great Sendrongan (Silorongang), and Mangit, with the village of Nako about N. by W. distant 2 miles, and Sendrongan village South about one mile. This space is sheltered from the sea by the surrounding islands and has a depth of 17 fathoms, mud and sand. It should not be approached from the westward, as numerous sandbanks are said to lie to the westward of Nako islands. The services of a native pilot could probably be obtained.* Water may be had from a small stream near Sendrongan village.

Aztec rock, on which the British barque *Aztec* is said to have struck in 1879, in 16 feet water, is reported to lie in lat. $0^{\circ} 55' N.$, long. $96^{\circ} 48' E.$, or about 27 miles westward of the north islet of the Nako group. Breakers are reported to have been seen about 12 miles south-westward of Simanang, the centre island of Nako group.

* The Rajah of the Nako group appear to have taken Captaiu Murat's vessel to the anchorage.—*Vide* account in Horsburgh.

Merapi bank, one mile in diameter, with depths of from 6 to 8 fathoms, lies between Bunga and Nako islets, with the east point of Pulo Bunga bearing N.W., and Tanjong Kapulu N.N.E. $\frac{1}{3}$ E.

Other dangers lie eastward and south-eastward of the Nako group for which a good look-out should be kept. One of these, the Herzog Bernhard, about 2 miles in length, lies about 10 miles south-eastward of the group, at about 6 miles off shore.

Serumbu bay lies about 7 miles north-eastward of the Nako group. Anchorage will be found here in about 10 fathoms off Serumbu river with Ujong Serumbu bearing N.W. and Pulo Ache about E. by N. distant $1\frac{1}{2}$ miles. The bar of the river is dangerous at times, and there are two shoals near Pulo Ache which must be avoided when approaching this anchorage from the southward. Also northward of Ujong Serumbu lies a large shoal; the point should not be approached from the northward in a less depth than 10 fathoms.

At the south end of Pulo Nias there are three bays named Telok Lagundi, Pohili, and Dalam; in one of these (not named) there is good anchorage, where bullocks, buffaloes, goats, and poultry are plentiful, and water easily procured.

Thornhill bank the least known depth on which is 18 fathoms and steep-to, lies about 8 miles southward of Pulo Nias, with the hill near Somo Somo, bearing about N.W. $\frac{1}{2}$ W., and distant 15 miles.

The east coast of Pulo Nias has moderate depths, with good anchorage, and some fine rivers; especially one in lat. $0^{\circ} 54' N.$, where trade is carried on in native craft: many isles line the coast here, as on the western side; but the sea being more smooth on the eastern coast renders it safer.

There is anchorage inside the islands and shoals at the east point of the island, at the mouth of Nias river: there are also other places where a vessel might anchor occasionally.

Pulo Somosomo, a small island, lies 2 miles off the east extreme of Pulo Nias.

Pulo Nias great channel lies between Pulo Nias and the Batu islands, and is about 40 miles across. This channel is safe with a good look-out, but the prudent navigator will be cautious when near any of the islands during the night, as the dangers are but imperfectly known.

BATU ISLANDS.—Herzog Bernard, a small island discovered by the Netherlands war vessel of that name, in her passage from Padang to Acheen, 1874, lies in lat. $0^{\circ} 2' S.$ long. $97^{\circ} 36' E.$ off the western entrance to Pulo Nias Great channel. It is about $1\frac{1}{2}$ miles long north and south, low and covered with bush. It may be considered the westernmost of the Batu group.

Pulo Simu lies 21 miles eastward of the position assigned to Herzog Bernard islet. A detached reef which breaks, lies about $1\frac{1}{2}$ miles south-westward of the west extreme. The other sides of the inland are apparently clear of danger beyond a short distance.

The Batu islands are but little frequented, but a trade in dammer (gum) and other forest products is carried on by coasters from Padang.

Tanah Masa, or Batu island, the central and largest of the Batu group, lies about 40 miles south-eastward of Pulo Nias, and forms the south side of Pulo Nias Great channel. It is 25 miles in length, north and south, and 5 miles in breadth. This, like the other large islands, is moderately elevated and hilly, covered with trees, and many small islands line its shores both on the east and west sides, with moderate depths among them, and forming safe bays or harbours, little known to Europeans. The north-east point of the island, named Batuwawa, is a bluff, with a reef projecting a quarter of a mile from it.

Anchorage. — There is anchorage close off the north shore of Tanah Masa, and also in the bay close westward of Batuwawa point, but exposed to the northerly monsoon. A few supplies may be obtained here, but no water. Also, on the east coast, about 3 miles south-eastward of Batuwawa point there is anchorage in 10 fathoms good holding ground, close southward of a small islet lying near the shore. There is a watering creek just southward of it.

Lance or Lams bay lies about 8 miles south-eastward of Batuwawa point, and is formed by two islands near the shore; a reef extends about one-third of a mile off the northern islet. The anchorage here is in about 16 fathoms, sand and shells, nearly midway between the islets, with the north extreme of outer islet about S.E. by S. A few supplies may be gathered here.

These anchorages on the east side are probably only suitable for small craft, but the least depth reported is 7 fathoms, avoiding patches, and the best track appears to be at about half a mile distant from the island.

Tanah Masa with its adjacent islands extends north and south nearly 45 miles, fronted by a chain of about twenty isles of various sizes, some of them 13 or 14 miles distant from the main island, with dangerous reefs which are steep to.

Pulo Pinie (native name (Kasanic), lying 9 miles north-eastward of the north end of Tanah Masa, nearly midway between it and the main, is of considerable extent, stretching nearly 20 miles east and west, and having islets and shoals extending off in nearly all directions for a distance of 7 or 8 miles. Those on the north-east and south-east sides have been referred to at pages 185-6.

Southward of Pulo Pinie and nearly midway in the channel between it and Tanah Masa, is a reef on which the Netherlands India SS. *Graaf van Bijlandt* struck in 1885; it is reported to lie about $2\frac{1}{2}$ miles southward of Pasakie islands, with Pasakie Besar bearing N. by E., and Pasakie Kechil N.N.W. $\frac{3}{4}$ W. As other shoals yet uncharted are reported to exist in this channel, caution must be exercised when navigating it.

Tanah Balah, is the southern large islet of the Batu group. It is thickly wooded, attains a height of from 600 to 700 feet, and forms the north side of Siberŭt strait.

SIBERŪT STRAIT, between Tanah Balah and Siberŭt island is 26 miles wide, and the passage usually about taken by steamers running between Achi and Batavia *viâ* Padang. Sailing vessels have hitherto chosen the Seaflower channel, southward of Siberŭt island, said to be free from danger, but in which there is no anchorage ground. Since the survey of Siberŭt strait in 1877, and the establishment of a light on Pulo Bojo, as well as the safe anchorage afforded in the southern portion of the strait, more particularly in the N.W. or fair monsoon period (November to May), most vessels will find it to their advantage to use it in preference to any other.*

LIGHT.—On Pulo Bojo, from a white lighthouse 197 feet high, erected on the south-west side of the island, is exhibited at an elevation of 360 feet above the sea, a *flashing* white light, showing *two flashes* in quick succession *every half minute*, visible in clear weather between the bearings of S. by W. $\frac{3}{4}$ W. (through west and north) and E. by S. $\frac{3}{4}$ S., from a distance of 27 miles.

Tides.—It is high water, full and change, in Siberŭt strait during the N.W. monsoon period at 7h. 30m., springs rise $2\frac{1}{2}$ feet. The flood runs to E.N.E., at times from 2 to 3 knots, but is sometimes stopped altogether and even reversed by the westerly current which runs at this season. The ebb, increased by this current, is said to vary from 3 to 6 knots. On the east coast of Siberŭt, the flood runs to the southward and the ebb to the northward.

Winds.—From November to May, when the N.W. monsoon prevails south of the equator, the weather is fine in Siberŭt strait, with cool westerly winds. During the day the wind is mostly fresh from N.W., shifting towards evening to S.W. and south. Over the coast of Sumatra, lightning with squally weather is seen towards night, but it does not extend off to Siberŭt. On that coast at this season, the N.W. monsoon is seldom felt northward of Kroé (5° S.) but land and sea breezes prevail with fine weather, and sometimes rain at night.

* See Admiralty chart:—Sumatra west coast, sheet I., No. 2,760.

Northern shore.—The south coast of Tanah Balah forms the north shore of Siberūt strait. Its western extreme, Hatik point is rocky, and has a remarkable clump of trees resembling a hillock. With the exception of a rocky point to the eastward the coast is sandy, and no dangers are known to exist other than those above water. In the bay, north-westward of Pulo Bojo there is a rock above water from which a spit extends off one cable to the eastward. As this portion of the strait has not been properly surveyed, and the water is generally deep with a heavy swell breaking all along this coast during the N.W. monsoon period, it is better to keep the Siberūt island shore.

Pulo Bojo, lying about 2 miles southward of Tanah Balah, is a small sloping island, fringed by a reef to the distance of about 3 cables; there are depths of 30 fathoms between it and the reef extending 5 cables southward from Tanah Balah. See light, page 211.

Reefs.—Heavy breakers were reported in 1876, by the steam-vessel *Marion*, on the east side of Tanah Balah, about 5 miles N.E. of Pulo Bojo, but the Dutch surveyors found 117 fathoms near this position, and make no mention of it.

Graaf reef, about one mile in extent, lies E. by N. $\frac{1}{2}$ N. distant 10 miles from the south point of Pulo Bojo.

Southern shore—Anchorages.—The northern end of Siberūt island, 15 miles in length in an east and west direction, forms the south side of Siberūt strait. Ujong Siopah, the north-western extreme, is a rocky point, from which the coast trends E.N.E. to Boompjes point, a distance of 3 miles. Boompjes is a double point with a conspicuous white rock on the western head visible from the northward at the distance of 7 miles; there is also a remarkable tree on it which is only seen from the eastward. With the exception of Boompjes point the whole shore is sandy.

At about 4 miles eastward of Boompjes point there are several patches with a least depth of 4 fathoms, at about one mile off shore; with this exception which only affects heavy draught vessels, the north shore may be safely approached for anchorage in from 10 to 20 fathoms, over a sandy bottom.

Close eastward of Ujong Sigeb there is anchorage in a bay in which the water is mostly very deep. By keeping close to the western shore anchorage may be taken in 20 fathoms at about $1\frac{1}{2}$ or 2 cables off shore, when Pulo Sigir comes in line with the east point of the bay. Rocky patches lie in the middle of this bay about one cable eastward of this position. Also, there is anchorage under Pulo Sigir, which may be approached by keeping close to the reef extending about half a mile south-east of that islet, to avoid shoal patches of 3 and 4 fathoms lying less than

one mile south-east of it, and anchoring with the islet bearing N.N.E., distant about one mile, in 6 fathoms of water.

Macassar reef, of sand and coral, with a least depth of about 2 fathoms is 2 miles in extent, and lies in the centre of the western entrance to Siberŭt strait, and on the north-west edge of the bank extending from Siberŭt island. This reef breaks occasionally with the swell, and in strong winds the breakers will be visible from about 4 miles distant.

From the reef, Ujong Siopah bears S. by E. $\frac{1}{2}$ E., distant 11 miles; northward and westward of the reef there is no bottom at 60 fathoms.

A chain of coral shoals on which the least water found was $3\frac{3}{4}$ fathoms, extends in a general N.W. $\frac{1}{2}$ N. direction, 14 miles from Sigeb point, the north-east extreme of Siberŭt; between these shoals, which may sometimes be seen by the discolouration of the water, are clear passages 2 to 4 miles wide. The southern shoal on which there is a depth of $4\frac{3}{4}$ fathoms lies with Sigeb point bearing S.E. $\frac{1}{2}$ E., distant $2\frac{1}{2}$ miles. The next shoal in the chain has $3\frac{3}{4}$ fathoms water, and lies with Sigeb point, bearing S.E. $\frac{1}{2}$ S. distant 6 miles; a patch of 5 fathoms lies 2 miles N.N.W. of it. The northern shoal, of 6 fathoms, lies with Sigeb point bearing about S.E. $\frac{1}{2}$ S. distant $13\frac{1}{2}$ miles. A patch of $5\frac{1}{2}$ fathoms lies 2 miles S.E. from it.

Directions.—Vessels approaching Siberŭt strait from the westward will sight Pulo Bojo, nearly 400 feet high, with a lighthouse, the light from which is visible about 27 miles. The best channel is that between Pulo Bojo and Macassar reef, which is clear of all danger. Macassar reef is nearly always to be seen by the breakers. The island should be passed at the distance of 2 or 3 miles, steering East until Ujong Sigeb bears S.S.E., when course may be shaped for the desired port. Or, passing southward of Macassar reef, the only dangers are those on the eastern part of the bank, the least depth on which is $3\frac{1}{4}$ fathoms at 6 miles off shore. The best course is along the north coast of Siberŭt island distant from 2 to 3 miles, passing Ujong Sigeb the east point at about one mile, by this means the patches are avoided.

In this track, anchorage may be taken anywhere in moderate depths, over sand, whilst northward of Macassar reef there is no anchorage, so that for sailing vessels possibly meeting with light winds and an adverse tide, the southern track through the strait is to be recommended.

MENTAWI ISLANDS.—**Siberŭt Island** (Great Fortune Island of the Dutch) is 56 miles in length and from 15 to 24 miles in breadth. It is inhabited by a race of Malays named Mentawi.

Siberŭt island is high and wooded, with many sandy beaches along the coast, and on which there is usually a heavy surf breaking.

Several small islands lie close to the coast on the eastern side, others interspersed with shoals, lie off the S.W. and south sides, the southernmost of the latter, named West island, is 10 miles off shore. There is an intricate channel between the islets off the south-west and south shores, with depths of from 16 to 20 fathoms, but it is inadvisable to attempt it. The west side of Siberüt is unexplored.

Seaflower Channel, formed between the islands off the south side of Siberüt and Sipora, is named after H.M. brig *Seaflower*, Captain W. Owen, who passed through the channel in 1806, and who describes it to be clear of danger; no soundings were obtained at 30 fathoms in passing through.

As there is no anchorage ground in this channel, Siberüt strait which has been partly surveyed, is to be preferred.

SIPORA (Sikabu), one of the Mentawi islands, forms the south side of Seaflower channel, and between cape Tilleru, the north-east point, and cape Marlborough the south point, is about 27 miles long, from 4 to 10 miles broad, and distant from Sumatra 63 miles. The island is wooded and a little less elevated than Siberüt.

Hurlock bay, consisting of an outer and an inner bay, lies on the north side of Sipora, and directly south of the small islands which front the shore.

The outer bay has moderate depth for anchorage, with a soft bottom, but is open to N.E. winds. The inner bay is about one mile in diameter, with an entrance about half a mile in width, with depths of 4 to 7 fathoms. In entering the inner bay, the northern side of the channel should be kept, as a reef extends some distance from the south side of the entrance. There is shelter from all winds in the northern part of the bay, in depths of 8 or 10 fathoms, with 5 and 6 fathoms nearer the shore, which is a red sandy beach.*

Se Uban bay.—The east coast of Sipora is generally steep, but rocks project a considerable way from the shore in some places, particularly to the southward of a round peaked hill named Turks Cap; from abreast of the Cap, soundings may be obtained along the coast towards cape Marlborough, which is bluff, moderately elevated, and fronted by rocks extending $1\frac{1}{2}$ miles off shore. In this space there are two considerable bays; Se Uban bay, situated about 8 miles northward of Turks Cap, and Se Labba bay, at 2 miles northward of the cap.

Se Uban bay is about 2 miles in length, and three-quarters of a mile wide in the entrance, and may be recognised by a considerable clump of trees standing on the northern point; the course into it is S.W., and a vessel

* See Sketch plans of Hurlock, Se Uban, and Se Labba bays, No. 866; scale $m = 1.5$ inches.

should keep in mid-channel, in from 24 to 30 fathoms, to avoid the rocks projecting from the points on each side of the entrance. The best anchorage is in the south part, with the south point of the entrance bearing about N.E., in depths of from 8 to 14 fathoms. As the plan is but a sketch, the precaution of sounding around the vessel should be taken, for in some parts there are patches of coral rock. There is a brook of fresh water at the north-west part of the bay.*

Se Labba or Sikityi bay may be known by the Turks Cap hill close to the southward, and which is seen from both sides of the island.* The bay is about one mile square, with reefs extending from both points of entrance, narrowing the channel to about half a mile. There is a large coral shoal, awash, near the middle of the bay, southward of which the bottom is mud, and suitable for anchorage in depths of from 10 to 20 fathoms.

Supplies.—At either of these three bays, a vessel may be supplied with wood, water, a few hogs, yams, poultry, and cocoa-nuts, by the people of the few straggling villages on the east side of the island; but the west side is said to be destitute of inhabitants.

The West Coast of Sipora, is rocky, with some small islands adjoining, and the sea breaks high upon the shore. Two of these islands, about 12 miles to the westward of cape Marlborough, lie close to the shore, and near each other; they are low and flat, covered with cocoa-nut trees, and rocky to seaward.

Sipora Strait.—The channel between the south end of Sipora and North Pagi island is about 12 miles broad, and considered to be safe. The islands are said to be connected by a coral ridge of from 20 to 40 fathoms; on this ridge, which lies with Turks Cap in line with cape Marlborough, bearing N.W. by N., and at about 3 or 4 miles from Sipora, there is a bank of about 7 fathoms water, which should be avoided as less water may exist.†

The English vessel *Dunleep Singh* (1884) found depths of 22 fathoms, rapidly decreasing to 13 and $7\frac{1}{2}$ fathoms, with the bottom plainly visible, but the actual positions of these soundings are not given.

PAGI (Pageh) ISLANDS are together about 55 miles in length, separated by Sikakap strait. Both the islands are high, covered with large trees, and may be seen in clear weather about 40 miles. The inhabitants number about 1,500 and are simple and inoffensive. Cocoa-nuts and sago palm are cultivated.†

North Pagi or North Nassau Island, is 20 miles long, and 14 miles in breadth.

Simenaju road, situated near the north-east extreme of North Pagi island, has depths from 5 to 6 fathoms, mud, at about half a

* See Sketch plans of Hurlock, Se Uban, and Se Labba bays, No. 866; scale $m = 1\frac{1}{2}$ inches.

† See Admiralty chart;—Sumatra west coast, sheet II., No. 2761.

mile off shore. The village lies abreast the islet in the north part of the road.*

Se Laubo Laubo.—On the west coast of North Pagi there is a group of islands, with a channel on either side of Pulo Laubo, the northernmost, leading to an anchorage between it and the main, where vessels may anchor in 12 or 13 fathoms, sheltered from all winds excepting those from the northward. The best channel to the anchorage is northward of the island, avoiding the reef extending some distance off it.†

Silabu Jabu or Se Laubo Laubo village is situated on the side of a rivulet at the south-east side of the bay, where water may be procured.

In northerly winds there appears, by the plan, to be sheltered anchorage in from 4 to 7 fathoms, southward of the Laubo islets and village.

Batu Mongo, another village, lies near the south-west point of North Pagi island, on low land; from thence to the south entrance of Sikakap strait the coast is rocky, and upon which the sea breaks heavily.

Sikakap strait, formed between North and South Pagi islands, is about 7 miles in length in a north-east and south-west direction, and apparently less than half a mile broad in its narrowest part, with water sufficient for most vessels.‡

The passage from the south-west is between Pulo Tee Nussa and the Siopa islets, by keeping in mid-channel, and passing westward of Pulo Mashuchu and Bakot Pegu, where the depths are from 5 to 15 fathoms. There is a rock in the channel eastward of the latter islet, and a few others near the shore of the channel. Pulo Tongo in the eastern entrance is nearly joined by reefs to South Pagi island, the channel therefore, is northward of Tongo, where the water is deep. The tide runs strongly through the channel, as much as 3 knots at times, but there is anchorage out of its force in the small bays on either side, and where the depths are regular.

Pulo Tee Nussa (Serasso), at the south end of the strait, is separated from North Pagi by a channel, with from 5 to 10 feet water, fronting which there is a small island, having a rock upon it resembling a thatched house when viewed from the south-westward. The sea breaks with great violence upon the rock, and upon the low rocky shore to the westward.

Sikakap river on the western shore, where fresh water may be procured, is opposite the north-west point of South Pagi; the village of that name is several miles up the river: there is also fresh water under the high land at the south-east point of North Pagi.

* See plan of Simeuaju road on Admiralty chart, No. 2,761; scale, $m = 1.7$ inches.

† See plan of Se Laubo Laubo, on Admiralty chart, No. 2,761; scale, $m = 1.5$ inches.

‡ See plan of Sikakap strait, on Admiralty chart, No. 2,761; scale, $m = 0.7$ of an inch.

The trees in Sikakap strait are cut into planks by the natives for the Padang and Benkulen markets. These also make good spars, and are more conveniently obtained than in most places in these seas, the natives affording every assistance.

South Pagi or South Nassau Island, is about 37 miles long and 10 miles broad. Several small islands lie near the western and south-east sides. The sea coast of Pagi islands, in several places where the land is low, abounds with cocoa-nuts; some small spots have been planted with pepper-vines.

Belabuan Ju, or S.E. harbour, is formed by four small islands lying off the south-east coast of South Pagi, and is the only sheltered anchorage on this coast.* It is about 2 miles square, with depths of 6 to 14 fathoms. A reef extends nearly one mile from the main, at about the same distance southward of Pulo Singinging, the northern island. The channel between the two northern islets is nearly half a mile wide, with a depth of 10 fathoms.

Belabuan Ju road apparently lies just northward of Pulo Singinging, with depths of 12 to 13 fathoms at about 3 cables off shore. The channel from the road to the harbour between Pulo Singinging and the land appears to be shallow.*

A large reef lies about 3 miles north-eastward of Pulo Singinging.

Between S.E. harbour and the east point of South Pagi, temporary anchorage may be taken off some of the small villages, where the depths appear to be moderate.

Tides.—The tide among Sipora and Pagi islands rises from 3 to 5 feet at springs; but currents often run with the prevailing winds.

Suman and Mongo islands, are situated 2 and 5 miles respectively south-eastward of S.E. harbour. Mongo is high, and a reef lies $1\frac{3}{4}$ miles S.E. of it.

Sandion Island lies 14 miles south-eastward of South Pagi, and is low. A small round island, with trees, lies close to the east side of Sandion, on the reef which surrounds that island to the distance of one mile.

A coral bank lies westward of Sandion, on which the *Europa* (in 1797) steering E.S.E. to pass southward of Sandion obtained soundings in 33 fathoms, soon shoaling to 4 fathoms; she then hauled off S.W. and deepened in half an hour to 65 fathoms, no bottom. When in 4 fathoms, the east point of Sandion bore E. by N. about 9 miles distant.

* See plan of Belabuan Ju, or S.E. harbour, on Admiralty chart, No. 2,761; scale, $n = 0.75$ of an inch; also plan of the road, scale, $m = 3$ inches.

The *David Scott*, in 1825, found 25 fathoms hard bottom, with the centre of Sandion bearing N.W. $\frac{1}{2}$ N., distant 10 miles; being nearly calm, a boat was sent to sound a distance of 2 or 3 cables from the vessel, and she found the same bottom. As other coral spots may probably exist in the vicinity of Sandion, it seems prudent to give this island a good berth on all sides. The channel between Sandion and South Pagi is reported safe.

TRIESTE ISLAND, or Pulo Mega, situated about 45 miles south-eastward of Sandion, may be seen about 15 miles. It is 3 miles long and surrounded by a reef; a coral bank of 25 or 30 fathoms stretches 3 or 4 miles off the north, east, and west sides of the island, where a vessel may anchor, if drifted near by the current during calm weather; some fresh water may be got upon the island in the rainy season.

Its centre is in about lat. $4^{\circ} 3' S.$, long. $101^{\circ} 4' E.$

ENGANO, (Telandyang) the southernmost of the large islands fronting the west coast of Sumatra, and distant from it 56 miles, is 14 miles long, and 12 miles broad; it has a level appearance, and may be seen about 22 miles distant. The shore generally is rocky and bold, fronted by ledges on which the sea breaks, rendering landing impossible except in one or two places. Black rock, 8 feet high, lies about one mile off the south point. Depths of 23 fathoms, rocky bottom, have been reported at 6 miles southward of the island, with shoaler water nearer the shore. The existence of this shoal water is somewhat doubtful, but as no soundings are shown on the chart it is advisable to give its assigned position a wide berth. The north side is clear.

The south-east point of the island is assumed to be in lat. $5^{\circ} 30' S.$, long. $102^{\circ} 20' E.$

Engano bay, on the east side of the island has in its entrance four small islands surrounded by reefs; the bay affords anchorage over sandy bottom and shelter from most winds.* North island is covered with trees, and, excepting a small opening on the west side, is surrounded by a coral reef of considerable extent, partly dry at low water; but having deep water close to. South island, distant 3 miles from North island, is also covered with trees, and surrounded by a reef, excepting the western side, which has a sandy beach bold to approach. South island is connected with the south-east point of the bay by a coral reef which skirts the south and west shores of Engano island as far as the north point.

Middle island is conspicuous from the sea, having a high sandy beach, with a tuft of trees on the centre. A reef extends from this island to the

* See plan of Engano bay on Admiralty chart, No. 2,761; scale, $m = 0.3$ inch.

southward and eastward, but it is bolder to approach on the north and west sides. Sandy island lying northward at less than half a mile from Middle island, is not more than 6 feet high, and a reef projects both eastward and westward; on the north side it is bold, with 8 fathoms close-to.

The channel leading into Engano bay is between North and South islands, and has from 14 to 18 fathoms coral in mid-channel; thence by one of the following passages to the anchorage off the village. The passage westward of Sandy island is narrow, though safe, the reefs being steep to on both sides, with 10 and 11 fathoms water in the channel. The passage between Sandy and Middle islands is still narrower, with 11 fathoms water, and equally safe. The passage between Middle and South islands has 16 and 17 fathoms water, and is also safe, by keeping near to South island until it bears N.E., thence steering for the village. The passage between North island and the main should not be attempted, as the passage is very narrow.

Landing is difficult in most parts of the bay.

Anchorage.—Outside of Middle and Sandy islands there is shelter from the prevailing winds in either monsoon, in 12 to 14 fathoms, sand, good anchorage; and plenty of wood may be got from either of the outer islands. Also a vessel may anchor in from 4 to 6 fathoms, sand and mud, about one mile off the village, keeping nearest the south shore, which has in most places a sandy beach, bold to approach, the trees growing quite into the water in some parts.

Supplies.—Northward of the village, situated at the head of the bay, there is a small stream of fresh water, the only place where water can be procured. The island abounds with good timber, fish, yams and coconuts, but the natives are reported to be treacherous, and caution must be used in dealing with them.

Barhao anchorage.—A little westward of the north point of Engano island is the anchorage of Barhao, a narrow inlet in the fringing reef, extending east and west nearly 8 cables, and having in mid-channel a depth of 6 to 8 fathoms, except near the head where there are shoal patches.*

* See plan of Barhao anchorage on Admiralty chart, No. 2,761; scale, $m = 5$ inches.

CHAPTER IV.

OBSERVATIONS ON THE PASSAGES ROUND THE CAPE OF
GOOD HOPE TO SUNDA STRAIT, AND THE CHINA SEA ;
WITH A DESCRIPTION OF SUNDA STRAIT, AND THE
OFF-LYING ISLANDS.

At all seasons of the year it is usual for vessels bound from Europe to Batavia, Singapore, Bangkok, Saigon, Sarawak, or Labuan, after rounding the Cape of Good Hope to steer as directed at page 222 for Java head, and to pass through Sunda strait into the Java sea ; and, with the exception of those bound to Batavia to enter the China sea by either Banka, Gaspar, or Carimata straits.

The route by Sunda strait and the China sea is also the direct and ordinary one for vessels bound to China and Manila ; but those which pass St. Paul island between the middle of September and the middle of January, when the north-east monsoon is blowing in the China sea—especially those bound to Shanghai or other northern ports either in China or Japan—generally proceed by some of the channels eastward of Java, and enter the Pacific ocean by Macassar strait, the Molucca or Gillolo passages, or by Dampier strait, which are recommended as the most eligible routes at this season ; whilst other vessels during this period enter the Java sea by Sunda strait, and then proceed by some of the channels eastward of Borneo.

It is not, however, an uncommon practice for fast sailing vessels bound to China to proceed through Sunda strait and beat up the China sea against the north-east monsoon ; in weighing the advantages of the two routes, it should be borne in mind that the Eastern passages are but imperfectly known, whereas the hydrography of the China sea has been much improved by the several British and Dutch Admiralty surveys.

Banka strait possesses unquestionable advantages over those of Gaspar and Carimata, and is without doubt the best and safest route into the China sea. It was carefully surveyed in 1859 by Messrs. Stanton and Reed, Masters R.N. in H.M. surveying vessel *Saracen*, and subsequently by Lieutenant Keuchanius, in H.N.M. surveying vessel *Pylades*. Banka strait, although of much greater length, and not so direct for vessels bound to China as Gaspar strait, yet it is manifestly superior, being easy and safe of approach ; affording convenient anchorage in every

part, which enables vessels to avail themselves of favourable winds and tides, and leading into a part of the China sea free from danger. Gaspar strait (though recently surveyed with Carimata strait), on the contrary, is difficult and dangerous of approach, rocks and shoals extending for 35 miles to the southward; the depths of water are too great to afford convenient anchorage; and it conducts into a part of the China sea, containing many dangers, amongst which vessels are liable to be set by uncertain currents.

For vessels proceeding to Singapore, Banka strait should therefore be preferred, and it has in fact become the recognised highway of the trade passing between Sunda strait or Batavia, and Singapore. In order to facilitate its safe navigation, the Dutch have established lights and light vessels, so that vessels may pass through at night with ease and safety. But for ships bound to China, Gaspar strait being shorter and more direct, is still preferred, and will no doubt continue to be by many navigators, especially those who are anxious to make quick passages, even at the expense of incurring additional risk. It is certain that a vessel arriving off the entrance of Banka or Gaspar strait in the morning, and favoured with a fair commanding breeze, would gain some advantage in point of time by passing through the latter; but in calms and light airs, or against the north-east monsoon, there is good reason to believe that vessels will make quick, and often quicker passages, by proceeding through Banka strait, carefully attending to the directions given in Chapter VI.; and they will always be assured of much greater safety. In thick or bad weather it is possible to proceed through Banka strait without risk; but Gaspar strait can never be approached at such times without incurring considerable danger.

Vessels bound to Singapore, and having passed through Banka strait, may proceed either eastward of Linga and Bentán islands, and making Horsburgh lighthouse, enter Singapore strait from the eastward; or passing between Linga and Bentán, proceed through Rhio strait into Singapore strait; or they may proceed inside Linga, through Varella, and Durian straits, and passing Raffles lighthouse, enter Singapore strait from the westward. The first of these passages is known as the Outer route, the second as the Middle route, and the third as the Inner route.

The Middle route, by Khio strait, is the one now generally adopted, being safe, sheltered, and easily navigable, the Dutch Government having placed beacons on many of the dangers; whereas the route outside Bentán is exposed in both monsoons, and there are many out-lying rocks and shoals, which render it necessary for vessels to keep at a great distance from the land.

The Inner route by Vareila, and Durian straits, is adopted when the north-east monsoon is blowing strong in the China sea, at which time

vessels may proceed by it speedily and comfortably, instead of beating about outside against a heavy sea and an adverse current.

For passages in the China sea, north of Singapore, *see* Vol. II.

Sunda Strait to Red Sea in S.W. monsoon.—Sunda strait at this season affords a shorter route than Malacca strait for steam tea clippers and others from the northern ports of China. Having cleared Sunda strait, edge away into about 8° S., keeping in that parallel to Diego Garcia, where coal may, if necessary, be obtained. From thence cross the meridian of 60° E. in about 5° S., and the equator in about 55° E.; thence to Ras Asir (*see* p. 9). By this route a fresh fair wind is carried the whole way, whereas by Malacca strait route a vessel meets the whole strength of the S.W. monsoon.

CAPE OF GOOD HOPE TO SUNDA STRAIT.

WINDS in the INDIAN OCEAN,*—The south-east trade wind which in the Indian ocean extends from the west coast of Australia to within a few degrees of Madagascar, will be found between the parallels of 4° and 25° South, from April to September, and between 10° and 30° South, from November to March. To the southward of this trade, as far as 60° or 70° S., the prevailing winds are westerly, which will be found with more or less force and irregularity at all seasons.

The Monsoons southward of the equator blow from S.E. from the middle of April till the middle of September, and from N.W. varying to W.S.W. from October to March. These monsoons extend from near the African coast far into the Pacific ocean, and from the equator to the parallel of 8° or 9° S., and near Australia, to 12° or 14° S.

The South-east Monsoon, which is the period of fine season, may be considered an extension of the south-east trade, blowing within three or four degrees of the equator when the sun is near the northern tropic, and receding to 10° or 11° S. when the sun is near the southern tropic.

The North-west or westerly Monsoon is subject to many irregularities, with occasional heavy gales, thunder, lightning, and rain; it sometimes does not set in before November or December, rarely blowing with regularity and strength except in December and January, when it occupies a space comprised between lat. 10° or 12° S., and 2° or 3° N.

DIRECTIONS. †—On leaving the Cape of Good Hope steer boldly to the southward, so as to run down the easting in lat. 39° or 40° S., where

* *See* Admiralty Wind and Current charts for the Pacific, Atlantic, and Indian oceans, 1875.

† *See* Admiralty charts:—Indian ocean, No. 2,483; scale, $m = 0.2$ of an inch; Indian ocean, sheets I. and II., Nos. 748*a* and 748*b*; scales, $m = 0.5$ of an inch; also Ice chart of Southern Hemisphere, No. 1,241.

the wind blows almost constantly from some western point, and seldom with more strength than will admit of carrying full sail; whereas in a higher latitude the weather is frequently boisterous and stormy, with sudden changes of wind.*

In the South-east Monsoon, that is from the middle of April to the middle of September, vessels, having passed St. Paul island, should not edge away too quickly to the northward, but should endeavour to reach first as far to the eastward into the south-east trade wind as the meridian of Java head, crossing the southern tropic in about 102° E. In this season a westerly current runs along the south coast of Java, and in the months of June, July, and August, when it is at its greatest strength, it will be indispensable to be well to the eastward, or otherwise the vessel will be liable to fall to leeward of Java head. In the vicinity of Java the south-east monsoon also veers sometimes to East or E.N.E.

In the North-west Monsoon, that is from the middle of October to the middle of March, but especially in December and January, the southern tropic should be crossed several degrees to the westward of the meridian of Java head, when a direct course can be steered for Sunda strait, or to make Engano island, or the land about Flat cape, the southern extreme of Sumatra. Great care must be taken during this monsoon not to fall to leeward (eastward) of Java head, for the westerly winds blow with great violence along the south coast of Java, and their strength, united with the strong current setting to the eastward, make it impracticable to work to windward along this coast; a vessel may thus have to steer to the southward, and re-enter the south-east trade, in order to make sufficient westing to fetch Flat cape. When nearly on the parallel of Java head, and one or two degrees to the westward of it, a direct course may be steered for the strait, with an allowance for a probable current setting to the southward.

If contrary winds be met with shortly after leaving St. Paul island, in November, December, or January, a vessel may steer at once to the northward, and cross the tropic in 80° or 90° E., when she will meet with westerly winds to carry her to Sunda strait.

Changing of the Monsoons.—During the periods when these changes occur, that is from about the middle of September to the end of October, and from about the middle of March to the end of April, the winds are variable and uncertain. It is advisable at those times to make sufficient easting in the south-east trade, to bring Java head nearly North,

* Some navigators prefer making their easting in a higher latitude than 39° or 40° S. whilst others steer a more direct course for Java head than is here recommended: but the above directions are those usually followed in H.M. ships, and are generally believed to be the best.

and then to steer direct for it, borrowing a little to the eastward or westward, when it is approached, as may be required by the prevailing wind or other circumstances.

Sunda strait to Cape of Good Hope.—In S.E. monsoon period the track from Sunda strait is direct, but the reported position of Glendinning shoal, northward of Keeling islands, should be avoided. In N.W. monsoon period, stand to the southward (westward of Christmas island if the wind permits), into the S.E. trade, then direct.

THE KEELING OR COCOS ISLANDS are situated about 600 miles in a S.W. by W. direction from Java head, nearly in the direct route of homeward bound vessels *viâ* the Cape of Good Hope. They are in two distinct divisions, lying north and south of each other, having a channel between them about 15 miles wide.*

The west point of Direction island, at the north-east extreme of South Keeling, is in about lat. $12^{\circ} 5' S.$, long. about $96^{\circ} 53' E.$

These islands were discovered in 1608, by Captain William Keeling in the service of the East India Company, but were little known previous to the visit of Captain J. Clunies Ross of the ship *Borneo*, who partially refitted his ship here in 1825.

Captain Ross returned to the islands in 1827 with some Scotch colonists, but found them occupied by Alexander Hare, who with a large number of Malay followers had arrived the same year. The two factions lived on bad terms with each other, and many of Ross' colonists left the place owing to its being already occupied, but eventually the Ross' influence became the stronger, and Hare deserted by his followers, left the islands. In 1836, the Keelings were visited by Captain Robert Fitzroy who surveyed the group, the chart of which appears to be still correct in its main features, but the head of the lagoon is shoaling.

In 1857, Captain Stephen G. Fremantle, in H.M.S. *Juno*, visited the Keelings and formally annexed them to the British Crown. In 1878 the islands were placed under the government of Ceylon. In 1886 they were transferred to the government of the Straits Settlements.

South Keeling.—The northern division consists of one island only, whilst the southern division or South Keeling, numbering about 20, form a roughly broken circle nearly approaching the horse-shoe shape common to coral atolls. The two largest islands of this southern group, named Selima and Ross, are about 6 miles in length, and lie on the south-east

* See Admiralty chart :—Cocos or Keeling islands, No. 2,510, scale, $m = 2$ inches. For an account of a Visit to the Cocos islands, see Proceedings of the Royal Geographical Society for December 1879, page 777, and Report of the visit of Mr. E. B. Birch, of the Straits Settlements, in H.M.S. *Espoir* in 1885.

† The *London Gazette*, 5th February 1886.

and south-west sides of the group. New Selima, on which is the settlement, composed of the Cocos or Malay village, and also the Bantam village, lies on the north-east side of the group. Direction and Horsburgh islands are the northern islets, between which is the channel to port Refuge, available for vessels of 20 feet draught of water.

Outside and nearly all round the group a natural barrier protects the lagoon, rendering it perfectly smooth inside. Seaward of this barrier, on which the sea breaks continually, there is a sudden slope into deep water. The greater portion of the lagoon, which is 9 miles in length, by about 6 in width, is filled with patches of growing coral, having deep water between, but it is only navigable by boats.

The land is evidently rising and at some distant time will form a circular island, surrounded by a crater like edge; at present the land is nowhere more than 20 feet above the sea. The tops of the cocoa-nut trees, with which the whole of the islands are covered, may be seen from a distance of about 16 miles.

Population.—George Clunies Ross, grandson of Captain J. C. Ross, is the present proprietor of the island; five of his brothers also live on the island, most of whom have received their education at the Scotch Universities. One of these is the doctor of the island, and another the captain of the trading schooner. In 1885, the population including the Ross' families, amounted to 195 males and 182 females; Cocos-born and Bantamese, 76 males and 63 females; making a total of 516.

Trade.—Supplies.—The exports are cocoa-nuts, copra, cocoa-nut oil; beche-de-mer, and mongkudu (a bark used for dyeing purposes) amounting in value to about 22,000*l.* annually. The imports are provisions of all kinds, clothes, cutlery, guns, and most other necessaries of life.

Poultry is plentiful on the islands, and the lagoon abounds with fish. On Direction island are some deer, and there are a few sheep on Settlement island, but they are not for sale; jungle fowl are found on most of the large islands. There are a few fruit trees, such as bananas, papaws, guavas, and figs; pumpkins grow plentifully, but other vegetables are to be obtained only in small quantities. Water is plentiful and can be put on board at the charge of 10 shillings per ton.

Vessels in distress can be assisted or hove down, and receive any repairs which are not of great magnitude. A vessel of 178 tons has been built on the island.

Communication.—Produce for the European market is called for once a year by a chartered vessel. Produce for Batavia is sent once a month by the family schooner, which returns with the necessary supplies for the islanders. One vessel from Australia annually, on an average, calls for water; between the years 1874 and 1885, eighteen vessels touched for that purpose.

Port Refuge, in the northern portion of the lagoon, affords good shelter from the sea for vessels of about 20 feet draught, in depths of from 4 to 5 fathoms, with the northern extreme of Direction island bearing E.N.E. With good daylight and a look-out aloft to point out the shoals, vessels may go farther in nearer the settlement. H.M.S. *Espoir* in August 1885 found good anchorage in about $5\frac{1}{2}$ fathoms, coral and sandy bottom, good holding ground, with the extremes of Direction island bearing E. $\frac{1}{2}$ N. and N. by E. $\frac{3}{4}$ E., and rode out some heavy squalls whilst there. The entrance is from the northward, between Direction and Horsburgh island; no bottom will be found with the hand lead until on the line joining these islands. Southward of the anchorage already mentioned, on either side of Dymoke shoal, are passages leading to what are known as East and West harbours, but they could not be taken unless first examined, or with local assistance.

The channel into the lagoon between Horsburgh and Ross or West island is too dangerous for a vessel to attempt.

Tides.—It is high water, full and change, at 5 h. 30 m., rise of tide about 5 feet, the flood setting into the harbour at the rate of $1\frac{1}{2}$ miles an hour. The current running past the islands to the north-westward, about 18 miles per day, is increased by the flood stream; with the ebb tide the current is counteracted, and there is little or no stream.

Winds.—Weather.—The S.E. trade blows with more or less force all the year round, varying between South and E.N.E., and being strongest about August. The months of June, July, and August are the coolest and healthiest, the fresh breezes being accompanied by frequent rains. September, October, and November are very dry months, the wind is variable, and beri-beri and diarrhoea are feared. December, January, and February, the cyclone period, are stormy, especially December, fine days being followed by ugly weather and *vice versa*; thunder and lightning, with violent gusts of wind and heavy showers, causing much anxiety about the schooners and boats, and the cocoa-nut trees suffer to an appreciable extent. The weather experienced in March, April, and May, is much the same as that of September to November, but not so dry, and sickness is not so much dreaded. The Keelings are not entirely free from cyclones; in March 1861 one was experienced, a second, in 1863, devastated the islands, and another in January 1876, accompanied by a tidal wave, destroyed the store houses, engine house and mills, and most of the dwellings, the corrugated roofs of some of them being carried away by the wind for several miles; a slight earthquake accompanied it, causing a black fluid to arise in the southern portion of the lagoon, and which overspreading it, destroyed nearly all the fish and corals.

The aneroid barometers fell as low as was possible, the mercurial was dashed against the wall and broken.

The average height of the barometer is 29·90, varying about one-tenth on either side of it. In the cyclone months it sometimes falls an inch. The temperature in the daytime ranges from 84° to 88°, the maximum being about February; the lowest night temperature ranges from 77° to 72°, the minimum being about August and September.

North Keeling, situated 15 miles northward of the South Keeling group, is one low island lying on a reef about one mile in diameter. The island is a strip of low coral surrounding a lagoon, and thickly covered with cocoa-nut trees. There is a small break in the island on the eastern side, but the passage is not available for entering the lagoon. The only landing is on the west or lee side of the island, and is not always practicable on account of the surf. North Keeling is looked upon as the sanatorium of the place. Cases of beri-beri are sent there and put under a course of mineral waters found on the island, and in which they have great faith.

A spit is said to extend about one mile northward of the island, and heavy rollers at times rise suddenly off the south point, making it dangerous to approach. Soundings extend for a distance of 5 miles S.S.W. of the island, and also it is said for 3 miles to the eastward.

GLENDINNING SHOAL. — Captain Glendinning of the English barque *Queen Mab*, 1860, reports having passed a dangerous shoal situated about 130 miles N.N.E. (true) from the Keeling or Cocos islands, in lat. 9° 54' S., long. 97° 50' E. (approximate), and lying directly in the track of vessels from Sunda strait to the Cape of Good Hope during the south-east monsoon. Discoloured water was observed for a distance of 10 miles, but 7 fathoms was the least water obtained on passing the shoal. In 1865 H.M.S. *Serpent*, Commander C. Bullock, passed over this reported position. No indication of the existence of such a shoal was found, and no bottom was obtained with from 140 to 470 fathoms of line, over a space of 30 miles.

CHRISTMAS ISLAND, about 9 miles in length, and nearly square, is situated about 220 miles south of Java head, and nearly on the track of vessels proceeding to Sunda strait from the Cape of Good Hope in the months of April to September, and from Sunda strait in the opposite period. It is covered with trees, principally limes and cocoa-nuts, the tops of which may be seen from a distance of 30 miles in clear weather. (Captain G. Richardson of the *Pigot*, searched for the anchorage in 14 or 15 fathoms, reported to lie off the north end of the island, but found none; two of his boats were employed sounding around the island for a period of 2 days.) The island was found to be steep to all round, with a depth of about 100 fathoms, at the distance of one cable from the shore.

The only practicable landing place is on a coral beach on the north-west side of the island. Wild hogs were seen by the party who landed, but no

running water was discovered. The centre of the island is assumed to be in lat. $10^{\circ} 31' S.$, long. $105^{\circ} 33' E.$ *

JAVA HEAD,† the western extremity of Java, is a bluff promontory at the foot of high land, and is discernible at a considerable distance in clear weather.

Caution.—When making Java head in hazy weather, the appearance of the land to the eastward of cape Sangian Sira, between it and Sodon point, bears much resemblance to the high land of the west point of Java, with the adjacent hills on Princes island; and the low land in such circumstances not being distinguishable at a distance, the position of it is often mistaken for the entrance to Princes channel.

Cape Sangian Sira.—From Java head the coast trends S.E. by S. about $3\frac{1}{2}$ miles to Palembang point, which is 2 miles northward of cape Sangian Sira the most southern point of this part of Java. From this cape, and $1\frac{1}{2}$ miles to the southward, several rocks project, some of which are above water. The soundings are very deep close to these rocks, and along the shore as far as Java head there is no bottom with 100 fathoms; but as the breakers which line the whole coast seem to indicate that there are rocks under water, it will be advisable to give the shore a berth of at least 2 miles in passing.

Klapper (Breakers) Island, named by the Malays, Pulo Deli, lies 8 miles from the nearest shore of Java, and about 18 miles S.E. by E. $\frac{1}{2}$ E. from cape Sangian Sira. It is low, covered with large trees (those along the beach being cocoa-nut), and is surrounded by a reef, which in many places stretches off a distance of one mile. On the north-west side there is a good watering place in the south-east monsoon, and boats can enter a stream through a channel with reefs on both sides. Vessels may anchor in 18 to 24 fathoms, clay bottom, 2 miles from the island, close to those reefs which partially dry at low water. The depths are from 30 to 40 fathoms at 4 miles off the south shore of the island.

Trowers island (Pulo Tinjil), is nearly of the same circumference and outward appearance as Klapper island, from which it lies E. by N. distant 13 or 14 miles. This island is also surrounded by a reef.

On the north, and west sides of this island there are from 13 to 19 fathoms water, and at the south-east, and south sides, at some distance, no bottom at 50 and 100 fathoms. A rock is reported to exist at one mile northward of the island, and on which native craft have sometimes struck.

* See Admiralty chart:—Indian ocean, northern portion, No. 748*b*.; scale, $d = 0.5$ of an inch.

† See Admiralty charts:—Sunda strait, No. 2,056; scale, $m = 0.3$ of an inch; and Eastern Archipelago, western portion, No 941*a*; scale, $m = 2.75$ inches.

Between Trowers island and Sangian Sira there is no shelter from S.W. and S.E. gales; also rocks in some places lie $1\frac{1}{2}$ and 2 miles off shore; eastward of Sodon point, a patch of $2\frac{1}{2}$ fathoms lies $1\frac{1}{2}$ miles off shore.

SUNDA STRAIT.

VARIATION $2^{\circ} 0'$ E. in 1886.

GENERAL DESCRIPTION.—Sunda strait, through which passes a large portion of the trade of China, as also most of the trade of Batavia, Singapore, and other ports in the Java and China seas, separates the large islands of Java and Sumatra. Between cape Sangian Sira the most southern part of the western extreme of Java, and Flat cape the southern extremity of Sumatra, which forms the western limit of the strait, the distance is 68 miles, in a N.W. $\frac{1}{2}$ N., and S.E. $\frac{1}{2}$ S. direction; and from the western, to the eastern limit of the strait, which lies between St. Nicholas point the northern extreme of Java, and the opposite coast of Sumatra, the distance is 74 miles; the general direction of the track for shipping being about N.E. and S.W. The narrowest part of the strait is at its north-east end, where the distance between Fourth point in Java, and Hog point in Sumatra, is but 13 miles. This part of the strait is divided into two channels, each about 4 miles wide, by Thwart-way island, which, no doubt, received its name from the circumstance of its lying right in the middle or fairway of the narrowest part of the strait.

In the strait are several islands forming different channels, by which it may be entered from the westward; but Princes channel and Great channel, both on the south side, are those most commonly used.

The Great channel is limited on the north side by the conspicuous Krakatoa island, between which and the coast of Sumatra are three channels, formed by Sebesi (Bezee,) and Sebūko islands, all now very dangerous and should be avoided.*

VOLCANIC ERUPTION.—The volcano of Krakatoa island was in eruption in the year 1680, and although included within the category of active volcanoes it remained in a state of comparative inactivity for upwards of 200 years.

In the year 1883, on May 20th, the volcano burst into eruption, accompanied by earthquakes, which were severely felt at Batavia, and at the same time vast showers of pumice and ashes were projected to a great distance. This eruption was observed from the Imperial German ship *Elizabeth*, and on the following day, when 100 miles from Krakatoa, a

* See Admiralty charts:—Sunda strait, No. 2,056; scale, $m = 0.3$ of an inch; and Sumatra island, sheet II., No. 2,761; scale, $m = 0.1$ of an inch.

shower of dust was experienced which was estimated to become a layer one inch in thickness in 24 hours, and dust was observed to be still falling when the vessel had gained a position 300 miles south-west of Sunda strait.

On 26th August 1883, Krakatoa again burst into eruption, and of such a terrible nature that miles of coast on both sides of the strait were wholly devastated, and multitudes of people perished. On the 27th August, a succession of earthquake waves swept the shores of the strait, utterly destroying the towns of Anjer, Merak, Tiringin and Telok Betung, together with some of the lighthouses on both shores. This remarkable disturbance of the sea made itself felt in various parts of the world upon the same date, notably in Australia and Southern Africa, also at Karachi in India.

The vast amount of pumice which lay upon the surface of the sea, in some places many feet in thickness, gave an appearance as if the ocean bed had appeared above water.

The changes in the locality, resulting from the eruption, are partly defined by surveys executed by the Netherlands Government surveying vessel *Hydrograaf*, 1883-5, but it is advisable to take every precaution when navigating near the shore, or coming to an anchor.

Winds.—In Sunda strait the wind varies from S.S.E. to E.S.E. during the south-east monsoon, April to October; and from W.N.W. to N.W. in the north-west monsoon, with intervals of calm.

In the northern approach to Sunda strait, during the south-east monsoon period, a N.E. wind will sometimes blow for weeks, usually in the forenoon, rendering it advisable to anchor under the Java shore when the tide is adverse.

Tides.—Currents.—In the narrow part of Sunda strait the tides are greatly influenced by the winds in the Indian ocean and the Java sea, and frequently resemble currents more than regular tides. It is high water, full and change, in westerly monsoon, at 6 a.m. rise at springs 3 feet.

During the south-east monsoon, in Anjer road, the ebb often sets to the westward from one to 2 miles an hour, continuing to run sometimes about 14 hours, with a slack or flood of 6 hours; off Thwart-way and Button islands it often runs 14 hours at a time to the south-west, from 2 to 3½ miles an hour, then changes and sets to the north-westward and northward, but with much less velocity. At other times the ebb sets for about 6 hours to the south-west, and the flood for about the same time to the north-east with nearly equal velocity, about 3 or 3½ miles an hour at springs.*

On the south-east coast of Sumatra, in this monsoon, there is seldom any north-east or flood-stream, and it never exceeds one mile an hour, but the ebb is increased by the prevailing current running south-westward.

During the westerly monsoon, between Java and Thwartway, the tide has also been found to run 3 or 3½ miles an hour when at its greatest

* See foot-note, page 231.

strength, the ebb 6 hours to the south-west, and the flood the same length of time to the north-east; but this flood stream seems to be of rare occurrence, as,—observations taken at anchor 6 miles west of Tyringen, also between Button island and St. Nicholas point, during the westerly monsoon period (March) gave a current from 2 to 4 miles an hour, varying in directions from S.S.E. to S.W. There was no northerly set for the four days during which these observations were made. The master of the English barque *Bowfell*, October 1884, also states, “that from Fourth point to St. Nicholas the current both inshore and in the fairway runs to the south-west, and according to his pilot’s account there is no north-east stream. At irregular times it slack, and then starts again about W.N.W., turning to S.W. and S.S.W. at times as much as $2\frac{1}{2}$ or 3 knots an hour, and off St. Nicholas point from $3\frac{1}{2}$ to 4 knots.”*

Flood and ebb streams run on the Sumatra side of the strait when the monsoon is strong, (December to February) principally northward of the Zutphen islands; but the flood apparently has never much strength. From east and westward of those islands a current sets off towards the middle of the strait, and to the south-westward, at the rate of 2 to 3 miles an hour.†

SOUTH SHORE.

PRINCES ISLAND, or Pulo Panaitan, separated from the west end of Java by Princes channel, is the largest island in Sunda strait. Its greatest length, between the west and north-east points, is 12 miles, and its breadth about 8 miles. It is of an irregular form, projecting to a point on the north-east side, and having a large bay on the south-west side, the horns of which form the west and south points of the island. The middle and eastern parts of the island are hilly, the highest peak, 1,450 feet above the level of the sea, being on the eastern shore; but in some parts, particularly at the west end, the land is level and low fronting the sea; all parts of the island abound in wood.

The west point of Princes island is fronted by a reef to the distance of about $1\frac{1}{2}$ miles, several rocks of which are seen above water; on the north-west, and north sides, the island is steep to close to the fringe of reef which edges those shores.

A fringe of reef extends from the north-east point of the island, and along the shore on each side. A similar fringe extends about a third of a mile off the south-east point of the island; nearly 2 miles W.S.W. of

* Some observations by the Netherlands surveying vessel *Blommendal*, 1886, appear to confirm the statement that the set of the stream is mainly south-westward, during the greater part of the year.

† In February and March a current of 4 to $4\frac{1}{2}$ miles an hour sets sometimes in among Zutphen islands to the W.S.W., or round them towards Hog point, which requires great caution in vessels passing those islands. Horsburgh.

which, close in shore, and near a conspicuous White rock, is a coral reef, upon which the sea is always breaking.

Carpenter Rocks are a group about one mile in extent, projecting from the south point of Princes island. Most of the rocks are above water, and the sea is usually breaking over them. There is no bottom at 50 fathoms a short distance from these rocks.

Casuaris bay, on the south-west side of the island, is 4 miles deep, and has at its entrance soundings varying from 30 to 50 fathoms, decreasing inside to a convenient depth for anchoring; but being open to all winds between west and south, it is not frequented, and cannot be recommended.

Water.—According to Horsburgh, a vessel in want of water may anchor on the eastern side of this island in 35 fathoms, soft ground, about half a mile from the shore, with the peaked hill bearing about N.W. by N., and fresh water may be obtained here from a stream in the eastern part of a small sandy bay, where the casks must be filled at about 100 yards up, the higher the better, otherwise the water will be brackish.

It is, however, only in the north-west monsoon that water can be procured here, for in the south-east monsoon all the springs are dry from want of rain, and there is, moreover, no safe anchorage in this monsoon along the east side of the island, as it is a dead lee shore.

PRINCES CHANNEL, between Carpenter rocks off the south end of Princes island, and Friars rocks off First point of Java, is 3 miles broad at its narrowest part, and possesses the great advantage of affording anchorage to vessels when becalmed, which Great channel does not. Light baffling winds and calms are very common about the entrances to Sunda strait, occurring even in the strength of the south-east monsoon, and vessels when not able to anchor are liable to be set back by adverse currents.

The depths in this channel are much greater on the Princes island, than on the Java shore. Close to Carpenter rocks there is no bottom at 50 fathoms; with Peaked hill, on the south-east part of the island, bearing from N. by W. to W. by N., there are 10 to 30 fathoms, coarse sand, shells, and coral, little more than one cable distant off shore; with the same hill bearing from N.N.W. to S.W. there are 36 to 44 fathoms at about one mile from the shore. Towards Mew bay, on the Java shore, the depths decrease to 20 fathoms and less.

DIRECTIONS.—In the south-east monsoon, when proceeding either way through Princes channel keep closer to the Java coast than to Princes island.

In the north-west monsoon it often happens that vessels bound out of the strait, get quickly to the westward by proceeding through Princes channel, while those using Great channel are detained by heavy squalls and adverse currents. Indeed, instances have occurred in which vessels have worked through this passage in a remarkably short time during a westerly

gale, by carrying a heavy press of sail, and tacking between the squalls, when it was impossible for any vessel in Great channel to beat against the current and heavy sea.

Proceeding through Princes channel in this monsoon, keep near Princes island and Carpenter rocks, especially when working out against westerly winds, for a current will then sometimes be found setting to the westward. It is, moreover, very important to keep close to Carpenter rocks when working out, to avoid being set upon the rocks near Java head and Palembang point by the heavy swell, for being once outside anchoring ground, and in a calm, a vessel would have much trouble to clear the coast of Java. The south-east coast of Princes island must not, however, be approached within one mile.

GREAT CHANNEL lies between the north point of Princes island and the south point of Krakatoa island, which are 23 miles apart; and although too deep for anchorage, it is much frequented, being the widest passage into the strait, and is considered to be clear of danger. As far as at present ascertained, the eruption of Krakatoa has not affected the navigation of this channel. If the strait be entered by this channel, keep Princes island aboard, and when farther in the strait keep on the Java shore.

JAVA COAST. — **First point.** — The coast between Java head and First point forms a bight, and is fronted by high rocks stretching out a considerable distance in some places. First point, or Tanjong Along-ajang, the south point of entrance into Princes channel, has a conspicuous rock lying abreast of it, which rises abruptly out of the sea, and is steep-to. Close to the northward of First point there is another rock above water, which together with the former are named Friar rocks.

LIGHT.—From a white stone lighthouse, 131 feet high, erected on First point, is exhibited at an elevation of 260 feet above high water, a *flashing* white light, *every half minute*; each flash being of *six seconds* duration, followed by an eclipse of *twenty-four seconds*. The light is visible between the bearings of N. 17° W. through east, to N. 84° W., (except when obscured by Princes island), and should be visible in clear weather from a distance of 23 miles. Position, lat. 6° 44½' S., long. 105° 11½' E.

Mew island, or Pulo Kanti, lying about 2 miles eastward from First point, is nearly 2 miles in extent north and south, and one mile east and west. The island is hilly, and abounds with wood. Between it and First point, and close in-shore, is the Mew stone, a small rock above water. The shore is rocky on the outside of Mew island, but safe to approach; the soundings decrease gradually to 8 or 9 fathoms.

Between Mew island and the main there is a narrow but safe channel, with depths from 10 to 5 fathoms, sandy bottom. When taking this passage, keep close over towards Mew island, to avoid Watson bank,

which lies near the Java shore. Sometimes the sea breaks upon this bank.*

Water.—To the eastward of Mew island, on the Java shore, there is a good watering place in the south-east monsoon; the water is excellent, and is poured by a cataract upon the beach. Large boats may approach this spot at high water through a narrow channel in the reef, and fill the casks by a hose; at low water they will require a great length of hose to reach the boats.

A little to the northward of the watering place, and about half a mile from the Java shore, lies a coral reef about a cable in extent. Upon its shoalest part there is one fathom water, and all round from 5 to 6 fathoms. A vessel standing in for the watering place, must steer between this reef and the island, and anchor in 9 or 10 fathoms.

In the south-east monsoon there is also a good anchorage a little farther out, with the north point of Mew island bearing about W. $\frac{1}{2}$ S., and the east point S. by W., in 16 to 19 fathoms water, sandy bottom.

Plenty of wood may be obtained from Mew island or the main land.

Tides.—It is high water, full and change, at Mew bay at about 6h.

Second Point, or Tanjong Gukulang, consists of a low foreland somewhat broad in appearance, the western extremity of which lies about N.E. by E., nearly 9 miles distant from First point, and its northern extremity, which is usually known as Second point, about 3 miles farther to the north-eastward. It may be approached without danger to the distance of one or even half a mile, and in from 26 to 20 fathoms water, the reefs projecting but a little way off shore.

From Mew island towards Second point, reefs project half a cable from the shore, having from 5 to 6 fathoms water close to, which increases rapidly to 10 and 20 fathoms; with due care and attention to the lead, a vessel may approach the shore in order to anchor. Sometimes native craft may be met, having turtle, fowls, and cocoa-nuts for sale.

WELCOME BAY.—At a distance of 20 miles N.E. by E. from Second point is Third point, and between is a deep bight, named Welcome bay, which in the south-east monsoon affords good shelter, but should be avoided in the south-west monsoon. There is, however, good anchorage in the south-west monsoon, when the wind is not too northerly, south-eastward of Second point in 9 or 10 fathoms water; but this anchorage should be approached with great caution, as the soundings decrease very suddenly near Second point, and a shoal with 12 feet water, and 6 fathoms close-to, extends half a mile off shore between Second and Taming points.

The west side of the bay trends from Second point about S.S.E. $\frac{1}{2}$ E. 11 miles, about the middle of which the beach forms a small bight, with

* See Admiralty plan of Mew bay, scale, $m = 1.5$ inches, on chart of Sunda strait, No. 2,056.

4 fathoms at its entrance, but only one fathom a short distance within. The whole of this side of the bay is skirted by reefs, some parts of which are one mile distant from the shore.

Lieutenants Rietveld and Boom, Netherlands Royal Navy, surveyed Welcome bay in 1841, and determined the positions of the shoals and islands given below. A large portion of the bay, inside Panter and Rocky ridge reefs, has not been examined, but it is supposed to be dangerous.

Andellan, and Little Andellan, are two islets lying contiguous to the south-west shore of the bay, about 8 miles from Second point. Three sand-banks, each surrounded by a sunken reef, lie from half to three-quarters of a mile off these islands, in a N.N.E., East, and S.E. direction. Between these banks and Andellan the depths are from 4 to 6 fathoms, mud; and between that island and the shore from three-quarters to $1\frac{3}{4}$ fathoms. Near the head of the bay, to the eastward of Rongit islet, is a fourth bank.

The distance across from the southern shore of Welcome bay to the south coast of Java is about 3 miles, and the sound of the surf on the south coast may be distinctly heard across the isthmus.

The eastern shore of the bay is 22 miles in length, from the head of the bay to Third point, in a direction about N.N.E., and the general depths are 15 to 24 fathoms at some little distance from the coast. Several islets and dangers lie off this shore. Baddu is a small islet, surrounded by a reef, lying about 5 miles from the head of the bay, and about $1\frac{1}{2}$ miles northward of Tankyngi Parrie point. Between this point, and the islet are many coral rocks, for the most part dry at low water, with depths of 7 to 9 fathoms between them.

A large coral rock above water, usually covered with a heavy surf, lies W. $\frac{1}{2}$ N., about $1\frac{1}{2}$ miles from Baddu islet; and near it appear to be several reefs. Between the rock and the island the depths are from 6 to 12 fathoms.

Five or six miles north-eastward of Baddu islet is Plaggan point, with some islands off it, the southernmost of which is named Mangir, and the others War, Umang, and Sumur. These islands, as well as Plaggan point, are surrounded by reefs, a cable in breadth, but at one mile outside there is a depth of 15 fathoms, mud.

Rocky Ridge is a reef about 100 yards in length, mostly above water, and always covered by breakers, by which it may be distinguished at some distance. It lies about half way between the western shore of the bay and Panter reefs, with Second point bearing N.W. by W. $\frac{3}{4}$ W., distant 4 miles. The depths round it are 10 and 12 fathoms increasing at some distance to 18 and 19 fathoms.

Panter reefs are the outermost of the known dangers which encumber Welcome bay, and they lie nearly midway between Second point

and Plaggan point. From their north extremity, in 11 fathoms, Second point bears W. $\frac{1}{2}$ N., distant 6 miles. They consist of four different patches, lying in a N.N.E. and S.S.W. direction from each other, the whole being from half to three-quarters of a mile in extent. The shoalest patch has a depth of about one fathom, rock, but between and close round them are 9 and 10 fathoms, mud.

East and west of these reefs are 17 and 18 fathoms, and to the northward 20 and 25 fathoms.

Caution.—Welcome bay appears to be full of dangers not surveyed, and should be entered with extreme caution.*

THIRD POINT, or Tanjong Lussong, like Second point, is very low, although sharper, and fronted by rocks to the distance of 2 cables, from which the depths increase to 10 and 18 fathoms. Krakatoa island bears N.W. by N. from it, and is distant about 21 miles.

PEPPER BAY.—Papolle island lies about 11 miles north-eastward from Third point, and between is Pepper bay. Its shores are fronted by reefs which near the points project about half a mile, increasing their distance from the shore towards the depth of the bay, where they extend $1\frac{1}{2}$ miles. The bay is also encumbered with two dangerous reefs known as Coral bank and Panjang reef. The depths in the bay generally decrease uniformly from 14 to 4 fathoms; the latter depth will be found 2 miles off shore. In the eastern monsoon there is safe anchorage N.E. of Lawvengan islet, in 6 or 8 fathoms, soft bottom.

Coral bank.—Nearly 2 miles East from Third point is a coral bank, about 3 cables in length, the greater part of which is above water. Between this bank and Third point there is a channel of 4 to 9 fathoms water.

Lawvengan islet, situated at the head of Pepper bay, E. by S. $\frac{3}{4}$ S. distant $3\frac{1}{2}$ miles from Third point, is about three-quarters of a mile long, a quarter of a mile broad, and is surrounded by a reef which projects $1\frac{1}{2}$ cables from the north side of the islet.

Three-quarters of a mile to the north-westward and westward of Lawvengan islet are two reefs, partly dry at low water, and usually breaking.

To the southward, and in mid-channel between Lawvengan islet and the shore, is a reef with 3 feet water, between which and the island there is a narrow channel, with 3 and 4 fathoms; between the reef and the shore are several small coral reefs that dry at low water.

Panjang reef is a ledge of rocks, the north-west point of which bears W. by S. $\frac{3}{4}$ S. $1\frac{1}{2}$ miles from the north-west point of Papolle island. It is one mile long, half a mile in breadth, and has a least depth of 3 feet. This ledge, being steep-to, is dangerous, as the sea does not often break

* Captain C. Fellowes, H.M.S. *Cruizer*, 1857.

upon it; but by keeping a good look-out it may be distinguished by the light colour of the water, and its brown patches.

The COAST.—**Papolle island**, small, round, and about half a mile in diameter, lies within one mile of the shore, with which it is connected by a reef; there is, however, a channel of $1\frac{1}{2}$ fathoms through this reef, fit for the navigation of small craft.

Tyringin reef, about half a mile in extent, lying 2 miles north of Papolle island, and two-thirds of a mile off the shore near Tyringin, is of coral, partly above water, and generally breaks. It is steep-to, having 6 fathoms close outside, increasing to 9, 12, and 15 fathoms at 2 miles distance from the shore.

Between this reef and a rock near the shore there is a depth of 3 fathoms.

Anchorage.—A convenient anchorage in 7 fathoms, clay, will be found to the northward of Tyringin reef, at $1\frac{1}{2}$ miles off shore, with Papolle bearing S. by E.

The Coast from Tyringin trends nearly north, and may be approached to 2 miles distance, in 18 fathoms. The general appearance of the coast is low, though occasionally interrupted by hills and conspicuous rocky points.

Catharine rock, lying about 4 miles to the southward of Fourth point, and half a mile off shore, is about $2\frac{1}{2}$ cables in extent, in the direction of the coast, with two rocky heads above water near the centre, and which are visible about 3 miles.

A small patch of 3 fathoms lies 3 cables N.N.W. of the rocks above water, with 6 fathoms between. The coast should not be approached within one mile, or in less depth than 12 fathoms. Between Catherine rock and the shore there is said to be a depth of 4 fathoms.*

FOURTH POINT, or Tanjong Tykoneng, distant nearly 27 miles north-eastward from Third point, is low, but easily discerned from its numerous cocoa-nut trees. A reef fringes the shore to the distance of one to 2 cables.

LIGHT.—On Fourth point stands an iron lighthouse, painted white, 177 feet high, which exhibits, at an elevation of 180 feet above high water a *fixed* white light, visible in clear weather from a distance of 20 miles.

Anjer.—The settlement at Fourth point (formerly known as Bojong) has been named Anjer, and it is intended to remove the post office, signal and semaphore stations, and the end of the submarine cable in connection with Sumatra, from New Anjer (Merak) to this settlement. Vessels will be signalled free of charge to Batavia. A harbour master will be appointed, and drinking water free of charge will be obtainable from a reservoir near

* A wreck lies one mile S.W. $\frac{3}{4}$ W. of Catherine rocks. Hague Notice to Mariners, No. 29 of 1886.

the Bojong river. Native pilots for Sunda Strait and Batavia will be found here.

Old Anjer formerly situated $2\frac{1}{2}$ miles north-eastward of Fourth point was destroyed by the earthquake and tidal wave in 1883; but a new native settlement has been formed there which furnishes supplies as stated below.

Anjer river close westward of this settlement is 40 yards in breadth, with a depth of 3 to 6 feet at low water, and affords good landing for boats in the easterly monsoon; but the Paku river situated half a mile to the northward, and which has a least depth of 2 fathoms is to be preferred. The Paku is about 80 yards wide, and has some rocks near the entrance, which may be avoided by keeping close over to the reef extending from the south point. During the easterly monsoon, small craft will find anchorage in 4 to 5 fathoms, within the entrance, avoiding patches of 2 fathoms (the ruins of the former settlement).

Anchorage.—There is anchorage in Anjer road in 14 fathoms, fair holding ground, with Fourth point bearing S.W. $\frac{1}{4}$ S.; and the summit of Thwartway N.W. $\frac{1}{4}$ N., at half a mile from the shore reef; from thence the depths decrease uniformly to 9 and 8 fathoms at about a cable from the reef which fringes the shore. This is but an indifferent roadstead in the north-west monsoon, and landing is then dangerous on account of the high surf. Sailing vessels have frequently found themselves in dangerous proximity to this reef from anchoring in too small a depth of water, and with no room to veer in the event of sudden and violent squalls, which, as in most tropical countries, are very common in this strait.

Supplies, &c.—In the south-east monsoon, vessels both outward and homeward bound, often call at Anjer for supplies. Buffaloes, poultry, vegetables, fruit, hogs, sheep, turtle, and water are to be procured. Native craft from Anjer, with supplies, will be met with in Sunda strait, and even as far northward as the Brothers.

THWART-WAY ISLAND, or Pulo Sangian, 500 feet high, lying in the middle of the narrowest part of Sunda strait, is easily recognised by its irregular shape. From the north-eastward or south-westward, the island appears as five islets, the earthquake wave having swept through it, destroying all the trees in the low ground and valleys, but there is no change in the contour of the island, or in the depths around. It is $2\frac{1}{4}$ miles long in a N.N.W. and S.S.E. direction, and steep to on its northern and eastern sides beyond one cable distance. Off its southern extremity a reef projects about 3 cables, on which a rock above water is visible; southward of the reef are depths of 17 to 20 fathoms, sand.

The west side of the island forms a bay, in which there is good temporary anchorage in 13 fathoms, sand, with the extremes of the island N. $\frac{3}{4}$ W. and S.E. by E. $\frac{1}{2}$ E. The south-westerly set in Sunda strait causes strong eddies in this bay.

Brabands or Cap Island (Pulo Ular); is a small round island, about a cable in diameter, lying about E.S.E. 4 miles from the south-east end of Thwart-way island.

A shoal of 2 fathoms lies 2 cables off the Java shore, with Brabands island bearing N.W. by W. distant one mile.

Brouwers Sand is a bank lying off the Java shore, between Brabands and Merak islands. It is composed of hard sand, and extends nearly 3 miles along the coast in a N.E. by N. direction, with a breadth of 2 cables. There is a depth of $4\frac{1}{4}$ fathoms on the south part of the bank with from $4\frac{3}{4}$ to $7\frac{3}{4}$ fathoms over the remainder of the bank. Its southern limit is $2\frac{1}{4}$ miles N.E. from Brabands island; and its northern end forms with Merak island a channel 2 cables wide, with depths of 10 fathoms.* It affords convenient anchorage for vessels working through Sunda strait.

Between this bank and the shore there is a channel one mile wide, with 6 to 10 fathoms water, which increases in the direction of Brabands island to 15 and 20 fathoms. Krunjo rock, which dries at low water, lies about 2 cables off shore, with Brabands island bearing S.W. by W. $\frac{1}{4}$ W., and the west point of Merak island N. $\frac{3}{4}$ W.

The depths close to the west side of Brouwers sand are from 10 to 15 fathoms, increasing to 19 and 20 fathoms at the distance of one mile. When standing inshore, Brabands island should be kept inside of Fourth point, as the island in line with Fourth point leads only just outside the edge of the bank.

GREAT MERAK ISLAND, or **Pulo Merak Besar**, lying N.E. $\frac{3}{4}$ N. $5\frac{1}{2}$ miles from Brabands island, is of considerable height; nearly round, and about half a mile in diameter. Within it is New Anjer road.

LIGHT.—A fixed white light is exhibited from the northern hill on Great Merak island, at an elevation of 218 feet. It is visible from a distance of 10 to 12 miles over an arc extending seaward of Fourth point to within one-fourth of a mile westward of St. Nicholas point, except where intercepted by islands. Position, lat. $5^{\circ} 56\frac{1}{2}'$ S., long. $105^{\circ} 58\frac{3}{4}'$ E.

A **Semaphore** is placed just eastward of the lighthouse.†

Bank.—A small patch of coral, with a depth of $4\frac{1}{2}$ fathoms, and steep to nearly all round, lies with Merak lighthouse, bearing about S. $\frac{1}{4}$ E., and distant $1\frac{1}{4}$ miles. When the current is running from one to 2 miles an hour, the bank is marked by ripples, and sometimes by discoloured water.

Little Merak Island, or Pulo Merak Kechil, lies near the shore, about half a mile south-eastward of Great Merak island. It is con-

* Brouwers sand, previous to the earthquake, had in one place a depth only of $1\frac{1}{2}$ fathoms, with a general depth of $3\frac{1}{2}$ or 4 fathoms.

† See page 237, Anjer, on intended removal of semaphore, &c.

nected to the main by a dam. A small pier extends from the north-east side of the island.

NEW ANJER is the name of the town built to replace Anjer, which was destroyed by the earthquake in 1883. It is situated on the point of the mainland, north-eastward of Great Merak island.

A post office and telegraph station are established at New Anjer (in place of that destroyed at Old Anjer).*

A Telegraph Cable connects New Anjer to Kalianda, on the eastern shore of Lampong bay, Sumatra, the position of which marked by buoys, will be seen on the chart.* Vessels are prohibited from anchoring near the cable, but should such a necessity arise, the anchor is to be weighed as soon as practicable without making sail.

NEW ANJER ROAD (Merak Harbour), nearly half a mile in extent, is situated between Merak islands and the main coast of Java.†

Tarrembu Bank, nearly 2 cables in extent, lies in the south entrance to the road, midway between Merak islands. On its north-western part is a patch nearly a cable in extent, with a rock which dries. A patch of $3\frac{1}{4}$ fathoms lies half a cable northward of this rock; and a bank of 4 to $4\frac{3}{4}$ fathoms lies $1\frac{1}{2}$ cables north-north-eastward of the rock.

Anchorage.—The anchorage with south-west winds is northward of Tarrembu bank and other patches, in from 8 to 10 fathoms, with the lighthouse on Great Merak bearing West. It is not considered safe for large vessels in the north-west monsoon, as a heavy swell sometimes sets into the harbour, but small vessels will always find shelter under Merak island.

Directions.—The channel into the harbour north of Great Merak is the one recommended; it is more than a cable in breadth, and has depths of 7 to 10 fathoms. In entering, keep Great Merak island aboard. Steam vessels may enter the harbour by south channel, on either side of Tarrembu bank, as there are depths of from 5 to 8 fathoms water in each, but it is not practicable for sailing vessels as there is always a strong adverse current.

ST. NICHOLAS POINT.—The coast from Great Merak island trends in a north-easterly direction about 5 miles, to St. Nicholas point. About midway between is a small islet, named Tempoza, near the edge of the reef fronting this coast about a third of a mile; close to this reef are depths of 10 to 15 fathoms. The shore should not be approached nearer than half a mile, or in less than 20 or 18 fathoms water, unless the wind and current

* See page 237, Anjer, on intended removal of telegraph, &c.

† See Admiralty plan of New Anjer road; scale, $m=4.4$ inches, on chart of Sunda strait, No. 2,056.

are unfavourable, when good anchorage will be found in the bays along this shore, in from 8 to 10 fathoms.

St. Nicholas point is the extreme end of the high bold promontory forming the northern point of Java. Dangers extend about a third of a mile off the point, with 11 fathoms close to, and 30 to 35 fathoms at a distance of one to 2 miles.

Toppers (Button) Island, about one cable in diameter, is 230 feet high, steep, and covered with trees. It lies well out in the fairway of Sunda strait, 5 miles N.E. by E. $\frac{1}{4}$ E. of the high part of Thwart-way island, and has 30 fathoms close-to and about 55 fathoms at 3 cables distant.

The CHANNEL between Thwart-way and Zutphen islands is 4 miles wide, with two dangers, viz., Stroom rocks off Thwart-way, and Winsor rock off Toppers (Button) island. Owing to the great depth of water, 40 to 50 fathoms, it is not so convenient as the channel between Thwart-way and Java, where the depths being only 20 to 30 fathoms, greater facility is afforded for anchoring in calms. Horsburgh says that the channel between Thwart-way and Sumatra is much frequented in the westerly monsoon by vessels bound to the westward, being shorter although more contracted than the other channel between Thwart-way and Java. The former may be adopted with a steady wind, for in such case, with the westerly current, a vessel will get speedily through; but in light baffling winds, she is liable to be drifted about by strong tides or currents near Stroom rocks, where the water is too deep for anchorage.

Stroom Rocks, lying N.N.W. $\frac{1}{3}$ W. $1\frac{3}{4}$ miles distant from the west point of Thwart-way, are a group of rocks with some of their heads just above high water. At times they may be seen at a considerable distance by the breakers on the reef which connects them under water. They are steep to, having 40 and 50 fathoms near them.

A rock, said to be well known to the local pilots, lies one mile south-east from Stroom rocks.

The currents which meet here from the north and east are very strong, and with the opposite wind, causes such strong eddies, that it almost appears as if Stroom rocks are connected to Thwart-way.

Winsor Rock, marked by tide rips, has a least depth of 14 feet, with other rocks close to, beyond which the depths increase suddenly to about 30 fathoms in all directions. From the rock the summit of Toppers island bears S.E. by E. $\frac{3}{4}$ E., distant $1\frac{1}{2}$ miles, and in line with Merak light.

DIRECTIONS.—With a steady and commanding breeze a vessel from about 2 miles off Third point may steer N.N.E. $\frac{3}{4}$ E. for Fourth point, passing it at about the same distance, thence on the same course, westward of Brabands island, taking care not to borrow too close on

Brouwers sand in passing, observing that Brabands island shut in with Fourth point leads westward of it.

The winds, however, frequently become light and variable, and she may be compelled to anchor, in which case it is better to keep well in with the Java shore, avoiding the dangers in Pepper bay, which should not be approached under a depth of 14 fathoms.

When the current is running to the westward in the middle of Sunda strait, an eddy will be experienced near the land; besides which, a vessel may anchor anywhere along the shore, except near Fourth point, where the bottom begins to get foul and rocky. When working to the north-east, therefore, it is advisable not to keep too far in the offing, in order to make the eddy available, and not to lose favourable anchoring ground, and perhaps be compelled to anchor in deep water.* See also p. 259.

When northward of Button island, if bound to Banka strait, steer about N. by E. for Two Brothers; if bound to Batavia, pass St. Nicholas point at the distance of 2 miles, and shape course about E. $\frac{1}{2}$ S., which will lead midway between Babi island and Pontang point, and to the entrance of Inner or Dutch channel, the one most frequented by vessels entering Batavia road from the westward. See page 272.

NORTH SHORE.

The SOUTH COAST of SUMATRA, which forms the north shore of Sunda strait, between Flat cape on the west and Hog point on the east, a distance of 70 miles, is indented by two large bays, named Semangka or Keyser, and Lampong, the shores of which are fronted by numerous island and rocks.†

Flat Cape, Vlackenbuk, or Pamantyooss point, is the south-west extremity of Sumatra, and the north-west boundary of Sunda strait; the neck of land of which it is the western extremity separates Keyser bay, on the east side, from Blimbing bay on the west side. The south part of this neck of land is low and woody, the east end of it bounding the entrance of Keyser bay, is named cape Rada or Keehil, and is distant 10 miles from Flat cape.

Approaching Flat point, in thick weather, when the land cannot be seen, the soundings will be a good guide, but it is not advisable to get into less than 20 fathoms.

A reef fringes the shore of Flat cape and thence to cape Rada, but at one mile distant there are depths of 7 to 10 fathoms.

* See foot-note on page 231.

† See Admiralty charts:—Sunda strait and its approaches, No. 2,056; scale, $m=0\cdot3$ of an inch; and Sumatra, west coast, sheet ii., No. 2,761; scale, $m=0\cdot1$ of an inch.

LIGHT.—A *flashing* white light is exhibited from a lighthouse on Flat cape, at an elevation of 213 feet above the sea. It shows in quick succession *three flashes*, each of *two seconds' duration*, separated by three seconds of darkness, and followed by an eclipse of eighteen seconds. It is visible seaward, between the bearings of S. 42° E. and N. 84° W. from a distance of 21 to 23 miles, except where obscured by Little Fortune island between the bearings of S. 72° E. and S. 76° E. Position, lat. 5° 59' S., long. 104° 30' 40" E.

Sliman rock, on which the sea breaks, has a less depth than 3 fathoms, and lies with Tanjong Sliman (the S.E. extreme of Flat cape) bearing W. by N. $\frac{1}{2}$ N. distant one mile.

Sand-bank.—At about 3 miles south-westward of Flat cape there is a narrow bank, partly consisting of reddish sand, with depths of 8 and 9 fathoms, about 2 miles in length, N.W. and S.E., and about one mile in breadth. The depths outside this bank increase rapidly to 30, 40, and 50 fathoms, and inside of it there is a channel about 3 miles wide, with 12 and 14 fathoms. At about $1\frac{1}{2}$ miles north-westward of this sand-bank a doubtful bank of 5 fathoms is marked on the charts.

BLIMBING BAY lies northward of Flat cape. At its entrance vessels may anchor in 7 or 8 fathoms, and find a good berth with S.E. winds; but not with those from the N.W. Small vessels will be sheltered from all winds by anchoring farther inside in 3 fathoms, behind the projecting reef.*

Water.—On the east side of this bay is a small river, but its water is brackish; a fresh-water spring, however, may be found inside the south-west point, from which a reef projects from a quarter to half a mile northward.

Little Fortune Island, or Pulo Batu Kechil, lies N.W. by W. 9 miles from Flat cape, and about 5 miles from the main; it is low, woody, about one mile in diameter, and surrounded by a reef extending one mile in places.

There is anchorage off the east side of Little Fortune island in 9 or 10 fathoms.

SEMANKA or **KEYSER BAY**, situated about 12 miles to the eastward of Flat cape, extends in a north-westerly direction about 30 miles, and is about 20 miles wide at its entrance. The western shore of the bay affords no shelter from south-easterly winds, and has 20 and 30 fathoms water within half a mile of it; the eastern side, north-westward of Kalang-bayang harbour, is not so steep, and affords good anchorage about 2 miles off, in 20 or 30 fathoms; but is also exposed to south-easterly winds.

* See plan of Blimbing bay on Admiralty chart, No. 2,761.

Tamping Bay, about 3 miles to the northward of cape Rada, the western entrance point of Semanka bay, is an open light, but has good anchorage ground in depths from 12 to 15 fathoms, one mile off shore. A vessel will be exposed here to south-easterly winds, and will have much difficulty, on account of the rocky shore, in getting water from the shallow rivulets that discharge themselves into the bay.

The village of Borne lies in the north-west part of Semanka bay, at the mouth of Semanka river, the water of which is good, but boats will find it difficult to enter. The land is low, and marshy near the sea. The best anchorage is East or E. by N. from the mouth of the rivulet, one or $1\frac{1}{2}$ miles distant from the shore. Vessels lie here usually without danger from south-easterly winds, which seldom throw a very high swell so far up the bay. Near Betong point, the southern extremity of the bay near Borne, there is a rocky ledge which projects more than one mile, with 10 fathoms near it.

Labúan island, lying nearly in the middle of the entrance of Semanka bay, is high and steep-to all around, the only anchorage being on the north-east side in 25 to 30 fathoms, sand, and very near the shore. The anchorage is a very indifferent one in the westerly monsoon. There is fresh water on the island, but the high surf renders landing difficult.

Kalang-Bayang Harbour, on the eastern side of Semanka bay, and about East from the north point of Labuan island, is small, but safe, and affords good shelter from all winds, with sufficient depths of water for large vessels; it may be easily recognised by the high and rocky Eyu island, which lies about a mile to the southward, and can be seen about 15 miles. Half a mile north-westward of Eyu island lies Kelapa island, with a single cocoa-nut tree upon it. There is a safe channel with 25 fathoms water between these islands.*

Supplies.—Water may be obtained from a small rivulet in the north-easterly part of the bay, whence there is a road leading to the kampong, or village, which is situated in a valley, about three-quarters of a mile from the landing place, and where probably supplies may be obtained.

Directions.—In the north-west monsoon, enter the harbour by the western passage, between Kelapa island and Napal point, and when the latter bears about West, or W. by S., anchor near the eastern beach in 10 fathoms, mud, or anywhere in the harbour, there being no hidden danger.

In the south-east monsoon steer in about N. by E., between Eyu and Kelapa islands. With a commanding breeze a vessel may pass eastward of Eyu, between it and Vogel or Bird island on a N.N.W. course, or even between the latter island and the main, steering about N.W., but

* See Admiralty plan of Kalang-bayang, on chart of Sunda strait, No. 2,056.

this channel is narrow. Rover rocks, lying off South point are easily avoided, as most of them are above water, and should be kept to the eastward.

Kiloang Harbour lies 5 miles to the south-eastward of Kalang-bayang, and also affords safe anchorage. It may be known by Tonkali island, which is visible 12 miles, and lies off the south-east point of the harbour, being separated from the main by a boat passage.*

Kiloang island, which is small and not very high, lies near the northern beach of this harbour, with some rocks at its northern and southern extremities, a large reef to the eastward and a smaller one on its western side. Northward of Kiloang island the depths are 4 and 5 fathoms, and a high swell sometimes breaks there. Eastward of this, there is apparently anchorage in 11 or 12 fathoms, but great caution is necessary in making use of this inner portion, which is little known.

Wood.—This harbour, as well as Kalang-bayang harbour, contains various kinds of wood.

Directions.—Coming from the westward or southward with a leading wind, steer for Tonkali, till it bears East, distant 2 or 3 cables, when three groups of Black rocks will be seen, the southernmost of which bears N.N.W. from Tonkali, and S.W. from the others. Steer about E.N.E. between the island and rocks, southward of Kiloang island, in from 30 to 20 fathoms, for the eastern side of the harbour, which is very high, till Kiloang island bears West, when good anchorage may be taken in 13 fathoms, sheltered from all winds. Anchoring ground may be found in other parts of the harbour in 16 to 18 fathoms, but accompanied by a heavy swell. Vessels may run out with the land wind which blows here from the northward, but it is recommended to have a boat in attendance to tow, lest they should get becalmed under the high land. Although the bay outside Kiloang harbour is spacious, it is advisable to pass close to the westward of Tongkali.

Mountains.—The land of Sumatra, eastward of Kalang-bayang harbour and Kiloang bay, is very high, consisting of the Kalang-bayang or Tanka mountains, 3,419 feet high; and 13 miles farther to the northward the Rattah mountains, the southernmost peak of which is 5,093 feet above the sea. More westerly, and not far from the shore of Semangka bay, the Lampong mountains rise to the height of 6,560 feet and Semangka peak situated 11 or 12 miles farther to the north-westward, and near the head of the bay, reaches to 7,412 feet.

PEPPER BAY is on the north shore of Lagundi strait, on the west side of Tikus point, the south-west point of entrance of Lampong

* See plan of Kiloang harbour on Admiralty chart of Sunda strait, No. 2,056.

bay. It is about three-quarters of a mile across, and has a large three-cornered rock in the middle. The water appears to be deep.*

Batu Blantong, on which the sea generally breaks, lies about S.W. three-quarters of a mile from the west point of Pepper bay; this rock is connected with a small island $1\frac{1}{4}$ cables north of it by an uneven ridge having 11 fathoms least water.

LAMPONG BAY, formed between Tikus point on the west, and Rajah Bassa on the east, is about 20 miles wide at its entrance, and extends nearly the same distance in a northerly direction. Several islands line the western shore of the bay inside, between which and the main there are several sheltered anchorages. In every part of the bay, from north to south, will be found from 10 fathoms, mud, to 20 fathoms, clay bottom.†

The eastern side of Lampong bay, between Telok Betung and Chūdong islands, is high, free from danger, and has 14 to 15 fathoms, close-to. From Chūdong islands to Rajah Bassa the coast, at 2 or 3 cables distance, is fronted by a line of rocks on which the surf breaks heavily with westerly winds, and renders landing difficult.

Dangers.—If a vessel keep outside the islands on the western shore of the bay there are but two dangers, both of which may be easily avoided. The first is a sand-bank, dry at low water, surrounded by a reef, which rises from 17 fathoms, mud, and bears E.S.E. $1\frac{1}{2}$ miles from Kalagian island, and N.E. 2 miles from the east extreme of Pokowang island. The second is a reef of $1\frac{1}{2}$ fathoms, bearing S.E. $\frac{1}{2}$ S. $1\frac{1}{4}$ miles from the easternmost Chūdong island.

Pedada Bay, the first bight to the northward of Tikus point, on the western side of Lampong bay, is $1\frac{1}{2}$ miles wide at entrance, and $3\frac{1}{2}$ miles deep.

When running into this bay in the direction of the southern end of Kalang-bayang mountains, on a W. $\frac{1}{2}$ N. course, the soundings will be 20 to 15 fathoms, clay and mud, and the three small islands of Pedada, Penarian, and Lalanga will be seen. Pedada is the easternmost and highest; N. by E. from it about half a mile there are two detached reefs, which usually break; a third reef lies N.E., about $1\frac{1}{4}$ miles, bearing W. by S. from the north point of the bay. Keeping this last reef on the starboard bow, and the other two on the port bow, will lead to an anchorage in 15 fathoms water, very near the village of Pedada. This village is to the westward of Lalanga island, and stands on a clear fresh-water stream. The high rocky islet of Kelapa is connected with Pedada point by three groups of rocks above water, leaving, however,

* See plan of Lagundi strait on Admiralty chart, No. 2,056.

† Telok Betung at the head of Lampong bay, was destroyed by the earthquake in 1883. It is probable that parts of the bay may have altered, and therefore the information relative to it must be used with caution.

between each of them a passage for small vessels. North-eastward of Kelapa lie also three patches of rock, with 17 and 16 fathoms, clay, between; to avoid them keep Satanga island to the westward of North. This small island is also high, with a reef extending about 2 cables from its north-east point.

Pundo Bay, lying 4 or 5 miles to the northward of Pedada bay, is 2 miles wide and 3 miles deep, with 10 to 7 fathoms water. Across the entrance lies Pokowang, the largest island in Lampong bay except Lagundi, with a peak on its northern side; eastward of it is a small island, to which it is connected by a reef.

Pundo bay may be approached on either side of Pokowang. When taking the northern passage, which is preferable, the white coral reefs lying about $1\frac{1}{2}$ miles north-east of Pokowang island are seen at some distance, avoid also the reef projecting 3 cables N.E. from the island, with 15 fathoms close to. There is also a detached coral reef close to the north-west point of Pokowang, which must be kept on the port side, and another apparently off Badong point; the four coral reefs, lying in mid-channel N.W. and W.N.W. from the centre of Pokowang, will now be seen, and should be kept on the starboard side. The depth of 8 or 9 fathoms, mud, will be found a convenient anchorage, Pundo village bearing West, and the south point of the bay S.E. Entering south of Pokowang, if when near Satanga island a W.N.W. course is steered, pay attention to the discolouration of the water on the 2-fathoms bank, which, like all the other visible coral reefs projecting from the south side of the bay, should be kept to the southward, passing half a mile distant from the south shore of Pokowang in 15 to 9 fathoms.

Rateh Bay, just north of Pundo bay, is 3 miles in extent, with 16 to 18 fathoms, mud bottom; at the entrance lies Kalagian island, which is high, and has a small islet separated from its south point by a boat channel.

At about half a mile South from the east point of Kalagian, lies a coral reef, showing at low water like a black spot.

Rateh bay may be approached on either side of Kalagian; and the two reefs, which dry at low water, to the westward of the island, may be discerned at some distance, and, consequently, easily avoided. They are not in mid-channel, and lie north-west and south-east of each other, with from 4 to 9 fathoms between them and Kalagian. Three rivulets lie on the western side of the bay, on which are the villages of Sabo, Rateh, and Pinjindangon, fronted by a bank extending from half a mile to a mile off shore. Menanga village, on the north side of the bay is the largest.

Mahitam Island lies off the north point of Rateh bay, with which it is connected by a reef. There is a good anchorage on its north side, in 13 fathoms, mud.

Tagal Island, flat topped and conspicuous, bears N.E. $1\frac{3}{4}$ miles from Mahitam, and about W. by S., $3\frac{1}{2}$ miles from the Chūdōng islands. Between Tagal and the western shore some sand-banks obstruct the passage, leaving but a small channel, with 14 fathoms, mud.

In the bay north-westward of Tagal there are two villages, Ringong and Urong; and near the south point of the bay is the small island Laho, connected to the shore by a reef, which also projects to the northward. The general depth in this bay is 12 to 9 fathoms, mud, and on its northern side is the small island of Tabikel, attached to the main by a reef. Between it and Tankil island, there is a channel with 11 and 12 fathoms, mud.

Tagal island, with its flat top, is visible throughout the whole of Lampong bay. When coming in from the eastward, a vessel may steer for it on a N.W. bearing, and pass it in 15 fathoms; entering from the southward it is also a useful mark from Lagundi strait.

Tankil Island is 3 miles north of Tagal. Its north side is low, but the south is high; and from its eastern point a reef stretches off 2 or 3 cables, showing, at low water, some black spots, which may be passed in from 9 to 14 fathoms.

The Head of Lampong Bay, northward of Tankil, is about 4 miles wide, and contains four islands:—Pamagotang, an islet lying nearly 2 miles north from Tankil, is a sand bank with some trees, and is surrounded by a reef which extends to the distance of 3 cables southward and westward of it. A bank with $1\frac{1}{4}$ fathoms least water, and $1\frac{1}{2}$ cables in extent lies S.S.E. distant 4 cables from the islet. Kobur island lies about 8 cables south-west from Pamagotang, and about 4 cables off shore. Passarang is a low island, lying 9 cables northward of Pamagotang, and on the west side of Telok Betung road.

Reefs.—Besides these islands there are several coral reefs, with depths varying from one foot to 3 fathoms: the easternmost, with 3 feet least water, lies with Pamagotang islet bearing S.S.W., distant 7 to 8 cables. The north-east side of this reef is marked by a black beacon buoy. Foul ground with some shallow heads extend about 3 cables southward of the coast under Apen hill, north-east side of Telok Betung road.

Telok Betung, situated in the north-western part of the bight, is the chief place of trade in Lampong bay. Its population consists of natives of Sumatra and Bougies, with a Regent from the Dutch Government as their Chief. They trade with the Javanese in Lampong tobacco, which is highly esteemed.*

* See Admiralty chart:—Telok Betung, No. 940; scale $m = 2.6$ inches. Telok Betung was destroyed by the earthquake and tidal wave in August 1883, but is being rebuilt; the remarks, therefore, are subject to amendment.

Light.—A fixed *red* light is exhibited from an iron frame, painted white, which stands on the beach, about 330 yards north-eastward of the new pier, at an elevation of 48 feet above high water, visible in clear weather from a distance of 6 miles.*

Coal.—Telok Betung is a coaling station for vessels of the Netherlands navy.

Directions.—When bound to Telok Betung, after passing eastward of Tagal, be careful not to bring its east point to the eastward of South, in order to leave Pamagotang and the adjacent dangers to the westward. When the south point of Passarang bears southward of west, and not less than 8 cables distant on account of the reefs eastward of it, haul to the north-westward for the pier, off which, at about three-quarters of a mile distant, good anchorage will be found in 7 to 9 fathoms, mud. There appears to be good shelter for small craft, south-westward of Passarang island, in about 3 fathoms.

Panjang river, situated in a bight on the east side of the head of Lampong bay, is fronted by a sand spit extending three-quarters of a mile northward from the point southward of the river. There is apparently good shelter in the harbour from 3 to 4 cables in extent, formed within this spit, in 6 to 7 fathoms, clay; the entrance, with depth of 6 to 9 fathoms, is about half a cable wide, with the river mouth bearing about S.E. $\frac{1}{4}$ E.†

Chūdōng Islands are three in number, of which the northernmost is a steep rock, and the two others are larger, but not so high. Between them are narrow passages, with 12 fathoms water; and between them and the main the depths are from 14 to 10 fathoms, mud. From the easternmost island a coral reef projects S.E., 2 cables; and at $1\frac{1}{4}$ miles S.E. $\frac{1}{2}$ S. from the same island, lies the coral reef of $1\frac{1}{2}$ fathoms.

Kranvogel or Crane Island, 9 miles south-eastward from Chūdōng islands, and connected to the shore by a coral reef, with 9 fathoms close to its south and west sides, is difficult to discern, as it lies close to the high land, and consists only of a single rock; just to the eastward of it, however, there are some white limestone rocks on the shore.

Lobok or Blantong Bay.—To the northward of Tiga islets the Sumatra coast forms a deep curve named Lobok or Blantong bay, with depths of 4 to 5 fathoms, mud, and a salt-water river. The points of the bay on each side are fringed with rocks on which there is usually a high surf. A rock, dry at low water, and on which the sea generally breaks, lies S.S.E. $\frac{1}{4}$ E., $1\frac{1}{2}$ cables from Tanjong Blantong.

Kalianda road lies about $2\frac{1}{2}$ miles south-eastward of Lobok bay. The village is fronted by a white sandy beach, with rocks above water,

* Batavia Notice, 24th October 1865. † Information gathered from chart No. 940.

between which there are channels that make it easy to land. The submarine electric cable from Merak in Java, is landed here.

A rock of $1\frac{1}{2}$ feet lies about 650 yards from the shore, with the flagstaff bearing E. by S. $\frac{1}{2}$ S. A red beacon buoy lies close westward of it. A rock, with a depth of 3 feet, lies close eastward of the former.

The Anchorage is in from 7 to 10 fathoms, mud, with the village bearing East, distant one mile. Vessels are prohibited from anchoring near the cable, which is marked by a buoy $1\frac{1}{2}$ miles south-west of the village, from whence the cable takes a N.E. by E. and E.N.E. direction for the beacon with triangle, and the cable house at Kalianda.

Tiga Islets.—These three rocky islets lying about 7 miles southward of Blantong bay and 3 miles off shore, appear as one when coming from the eastward, and do not begin to open until Rajah Bassa road is approached. The westernmost islet is the largest, and on its north-west side a reef projects 2 cables, indicated usually by breakers; between the two south-easternmost islets there is a channel with 18 fathoms water.

Rajah Bassa road.—The land forming the south-eastern part of Lampong bay is high, and rises to two conspicuous peaks, 3 or 4 miles inland, named Rajah Bassa mountains; the height of the north-west peak is 4,098 feet, and that of the south-east peak 4,093 feet. Kalianda road lies between Lobok bay and the mountains, and Rajah Bassa road to the south-west of the mountains. Rajah Bassa road was formerly frequently visited by China traders, it being an excellent place to obtain good water with facility, and other supplies.

There are three villages on the shore of Rajah Bassa road.

Tianté village lies E.N.E. from the largest Tiga islet, and abreast that part of Rajah Bassa road where the best anchorage is. The best watering place is just north of the village.

Rajah Bassa village, is just to the northward of Cocoa-nut point, and about East from Tiga islets. Watering there is difficult, at least much more so than at Tianté, and the landing dangerous with westerly winds, as the coast there is always covered with high breakers.

The anchorage in Rajah Bassa road is between Tiga islets and the rocky bank which fronts the shore, but a vessel should not come under 12 fathoms, for the bank in some places projects to the distance of half a mile, having 7 fathoms close-to. The best anchorage is about half a mile off shore, with Cocoa-nut point in line with Hog point, bearing S.E. by E., and the north peak of Rajah Bassa E.N.E., in 12 to 16 fathoms, blue mud. On these bearings a vessel will be just abreast the watering places.

Cocoa-nut, Kelapa, or Rajah Bassa Point, the south-east point of Rajah Bassa road, is low, and covered with cocoa-nut trees.

BIGHT ISLANDS.—Between Cocoa-nut and Hog points the coast curves in north-eastward for about 2 miles, and at the bottom of this bight are the two small Bight islands surrounded by reefs. On the mainland opposite is a village near a river, and proas and small vessels find shelter there behind a projecting point. The depths throughout the bight are from 15 to 23 fathoms, decreasing near the shore to 10 and 8 fathoms.

Tims or Collier Rock, 6 or 7 feet high, 33 yards in extent, and steep-to, lies $1\frac{1}{2}$ miles north-westward of Hog point, and about one mile off shore.

LAGUNDI GROUP, lying in the south-west part of the entrance to Lampong bay, and between 2 and 10 miles eastward of Tikus point, consists of seven islands, viz., Lagundi, Rond, Saka, Sungal, Mangoman, Sussarat, and Tims; good timber, deer, and wild hogs may be obtained. Along the southern shores of the first four islands, and also along the neighbouring coast of Sumatra, 40 and 50 fathoms, hard bottom, are found close in, and the sea there in the western monsoon is very violent, but on their northern side boats can generally land. The following description is by Lieutenant Prins, Netherlands Royal Navy, but the coast line of the group is said to have been altered by the volcanic eruption in 1883, and pending further information must be used with caution.*

Lagundi, the largest island of the group, is nearly 5 miles in length, E.N.E. and W.S.W., and close to the southward of its west point are two high, round shaped rocks covered with verdure, with a boat channel between them. On the south-east side of Lagundi there is another rock or islet of the same character.

On the north side of Lagundi is Lagundi harbour (named by Captain Owen, R.N., Nanga), small, but safe, with depths of 9 to 15 fathoms. In the middle of the entrance is the small island Pattappan, behind which a vessel may find good shelter from wind and sea. Lieutenant Prins says there is room for several vessels, and that fresh water is found on Lagundi, south-eastward of Pattappan.

Mangoman island, lying a little northward of Lagundi harbour, has 15 to 22 fathoms, clay, all round, except on its eastern side, where the depths are 10 to 15 fathoms. Between Mangoman and the west point of Lagundi bay, is a patch of $3\frac{1}{4}$ fathoms; a reef also extends southward of the island for about $1\frac{1}{2}$ cables, distant about 2 cables from the former patch. When coming from the eastward or northward a mistake may

* See Admiralty plan of Lagundi strait, scale, $m=0.5$ of an inch, and Lagundi harbour, scale, $m=1.2$ inches, on chart of Sunda strait, No. 2,056; also plan of Sunda strait, on No. 941a.

occur between this island and Pattappan, but the latter is lower and smaller than Mangoman.

Lagundi strait, between Tikus point and Lagundi islands, is 2 miles wide, and may be recommended to vessels working out of Lampong bay in the N.W. monsoon. About mid-channel is Sussarat island, which is high, with 10 fathoms, sand, close-to. Near its west point there are some rocks, but they are high above water, and although this island is in the middle of this channel, yet in a calm vessels need not be alarmed by the current, which seems to set towards it; for close in the same current will set them off again, and the ripples and green patches of water are of no consequence. The passages on either side of Sussarat are equally good, and with adverse winds or currents good anchorage may be obtained to the eastward of that island, in 10 or 12 fathoms.

A Coral Reef, with 2 fathoms water, and 13 fathoms around it, lies northward of Mangoman island, with the highest point of Sussarat bearing S.W. by W., nearly 4 miles, and the middle of Mangoman S. $\frac{3}{4}$ E. The reef is about 75 yards long, and cannot be distinguished by discoloured water. When the passage between Rond island and the east end of Lagundi is open, a vessel will be north-castward of the reef. The highest point of Lagundi in line with the west point of Lagundi harbour, leads well to the south-westward.

Rond, Saka, and Sungal Islands.—Rond island, off the sea end of Lagundi, is about $2\frac{1}{2}$ miles long, in a north-west and south-east direction, and nearly one mile broad. Saka lies about one-third of a mile off the south-west point of Rond island; and Sungal about the same distance off the south-east point.

The depths in the channel, between Lagundi and Rond island, are from 19 to 20 fathoms, hard ground, but a strong current runs there. Saka has 20 or 30 fathoms close-to; but about half a mile S.E. by S., there is a rock which covers at high water, usually visible by its breakers. This passage cannot be recommended, nor that between Rond island and Sungal, for although the water is everywhere deep, the ground is foul and the current strong.

Tims Island, lying 3 miles eastward of Sungal, is small, low, consisting chiefly of red clay, and surrounded by a broad reef with heavy breakers; but the channels on either side of it into Lampong bay are quite clear.

KRAKATOA ISLAND, an active volcano, lying in the middle of Sunda strait, was, before the earthquake in 1883, about 5 miles in extent N.N.W. and S.S.E., and 3 miles broad. That portion of the island northward of the highest peak was completely destroyed by the upheaval, and the scattered fragments now form numerous banks in Sebesi channel, which is at present unnavigable. The island is now about

3 miles in length, east and west, by $1\frac{1}{2}$ miles in breadth, and from the peak which is 2,657 feet high, the north side of the island is a perpendicular cliff, forming part of the arc of the crater, which lies between it and Verlaten island. No bottom was found at 164 fathoms, about $1\frac{1}{2}$ miles north-westward of the peak, and where the larger portion of Krakatoa formerly stood. Reefs extend about one mile westward and south-westward of the island.*

The whole group of islands are covered with volcanic mud.

Formerly, good shelter was obtained in the N.W. monsoon, with the peak of Krakatoa bearing S.W. by W. distant about 2 miles, in 20 to 23 fathoms. It is probable that shelter may be found under the lee of the newly formed Calmeyir and Steel banks, but sufficient information is not at hand for directions to be given.

Tides.—It is high water, full and change, at Krakatoa island, at 7h.; springs rise 4 feet, neaps scarcely perceptible. The tides, however, are much influenced by the prevailing monsoon.

Verlaten, or Forsaken Island, lying north-west of Krakatoa, is nearly three times larger in area than formerly, and is 673 feet high. It is also an active volcano separated from Krakatoa by a channel 2 miles wide. The island is about 3 miles in length in a north-east and south-west direction, by one mile in breadth. Reefs extend about 2 miles northward from the island, and one mile eastward and westward.

Lang Island, about 2 miles long, north and south, and about half a mile broad, is separated from the north-east side of Krakatoa by a channel nearly $1\frac{1}{2}$ miles wide, and is 443 feet in height. This island does not appear to have altered very much, but the channel formerly between it and Krakatoa was only 2 cables wide. A reef stretches out from its west side nearly half a mile, and a new small islet has arisen about three-quarters of a mile west of the south point of Lang island, while Polish Hat has disappeared. A large new reef lies between Lang and Verlaten islands.

Krakatoa Channel between Krakatoa and Lang island, is about $1\frac{1}{2}$ miles wide, with deep water. As reefs extend from Krakatoa and Verlaten island, great caution is necessary in making use of this channel.

Sebesi (Bezee) or Tamarind island, bearing about N. by E., 11 miles from Krakatoa peak, is nearly 3 miles in extent north and south, and the same, east and west. This island has a high peak, resembling a sugar-loaf, which rises abruptly to a height of 2,818 feet from the southern extremity of the island, and slopes gently down to the northward. Off the north-east side, at the distance of about half-a-mile, there are three small islets named Husband, Little Tamarind, and Gorts,

* See Admiralty chart, Sunda strait, No. 2,056; scale, $m=0.3$ of an inch, and plan on No. 941a.

all of which are surrounded by small reefs having banks between them; Sebesi island produces a certain quantity of pepper. The village is on the east side, opposite Little Tamarind island.

Anchorage.—There is good anchorage around this island except on its south side, in 15 to 25 fathoms water; and at one mile from the north-east side there is an excellent roadstead, even in south-west gales, with 13 fathoms water.

SEBESI (BEZEE) CHANNEL, between Verlateu and Sebesi, is 8 miles wide; formerly, it was frequently used by vessels working out in the N.W. monsoon, in preference to the Great Channel, as the soundings were regular and vessels could anchor when convenient.

This channel is now obstructed by reefs, and should on no account be used. The two new dry reefs in this channel, named respectively Steers and Calmeyer, are low banks of mud and pumice, their configuration is continually altering, and they are stated to be gradually subsiding.

Calmeyer bank lies N.E. by N., $6\frac{3}{4}$ miles, and Steers bank, N. $\frac{3}{4}$ E., 8 miles from Krakatoa peak. Depths of less than 3 fathoms extend 3 miles southward from Calmeyer. Between Calmeyer and Steers bank the channel is foul, and has only been partially examined.

Banks extend north-westward and south-westward from Steers bank, for about $3\frac{1}{2}$ miles, and there are numerous detached and shallow patches between it and Verlaten and Lang island, rendering navigation hazardous in the extreme.

Boom rock, lying nearly half a mile off the south point of Sebesi island, is a few feet above water.

Hindustan rock with about 9 feet water, lies 2 miles south of Sebesi peak, and is but a short distance from Steers bank.

Sea rocks, bearing W. by S. 6 miles from Sebesi peak, consist of three pyramidal rocks, steep-to, and inaccessible. The southernmost, about 30 feet high, is the largest, and named Gap rock, on account of a cleft in it. They are connected under water by reefs, upon which the sea continually breaks.

SEBÚKO ISLAND, 1,398 feet high, lies N.N.E. one mile from Sebesi island, and consists mostly of craggy hills. Its extent is $3\frac{1}{2}$ miles north and south, and about 3 miles east and west. The inhabitants cultivate pepper.

Reefs and ledges project from the numerous points of Sebúko, but they do not seem to extend far off, except from the west point, from which a reef stretches off $1\frac{3}{4}$ miles; this reef is steep-to, but not dangerous because the westernmost rock on it rises to a considerable height above the water, and has a slight resemblance to Sea rocks. This outer rock lies with the south point of Sebúko, bearing S.E. by E. $\frac{3}{4}$ E., and the north-west point, N.E. by E. $\frac{1}{4}$ E.

Close to the east side of Sebúko is Shelter or Basehutter islet, which is high on the east side, has a reef on its south side, and forms with Sebúko a small bay, with 15 to 19 fathoms water, affording good anchorage for coasters. A coral rock, lying mid-channel between the east point of Sebúko and north point of Shelter islet, renders it dangerous to enter this little bay from the northward with westerly gales; but there is a good road for large vessels in 11 and 13 fathoms, one or $1\frac{1}{2}$ miles from Sebúko, near the east side of Shelter islet.

The Channel between Sebúko and Sebesi islands is not quite one mile wide, with soundings, formerly of from 18 to 20 fathoms, hard sandy bottom. It has been reported dangerous since the earthquake, and until further examination is made had better be avoided. The passage northward of Sebúko, between it and Tiga islets, is $1\frac{1}{2}$ or 2 miles wide, and has from 20 to 33 fathoms.

HOG POINT, or Tanjong Toka, bearing S.E. by E. $7\frac{1}{2}$ miles from Cocoa-nut point (page 250), is the south-eastern extreme of Sumatra, and between it and Fourth point on the Java coast, which bears S.E. 13 miles, is the narrowest part of Sunda strait. The point has a round hilly appearance, and is easily distinguished when approaching it from the eastward; the hills at 2 miles north-eastward of the point attain the height of 836 feet.

Tanjong Bawang, at one mile eastward of Hog point is precipitous, and the hills behind are about 400 feet high. The coast from thence to Steile point is fringed by reef to the distance of half a cable.

A reef, having a rock above water near its western extremity, extends about a third of a mile westward of Hog point.*

ZUTPHEN ISLANDS are situated within $2\frac{1}{2}$ miles of the Sumatra coast, north-eastward of Hog point. Four of them are large, and the remainder small, extending N.E. and S.W. about 4 miles, the whole being covered with trees and fringed with reef to the distance of about half a cable. There are several shoals in the passage between them and the coast, amongst which there is said to be anchorage. This passage is generally used by coasting craft, and might be taken by vessels with a commanding breeze, there being sufficient depth of water, but it is not recommended. The islands are steep to on their south side, having from 40 to 50 fathoms water near them.†

Kandang, the south-westernmost of Zutphen islands, is about one mile long, half a mile broad, 410 feet in height, and covered with large trees.

* A rock with less than 6 feet, formerly charted about one mile due south of Hog point, was unsuccessfully searched for by H.N.M. surveying vessel *Blommendal*, 1885-6. Depths of 57 to 62 fathoms were found on and around the position, and in consequence the shoal has been removed from the charts.

† See plan of Zutphen islands, $m=0\cdot7$ of an inch, on Admiralty chart of Sunda strait,

Off its north-west side are two coral islets, steep-to on their western sides. Near these islets on the north-west side of Kandang there is a small bay that affords a safe anchorage to coasters in 11 or 12 fathoms water, close inshore, and even large vessels would find safety there; it formerly was frequented by pirates.

High and Hout Islands, lying to the eastward of Kandang, and respectively 312 and 367 feet high, are rocky and covered with trees. They are about half the size of Kandang, the three islands being separated by narrow channels. Between Kandang and High island is a small islet, with some cocoa-nut trees upon it.

A reef of rocks lies 2 cables from the north-east, east, and south-east sides of Hout island, with depths of 10 or 12 fathoms in the narrow passage between it and the island. There are depths of 40 to 50 fathoms a short distance to the eastward and south-eastward of Kandang, High, and Hout islands.

Cocoanut Island, lying north-westward of Kandang, and close to Sumatra island, is small, low, and surrounded by a reef, which is steep-to.

The Brothers, lying to the northward of High and Hout islands, are two small, low, sandy islets, covered with small wood, and surrounded by a narrow but steep reef, with 15 and 18 fathoms water close-to.

With a leading wind, a vessel coming from the eastward may pass between Brothers islands and Hout island, as this channel has 18 and 20 fathoms water; but its narrowness and the strong currents, sometimes at the rate of 2 and 3 miles an hour, render it dangerous, and the more so as the depths increase speedily to 30 and 40 fathoms. Care should also be taken to avoid the reef projecting from the north-east point of Hout.

Rimau (Remoa) Island, the northernmost and largest of Zutphen islands is also the highest, being elevated 800 feet above the sea, the south end being slightly the higher. The north-west end of the island is low for 400 yards from the extremity, a portion of which is a sandy beach, affording a good landing place. The island is partly fringed by a reef to the distance of half a cable, with five fathoms close-to.

Boompjes reef, $3\frac{1}{2}$ cables long, situated on the south side of Rimau, is partly above high water, with a narrow channel between it and the island; two islets with brushwood growing stand on the reef.

Fatal Islet.—Close to the north-east point of Rimau is a high rocky islet, named Fatal, or Little Rimau, 210 feet high, from which Geni reef projects to the north and north-west, about half a mile, having a sand bank above water, and a coral rock dry at low water, with depths of 11 and 12 fathoms close-to. From the northern point of this reef the north point of Fatal islet is in line with Button island; and from its western edge the west point of Rimau is in line with the west point of Kandang island.

Tumpal Island, lying westward of Rimau, is a small, low, wooded island, surrounded by a narrow reef, which is steep-to.

Coral rocks.—South of Tumpal and nearly in mid-channel, are two steep coral rocks, named Panalang and Usumbera, with small sand patches just showing above high water. They lie with Boompjes reef and the north-east point of Thwartway island in line bearing S.E. $\frac{1}{2}$ E. Close around and between these reefs are depths of 8 to 23 fathoms. Further south lies a steep coral rock, dry at low water, with Boompjes reef in line with the north point of Button island bearing E. $\frac{3}{4}$ S., and the southernmost point of Sumatra in line with the east point of Cocoa-nut island.

Anchorage.—There is anchorage for several large vessels between Hog point and Zutphen islands. If in either of the monsoons a vessel cannot work through, or is detained by calms or currents, she may anchor at about half a mile south-west of Sindu island, in from 30 to 5 fathoms, sand; thence the land wind will enable her on the following morning to pursue her voyage. Just to the westward of Sindu there is a stream of good water, near Begantungan village, with anchorage off it in 6 to 7 fathoms.

Another anchorage is between Cocoa-nut island and Brothers islands, with the west point of High island, bearing South, distant half a mile, in 15 fathoms of water.

On the Sumatra coast, abreast the north point of Rimau, is situated Steile point, bluff and steep, the ridge of hills behind attaining the height of 800 feet; northward of Steile point the shore reef extends one cable off the village, while still farther north the coast is fronted with a mud-bank, which makes landing difficult. There is anchorage in 7 to 10 fathoms, mud and sand, north-eastward of Steile point, with the village and a fresh-water spring nearly abreast; in general the natives are not to be trusted.

Directions.—The passage inside Zutphen islands, is not recommended.

Vessels from the northward intending to use this passage should steer inshore of Rimau island, and in order to clear the reef off its north and north-west points, should bring the west point of Kandang midway between Tumpal and Rimau island, when it should be steered for, thence passing close to Tumpal, and between or to the eastward of the coral rocks which lie in mid-channel southward of that island. Having passed these rocks, steer in close to Cocoa-nut island, by which a vessel may run freely past the visible reefs, north-westward of Kandang, in depths of 16 and 20 fathoms, which will increase southward of Cocoa-nut island to 30, and eastward of Hog point to 50 and 60 fathoms, no bottom.

Caution.—On account of the rapid currents experienced at times (principally February and March,) near Zutphen island, in the westerly monsoon, vessels ought not to approach their south and south-east parts nearer than one mile, particularly in passing Hout island, where the current has been known to run as much as $4\frac{1}{2}$ knots an hour, sweeping to the S.W. and W.S.W. round Hog point. A current of 3 knots has been found to run at times in the easterly monsoon, in the same direction. See page 230.

The **COAST** northward of Steile point again becomes flat, trending northward for a distance of 3 miles to Kangalan (Gantongan point), thence in the same direction about 150 miles to Banka strait. Sumur hill, 344 feet high, situated near the coast abreast North island, appears as the northern termination of the hills extending from Rajah Bassa mountain; thence northward the country is densely wooded and flat as far as Nibong river. Mount Nibong, 774 feet high, the southern peak of a group of hills, situated about 16 miles northward of North island, is rather conspicuous from the southward. Mount Imbong (*see* page 261) lies about 5 miles northward of it and of Nibong river.

Sekumpang river is of considerable extent, taking its rise in the mountains situated at the head of Keyser bay, and traversing the whole southern coast of Sumatra; it debouches at about 10 miles southward of Nibong river. Its south point of entrance is sharply defined, but when abreast, the entrance is difficult to distinguish. There is but 2 to 3 feet water on the bar, deepening to 4 and 5 fathoms within, where boats may water during ebb tide. Northward of Kangalan point, and for the distance of about 30 miles, the shore bank with 3 fathoms water, extends about $1\frac{1}{2}$ miles off shore, whilst southward of that point there is a depth of 5 fathoms within half a mile of the shore.

Kangalan (Gantongan) point.—Reefs.—A coral reef $2\frac{1}{2}$ cables in extent, with a least depth of $2\frac{1}{2}$ fathoms, lies $2\frac{1}{2}$ cables off Kangalan point, and about one mile southward of Logok, with depths of 7 to 13 fathoms close-to. A coral patch of 6 fathoms lies $2\frac{1}{2}$ cables north-east of this reef.

Pulo Logok (Kapia) is a small but high island covered with vegetation, lying one mile north of Kangalan point, one cable within the edge of the 3 fathom line of soundings, and half a mile off shore.

The Sisters (Serom) are three small low islands lying about 3 miles northward from Pulo Logok.* The northernmost is the largest, about 2 cables in extent, and covered with tall Kelapa trees; the other two are covered with low trees and bushes and not readily distinguished from any distance. The western island is $2\frac{1}{2}$ cables from the shore, and they all lie within the edge of the 3 fathoms line.

North Island, lying 3 miles north of the Sisters, is a low coral island, 4 cables in extent, covered with tall trees, and $1\frac{1}{2}$ miles off shore. It is encircled by a reef extending in some places a cable distance. A

* A reef with a depth of 2 fathoms reported to lie one mile south-eastward of the Sisters, with North island bearing N. $\frac{1}{4}$ E., and the middle of Sisters islands W.N.W., was unsuccessfully searched for by H.N.M. surveying vessel *Blonnendal*, 1885. A depth of 8 fathoms was found with 13 to 18 fathoms around it. A patch of $5\frac{1}{2}$ fathoms, coral, with 13 to 20 fathoms around, was also found at one mile eastward of the northern Sister.

conspicuous tree on the north end of the island may be seen from the distance of 14 miles.

Pulo Sina, the small islet, lying little more than $1\frac{1}{4}$ cables southward of North island, is covered with bushes, and there is a channel with depths of 8 to 9 fathoms, between the steep coral reefs fringing Sina and North islands.

A coral patch of $3\frac{1}{2}$ fathoms, with 6 to 8 fathoms close to, lies with Pulo Sina bearing West, distant about half a mile, and a patch of $5\frac{1}{2}$ fathoms lies nearly 2 cables N.N.W. of it. Sumur hill open eastward of Pulo Logok leads eastward of these patches.

Between North island and the mainland there is a channel nearly a mile wide with 18 to 20 fathoms water. Vessels taking it should pass about $1\frac{1}{2}$ cables westward of the island; keeping the summit of Rimau island open just eastward of the northern Sister, will lead clear of the edge of the 5 fathom bank extending from the shore.

Anchorage.—Between North and Sisters islands the coast is edged by a mud bank; at 2 miles from the shore will be found good anchorage, in from 8 to 12 fathoms, mud, with North island bearing N. by E. Small vessels will find good anchorage between Sisters islands and the main, in 2 or 3 fathoms water.

In the easterly monsoon, there is a considerable sea at times; vessels may then anchor under the lee of North island, in 10 to 16 fathoms, mud and sand. The holding ground is generally good in these anchorages, but the bottom should be ascertained before anchoring, as many isolated patches of coral exist.

WORKING through SUNDA STRAIT during the NORTH-WEST MONSOON.—The best route is between Zutphen islands and Stroom rocks (p. 241), giving Zutphen islands a berth of $1\frac{1}{2}$ miles, thence work up by short tacks along the coast of Sumatra to Hog point. In working through the passage between Sebúko and Sumatra, pass either northward or southward of Tiga islets, as the strong currents and hard squalls may allow, thence to the northward of Tims island, and between it and Sungal, or through Lagundi strait.* In this manner a vessel will make a quick passage through the strait, if the wind be not too variable, besides having the advantage of anchoring on the east side of Sebúko island, or in Lampong bay, if the currents or winds be too strong.

There are, however, on record, many instances of vessels having worked out of the strait along the coast of Java, during the westerly monsoon, with more ease and celerity than could have been effected by stretching into Lampong bay, in consequence of the westerly current having at those times developed its chief strength along the former side of the strait. See tides on pages 230–231.

* This route is not known to have been effected by the earthquake of 1883, but great caution should be observed.

CHAPTER V.

SUNDA STRAIT TO BANKA STRAIT, AND BATÁVIA.

VARIATION 2° 10' East in 1886.

MONSOONS.—In the Java sea the eastern monsoon prevails when the sun is northward of the equator, and the western monsoon when the sun is southward of it, their general tendency being towards that parallel when the sun is in the zenith. The easterly or south-east monsoon begins in April, is in its greatest strength from June to August, and ends in October, when the winds become variable. The north-west or westerly monsoon commences early in November, is at its height from December to February, and ceases at the end of March, when it is succeeded by light winds, squalls, and rain. In Carimata, Gaspar, and Banka straits the monsoons prevail as in the Java sea. But the times of the changes of these monsoons and their direction are somewhat irregular, and the south-east monsoon is subject to calms.

Land and sea breezes will be found at times within a certain distance of the north coast of Java, and may be advantageously employed in an adverse monsoon, but they are not regular, and in the strength of the west monsoon the wind does not at all deviate from its common direction; and in the strength of the east monsoon seldom more than one or two points. From many years' observations at Batavia, it appears that the direction of the wind there is nearly as follows:—From about N.W. by W. to W.N.W. from November to March; about North from April to June; from N.N.E. to N.E. by N. from July to September; and North in October; the north-west monsoon again beginning in November.

Rain.—The north-west monsoon period is the rainy season, the heaviest rains occurring from December to March.

CURRENTS in the Java sea are for the most part influenced by the prevailing monsoon, and are generally stronger during the north-west than in the south-east monsoon. They incline to the northward or southward, according to the influence of the currents of Sunda, Banka, and Gaspar straits; for, during the north-west monsoon they run to the eastward, or more southerly, according to the set of those which come from the straits; and in the south-east monsoon they run to the westward or more northerly from a similar cause; a daily allowance from 8 to 12 miles may be made in the south-east monsoon, and from 20 to 24 miles in the north-west monsoon.

The **EAST COAST** of **SUMATRA**, between the Zutphen islands and lat. 5° S. was surveyed by the Dutch in 1884-5; but from thence to Banka straits, has never been regularly surveyed; the coast northward of that parallel, therefore, must be navigated with caution.*

From Nibong river the coast is low, covered with wood to the water's edge, and trends north nearly 9 miles to Penat river; thence a further distance of 20 miles in the same direction to Tanjong Sekopong. It is fronted by extensive shallow banks, which to the northward project from 10 to 15 miles from the shore.

Mount Imbong or Samang, 840 feet high, in lat. $5^{\circ} 21'$ S., is the most prominent hill on the coast near Two Brothers islands. It is an oblong ridge, of gradual ascent, and covered with trees.

Knob hill or Labuan Ratu, 322 feet high, situated about 8 miles north-westward of mount Imbong, and near Penat river, is conspicuous from having a knob on its crest, and will be seen when coming from the southward, directly it opens of mount Imbong.

The Maringi river debouches on the coast, directly eastward of mount Imbong, and may be entered by boats at high water. The flourishing town of Maringi lies within the entrance, the only one in this neighbourhood. Northward of the Maringi a sandy beach commences, whilst to the southward tall trees fringe the shore.

A **patch** of 3 feet, with 3 fathoms close-to, lies about 2 miles off shore, with mount Imbong bearing W. by S. $\frac{1}{4}$ S. distant about 6 miles; and Penat point N. $\frac{1}{4}$ E., distant 4 miles.

Shahbundar bank.—Between Penat point, and Tanjong Sekopong situated 20 miles to the northward, the shore bank within a depth of 5 fathoms; extends 10 miles off abreast the Two Brothers islands, the channel between the bank and those islands being about 7 miles wide.† Within this 5 fathom depth, and extending from 5 to 6 miles off shore are several ridges of sand and coral with depths of $1\frac{1}{2}$ to 2 fathoms, named the Shahbundar bank, and lying with the South Brother between the bearings of E. $\frac{3}{4}$ N. and E.S.E. A patch of 4 fathoms lies 10 miles off shore, with South Brother bearing S.E. $\frac{1}{2}$ E., distant $7\frac{1}{2}$ miles.

* See Admiralty charts:—Eastern Archipelago, western portion, No. 941a; scale, $d = 2.75$ inches; Sunda strait, No. 2,056; scale $m = 0.3$ of an inch; and Banka, and Gaspar straits, No. 2,149; scale, $m = 0.14$ of an inch.

† See Admiralty chart: Banka and Gaspar straits, No. 2,149; scale, $m = 0.14$ of an inch.

Clifton shoal of 3 fathoms, lies 9 miles eastward of Tanjong Sekopong, with the Brothers high trees bearing about S. by E. $\frac{1}{4}$ E. distant 15 miles.

As the depths decrease gradually towards these banks, vessels may stand into 7 fathoms, but it is advisable if possible to pass within 3 miles of the Brothers when taking the inshore channel.

The COAST.—From Tanjong Sekopong the coast trends northward to Saputi river, for the distance of 15 miles; thence about 20 miles to the entrance of Tulang river.

Saputi river, the mouth of which is in lat. about $4^{\circ} 40'$ S., may be approached bearing about W. by N., to about three miles, where the depth is about 4 fathoms.

Tulang bank fronts the whole of the coast between Saputi and Tulang rivers, and is a hard sand-bank. Its northern edge projects 14 miles from the shore nearly due East of Tulang river. According to the reports of the natives there is a passage between the bank and the shore, but probably is only suitable for small craft.

TULANG RIVER.—The mouth of this river is about $4^{\circ} 20'$ S. may be closely approached from the north eastward, avoiding the bank of $4\frac{1}{2}$ fathoms or less, lying about 20 miles off in that direction. Near its entrance is a small village; and about 55 miles up the river is the town of Mangala, where the Rajah resides. H.M.S. *Vesuvius* anchored in 4 fathoms, 8 miles N.E. by N. from its mouth, and despatched some armed boats up the river in search of pirates. The boats crossed a bar in the mouth, having only one fathom depth of water, but inside, and as far up as 14 or 15 miles, they had 3 and 4 fathoms.

The Coast from Tulang river to Tree island about 30 miles north, curves to the westward 3 or 4 miles, and about the middle of it is the Masudyi river. From Tree island the coast trends north and north-eastward about 36 miles to Lucipara point, at the entrance of Banka strait.

Banks.—Between Tulang and Masudyi rivers the shallow bank fronting the shore gradually increases its distance to 12 miles between the latter and Tree island; thence it edges away towards the coast in a N. by W. direction to about 10 miles northward of Tree island, where it apparently approaches the shore to within 5 miles; thence to Lucipara point, to 10 or 12 miles off shore, but little is known of it.

Portions of this bank dry occasionally, one of which is named Tromp patch. A doubtful bank is charted nearly due South, 19 miles from Lucipara point. Parmassang peak, open of, or in line with First point, bearing N. by W. $\frac{3}{4}$ W., leads clear and eastward of both banks.

ISLANDS AND DANGERS.*

The islands and dangers bordering the channel between Sunda and Banka straits will now be described.†

THOUSAND ISLANDS.—These islands about 60 in number, with their outlying dangers occupy a space extending one 25 miles in a north-north-west and south-south-east direction, and veying in breadth from 12 miles at the northern end, between North island and Jason rock, to about 5 miles near their south extreme.

Karang Bras may be considered as the southern of the group ; it lies 2 miles northward of the Hoorn islands, and 14 miles from Kail point, western approach to Batavia.

As many reefs exist amongst the islands it is advisable not to attempt the passages between them.

West island, or Pulo Peblekan, the most north-western of the Thousand islands, is a quarter of a mile in length, and low, but the trees on it may be seen about 13 miles. It is steep-to on all sides at half a cable distant, except round its north-east sandy point, off which a coral reef extends a quarter of a mile.

Coventry reef, of coral, is circular, 2 cables in extent, dry at low water near the north end, with 5 fathoms on its south end. The reef is marked by discoloured water, and breaks with a light swell, and at half a cable from the reef there are depths of 15 to 17 fathoms all around. West island bears N. by E. distant one mile from it.

Dua island kept open westward of West island leads westward ; and Rangat island in line with North island (East Dua) leads eastward of Coventry reef.

Christian rock, on which the British ship *Christian McCausland* was wrecked in 1877, is said to lie S.W. by W., about $1\frac{3}{4}$ miles from Dyogon island, and E. by S. $\frac{1}{2}$ S., $5\frac{1}{2}$ miles from West island ; there is a depth of 16 feet on the rock which is steep-to, having 10 fathoms within half a cable.

Rangat island, situated about 3 miles E.N.E. from West island, is a small island surrounded by a sandy beach, having a reef on which the sea breaks heavily, extending about 2 cables from its north and north-east sides.

* The dangers heretofore supposed to exist between Thousand islands and the Sumatra shore, known as Dolphin, Antelope, Banterer, and Paulowna, were searched for in vain by Commander C. Bullock in H.M.S. *Serpent* (1865), and have been expunged from the charts ; the positions of several other dangers in this route were also rectified. Similar work is being done by His Netherland Majesty's surveying vessels. Helen rock, reported in 1876, as lying with North Watcher bearing N. by E. $\frac{2}{3}$ E. ; and Rangat island S.E. $\frac{1}{3}$ S., has been removed from the charts, on the latter authority, 1886.

† See Admiralty chart :—Sunda strait and its approaches, No. 2,056 ; scale, $m = 0.3$ of an inch.

Reef.—About one mile S.E. of Rangat island, lies a coral reef of 4 feet, extending about one cable, north and south, and $2\frac{3}{4}$ cables, east and west, with 4 to 5 fathoms around it. A similar patch is charted about midway between it and Dyogon island.

Edeling shoals consist of two coral patches half a mile apart. The eastern shoal has about 3 fathoms at low water, and the western, 4 fathoms; they lie midway between West Dua and Rangat islands.

Karang Beronang, a coral reef one cable in extent, with $1\frac{1}{2}$ fathoms least water, and from 14 to 18 fathoms, mud, around, lies about one third of a mile north-westward of Edeling shoals, with Rangat island bearing South, and West Dua N.E. by E. The reef is usually marked by ripples.*

Vessels of heavy draft should pass well to the westward of a line joining West Dua and West islands.

North, and Dua islands (East and West Dua), the two northern of the Thousand islands, stand out conspicuously from the group. They lie respectively N.E. by E. $6\frac{3}{4}$ miles, and N.E. $\frac{1}{4}$ E. $6\frac{1}{4}$ miles from West island. A detached reef, which breaks, lies half a mile westward of East Dua island.

Jason rock, the position of which has been determined by H.N.M. surveying vessel *Blommendal*, 1886, had not been seen or reported since the year 1712, though frequently searched for. It is found to be a dangerous coral patch, about 50 yards in extent, with a least depth of 13 feet, and 16 to 19 fathoms close around, lying with the following bearings: North Watcher lighthouse, N. 40° E.; Dua West islet, N. 89° E.; and Pulo Peblakan or West island, S. 62° E.; distant $1\frac{1}{2}$ miles from the position formerly assigned it.

The position of this rock is indicated only when there is a current; ripples over it were distinctly seen from the deck of the *Blommendal* at a distance of 7 cables; the sea was not seen to break on the rock, and the water was discoloured only in the immediate vicinity.

Karang Majang, a small coral head of $4\frac{1}{4}$ fathoms, has been found on the north-east side of the Thousand islands, with Ringiet island bearing W.S.W. distant nearly 2 miles.*

SOUTH WATCHER (Pulo Peniki) lies about 7 miles eastward of the southern groups of the Thousand islands, and $16\frac{1}{2}$ miles N.N.W. $\frac{3}{4}$ W. from Edam island lighthouse in Batavia road. It is small covered with trees and surrounded by a reef extending from one to $2\frac{1}{2}$ cables, with depths of 23 fathoms within half a cable of the reef. The island is visible from a distance of about 13 miles, and from a vessel abreast of it the Thousand islands will be seen from aloft.

NORTH WATCHER, the summit of which is in lat. $5^{\circ} 12\frac{1}{2}'$ S. long. $106^{\circ} 27\frac{1}{4}'$ E., is 650 yards in length, 270 yards in breadth and covered

* H.N.M. Surveying vessel *Hydrograaf*, 1886.

with trees ; it is visible in clear weather 18 or 20 miles. On the north-west side there is a cove with a rough pier, affording landing for boats.

The island is surrounded by a coral reef, which dries in places, and extends on the east and south sides a distance of $2\frac{1}{2}$ cables.

LIGHT.—On North Watcher island, near the centre, stands a white lighthouse, exhibiting at an elevation of 159 feet above high water, a white light which *revolves* once *every minute*, and should be seen in clear weather from a distance of 18 to 20 miles. The light shows 8 seconds bright, and 52 seconds eclipsed ; within a distance of 16 miles the eclipse is not total.

Anchorage.—At the distance of about 7 cables from the lighthouse, in all directions, there is good anchorage in 12 to 13 fathoms ; nearer the island the depth increases to 16 and 19 fathoms.

Omega rock, about $1\frac{1}{2}$ cables in extent, and with a depth of 3 feet, is steep-to, and lies E. by S. $\frac{3}{4}$ S. $5\frac{1}{2}$ cables from North Watcher lighthouse. It should be given a wide berth by a vessel passing eastward of North Watcher.

Karang Pajong, a small patch with a depth of 5 feet, lies with North Watcher lighthouse bearing N. $\frac{3}{4}$ E. distant $5\frac{1}{2}$ cables. Between these reefs and the island the depths are 14 to 16 fathoms, mud and sand. These reefs will be avoided by keeping the angle of elevation of the light at 2° or less.

Arnemuïden rock, composed of coral sand, and rock, is about half a cable long, and covered at high water. It lies with North Watcher bearing West, distant $14\frac{1}{2}$ miles.

Etna bank, on which the sea breaks, lies $13\frac{1}{2}$ miles E. by S. $\frac{2}{3}$ S. from Arnemuïden rock.

Molenwerf bank, the existence of which is doubtful, is said to lie in lat. $5^\circ 14\frac{1}{4}'$ S., long. $106^\circ 55'$ E. or $3\frac{1}{2}$ miles North of Etna bank.

Brouwers shoal lies $5\frac{1}{2}$ miles East from Etna bank, in lat. $5^\circ 17\frac{1}{2}'$ S., long. $107^\circ 0\frac{1}{4}'$ E.

TWO BROTHERS are low islands lying 19 miles south-eastward of Tanjong Supong, and about 7 miles eastward of the edge of Shakhbunar bank, and together extend one mile in a north and south direction. The northern island is small and round ; the southern island is 4 cables long. They are thickly covered with brushwood and tall trees, one of which, on the southern island, may be seen in clear weather about 15 miles off. The islands are encircled by a coral reef partly dry, which extends on the east, north, and south sides for a distance of $1\frac{1}{2}$ cables.

There is a passage between the islands 2 cables wide, having 5 to 6 fathoms over an apparently clean bottom.

Banks.—At the distance of $2\frac{1}{2}$ cables S.S.W. $\frac{3}{4}$ W. from the islands is a detached coral patch of 3 feet.

A 9-fathoms bank of fine speckled sand extends from 2 to $3\frac{1}{2}$ miles eastward and southward of Two Brothers islands. This bank shows discoloured water of a pale green colour, and has been seen from a distance of 2 miles; it would prove at times a convenient anchorage. Two Brothers islands just touching, lead over the shoalest part.

Swallow bank, with a least depth of 22 feet, is a round patch of coral, 87 yards across, with 8 to 10 fathoms, mud and sand, close around, and lies with the Two Brothers bearing N. by E. $\frac{1}{3}$ E., distant $7\frac{1}{2}$ miles.* Vessels of heavy draught should be careful to give it a wide berth, as except under very favourable circumstances (calm water and with a current of one knot, there is no ripple to indicate its position. At one cable due south from Swallow bank, is a patch of 5 fathoms, sand and shells, with 9 fathoms between it and the bank. The depths around the bank are 9 to 10 fathoms, sand.

Lynn bank is composed of coral, about one cable in extent, with a least depth of 2 feet; from the bank the highest part of the southern of the Two Brothers bears W. by N. $\frac{1}{4}$ N. $6\frac{1}{2}$ miles. There are depths of 6 fathoms close to the bank, deepening to 12 and 13 fathoms at one cable distant.

The extremes of Two Brothers islands subtend an angle of 9 degrees at the bank; if therefore they be made, whilst passing on (or within a point or more of) the above bearing to subtend an angle of 8° , a vessel will pass about a mile outside the bank; and if an angle of 10° , half a mile inside it. In calm weather the shoal from its dark colour is extremely difficult to see until close upon it; the above method as a safeguard will then be invaluable and may be used with confidence. A sharp look out should always be kept as the shoal may only be detected by a slight ripple. At night it is recommended to close Two Brothers islands and pass them at the distance of from one to 2 miles.

Brouwers reefs are two dangerous coral reefs, extending about $8\frac{1}{2}$ cables, in a N. by E. and S. by W. direction, with a dry patch of sand and coral upon each. Between the two patches there is an apparently clean fairway $2\frac{1}{2}$ cables wide, with depths of 10 to 14 fathoms. Hard ground stretches out from their north and south ends; at a short distance to the eastward and westward the bottom is soft, and the depths at 2 miles eastward are generally 14 and 15 fathoms, regular soundings.

The northern reef lies with the northern Two Brothers island bearing S.W. by W. $\frac{1}{4}$ W. distant $9\frac{3}{4}$ miles, and North Watcher island S.E. by E. $14\frac{1}{4}$ miles. They may usually be seen from the distance of 2 miles.

Clearing Mark.—Mount Imbong kept open southward of South Brothers leads southward of Brouwers reefs, and the same mount open northward of North Brothers leads northward of the reefs.

* H.N.M. surveying vessel *Blommendal*, 1885, gives the least depth as 27 feet.

A vessel passing eastward of Brouwers and Lynn reefs, should keep nearer North Watcher island, than the Two Brothers. The mountain seen in clear weather to the southward, is mount Karang (6,014 feet high), south of Anjer, but from the above reef and islands the round hill named mount Gedeh, 2,100 feet high, over St. Nicholas point, is more often visible and is a good landmark.

At about 6 miles north-westward of Brouwers reef, with Two Brothers bearing S.S.W. distant 8 miles, a bank with $6\frac{1}{2}$ fathoms (least water found) was passed over by H.M.S. *Magpie*, 1883.

Comara shoal, the existence of which is doubtful, is said to lie about 27 miles N.N.W. $\frac{1}{2}$ W. of North Watcher island, and 18 miles off Saputi river.*

Ocean Mail shoal, the position of which is doubtful, is said to lie about 33 miles eastward of Tulang river, in lat. $4^{\circ} 18' S.$, long. $106^{\circ} 26' E.$, with a depth of 18 feet, and 7 to 8 fathoms all round.

A Bank of hard ground, about 2 or more miles in extent, having but $4\frac{1}{2}$ fathoms water, appears on the chart in lat. $4^{\circ} 11' S.$, long. $106^{\circ} 12' E.$ There are no soundings to indicate whether it is isolated or joins the shore bank. The soundings to seaward are irregular, and from 6 to 10 fathoms.

Arend bank, in lat. $3^{\circ} 45' S.$, long. $106^{\circ} 15\frac{1}{2}' E.$, is 2 miles in length, and the same in breadth, consisting of fine gray sand and broken shells. It has $4\frac{1}{2}$ to 6 fathoms water, and 6 fathoms close-to.

Boreas bank lies E. $\frac{1}{2}$ N. about 12 miles distant from Arend bank, in lat. $3^{\circ} 44' S.$, long. $106^{\circ} 27' E.$ It is also composed of fine grey sand; and the least water is 5 fathoms. Between Arend, and Boreas banks there are irregular depths of 8 to 14 fathoms. A patch of 6 fathoms lies E.S.E. distant $7\frac{1}{2}$ miles from Boreas bank, with depth of from 7 to 9 fathoms north and south of it.

City of Carlisle bank, of $4\frac{1}{2}$ to 5 fathoms, is nearly 3 miles in length in a north-west and south-east direction, and its centre lies S.W. by S. about $4\frac{1}{2}$ miles from Boreas bank. A depth of 16 feet was reported on this bank, but it was not found by H.M. surveying vessel *Swallow*.

Caution.—Vessels in this neighbourhood unexpectedly shoaling their water at night ought to be very careful, for many that considered themselves to be upon these banks, were in fact upon those off the coast of Sumatra, near Tree island, and consequently in great danger. Arend and Boreas banks consist of fine gray sand, while those near Tree island are of coarse sand with gravel.

Soundings.—The depths in that part of the sea which lies between North Watcher island, Two Brothers islands, and Lucipara island, are,

* See Admiralty chart :—Banks and Gaspar straits, No. 2,149, scale, $m = 0.14$ of an inch.

except the $4\frac{1}{2}$ and 5 fathoms on Arend and Boreas banks, tolerably regular from 10 to 16 fathoms; but nearer to Sumatra, about 22 or 24 miles from the coast, they become irregular, changing often, and suddenly, from 10 to 5 and 6 fathoms.

DIRECTIONS.—Sunda Strait to Banka Strait.—Having passed through Sunda strait, and bound to Banka strait, it is usual to steer a direct course for Two Brothers islands. With a working wind, it will be prudent to keep within a moderate distance of the Sumatra coast. A good mark in daylight is, when standing inshore, to tack when North island is just on with Rimau, the highest Zutphen island; the soundings will then be generally 7 or 8 fathoms, and a large vessel should not risk a less depth when working between North island and Swallow bank, which she will pass eastward of, if the southern Two Brothers island be not brought eastward of N. by E.

Although the space between Thousand islands and Two Brothers islands can be navigated with more confidence since its partial examination by Commander Bullock in H.M.S. *Serpent* in 1865, and since then by the surveying vessels of His Netherland Majesty, yet, as no complete survey has been made, the mariner is recommended to proceed with caution. Two Brothers islands may be passed at a prudent distance on either side. On passing to the eastward, take care to avoid Lynn bank and Brouwers reefs; and when passing between the islands and Shahbundar banks, a vessel should not keep farther from the islands than 3 miles, and not nearer the coast of Sumatra than the depth of 7 fathoms.

Having passed Two Brothers islands steer northward towards Lucipara island, keeping Two Brothers islands to the westward of South, to avoid Clifton shoal, and endeavouring to keep in soundings from 9 to 12 fathoms, as a direct course cannot be depended upon on account of irregular currents or tides setting out from the rivers. Neither can the soundings in this track be implicitly trusted to, being irregular, from 8 to 11 or 12 fathoms in some places, particularly so near Tree island bank, the edges of the other banks projecting from the coast of Sumatra, and in the vicinity of Arend and Boreas banks in the offing. It will be, however, prudent to borrow towards the main if the depths increase to 12 or 13 fathoms; and to haul off from it if they decrease to $8\frac{1}{2}$ or 9 fathoms towards the banks that front the coast. Near these banks the bottom is generally hard, and the soundings more irregular than farther out from the land.

When the weather is clear, during the day, it may be proper to get a sight of the coast from a large vessel at times, edging out occasionally in the night, or when the depths decrease to $8\frac{1}{2}$ or 9 fathoms. Having passed the bank off Tree island, the coast may be approached with greater safety, but the position of the doubtful bank, south of Tromp patch, should be avoided; the depths will decrease regularly steering northward for

Lucipara island, to 5 fathoms, which depth will be found with the point bearing N. $\frac{1}{2}$ E. distant about 10 miles.

If, at night, a vessel should come into shallow water between Two Brothers islands and Lucipara island, and not being certain whether she is on either Arend or Boreas banks, or that off the coast of Sumatra, it is advisable to anchor immediately, and to wait for daylight, for the depths are moderate, and the bottom throughout this track generally favourable for that purpose.

Banka Strait to Sunda Strait.—When bound from Banka strait to that of Sunda, keep in depths of from 9 to 13 fathoms; the currents are too variable to trust implicitly to any course, and the depths also are too irregular to depend upon them alone, for the 5 and $4\frac{1}{2}$ fathoms on Boreas and Arend banks may be easily mistaken for those south-eastward of Tree island, which are dangerous. It will therefore be advisable in daytime to keep on the Sumatra side in 8 or 9 fathoms, from which depths that shore is generally visible from the deck, and at night to keep off shore when the water shoals to less than 9 fathoms, and to approach the shore when it deepens to more than 13 fathoms, as that depth with westerly winds would be too far off.

Having arrived in about $4^{\circ} 40'$ S., or about 30 miles distant from Two Brothers islands, keep as nearly as possible in 9 or 10 fathoms, so as to get sight of these islands bearing South, but not to the eastward of that bearing in order to avoid Clifton shoal; otherwise, if made, when in 11 fathoms, it would be difficult to weather them with a westerly wind, especially as the currents run to the south-eastward during the western monsoon. Caution must be exercised when passing the neighbourhood of Comara shoal, the existence of which is doubtful. If passing eastward of Two Brothers islands take care to avoid Brouwers reefs and Lynn bank.

Coming from the northward, Two Brothers islands appear like one island, and hence some vessels have been led into danger by mistaking mount Imbong and Knob-hill, in Sumatra, when seen in the twilight, for them. Sailing past these islands at night, the position of the vessel should be well ascertained before dark, or else it would be better to anchor.

Having passed on either side of Two Brothers islands, they should be brought to bear northward of N. $\frac{1}{2}$ E. when nearing Swallow bank in vessels of heavy draught; thence a course may be steered for Sunda strait.

SUNDA STRAIT TO BATAVIA.

BANTAM BAY.—From St. Nicholas point (*see* page 240) the north coast of Java takes an easterly direction for about 2 miles and then

turns south-eastward into Bantam bay, which between Kapo and Pontang points is about 9 miles in width, and 7 miles in depth. Between St. Nicholas and Kapo points are the Saleira and Kalie islands, situated from 2 to 3 cables off shore. Saleira is a low coral islet with a few trees, lying within the 3 fathom line, and affords shelter for small coasting craft.

Near the entrance of Bantam bay, the depths are from 10 to 12 fathoms, sand, decreasing gradually towards the shore, near which the bottom is mud. The southern and eastern sides of the bay are low and marshy; but in the west, is mount Santri 315 feet high, and more to the northward is mount Gedeh, about 2,100 feet high. The little hill of Pinang, situated on the plain, westward of Karang Antu, is also noticeable.

Pontang point, is the eastern extreme of Bantam bay. A mud bank of less than 3 fathoms, extends one mile northward of the point, and continues round Bantam bay from one to $1\frac{1}{2}$ miles off shore.

Pontang point is formed by the delta of the river Pontang, and is covered with tall trees. The river has three entrances, almost dry at low water, and though deeper inside can only be entered by very small craft or boats.

Beacon.—A wreck lies on the edge of the bank extending from Pontang point; a stake surmounted by a ball is fastened to the bowsprit, which is above water. The bank is steep to outside the wreck.

Islets.—There are several islets in the bay, the largest of which, Great Panjang, lies in the entrance; it is about 2 miles in diameter, thickly covered with vegetation, and surrounded by a coral reef to the distance of 50 yards. On its south-east side the reef extends to the distance of half a mile, and on which are two islets. Mount Gedeh open south of Panjang islet lead southward; and the east point of Panjang bearing North, leads eastward of the reef. Great and little Muyang islands, lie respectively 3 miles eastward, and 2 miles south-eastward of Panjang island, nearly in the middle of the bay. These are encircled by coral reefs to the distance of half a cable, beyond which there is no danger. The islands are small, thickly wooded, and on each is a conspicuous tall tree. Several small islets lie on the west and southern sides of the bay, within the depth of 3 fathoms.

Panjang is the only island in Bantam bay on which there is a village.

Karang Antu (Bantam) is situated on a river to the eastward of Old Bantam, and is considered the port of Serang, the capital of the residency of Bantam. Old Bantam was formerly the native emporium of these seas, but has been reduced from its former importance to an insignificant place. Serang, distant about 6 miles, is in connexion with the telegraph service, and on the main road to Batavia. The approach to Antu river is from north-eastward of the harbour light, which is hoisted on a tripod. The entrance is nearly dry at low water, and is only available for boats. There is a harbour master here.

The salt and coffee warehouses stand half a mile up the river.

Road.—In approaching Karang Antu or Bantam road, the Muyang islets may be passed on either side, but the channel westward of them is preferable having regular depths of about 5 fathoms. Small vessels anchor in from $3\frac{1}{4}$ to $3\frac{1}{2}$ fathoms, with mount Santri in line with the south side of Lima-Kelapa (Klappa); and the east point of Great Panjang island, North; from one to $1\frac{1}{4}$ miles off the river entrance. Large vessels must not anchor with Lima-Kelapa island bearing northward of West.

Tides.—The tides are irregular, and the rise is usually less than 3 feet.

PULO BABI, or Tunda island, lies about $7\frac{1}{2}$ miles due north of Pontang point. It is nearly 3 miles in length, by one mile in breadth, covered with trees, and steep to all round beyond the reefs extending about 2 cables off its east and west extremes, and from a half to one cable off its north and south sides. A few fishermen occasionally resort to the island, and the best landing is on the south side.

COAST.—Eastward of Pontang point, the coast which is low and covered with trees, trends E.S.E. for about 14 miles, thence turning north-eastward to Kaik point. In the bay thus formed are the villages of Lontar, Pasir-Pandang, Tanara and Mauk. The two first mentioned may be recognised from the offing by the Kelapa trees, which are seen long before the other trees on the coast; whilst Tanara may be known by the red roofs of the houses, and which will be seen above the trees. Tanara is also known by a conspicuous group of trees, just eastward of it, and which is a good mark for leading to the anchorage. Mauk may also be known by some tall trees, which are seen from a considerable distance. These were formerly known as False Menschen-eter island.

Mud Bank.—From one mile off Pontang point, the mud bank within a depth of 3 fathoms takes an E. by S. direction; off Lontar its outer edge is 2 miles from the shore. Near Pasir Pandang the distance is again reduced to one mile, whence it suddenly stretches directly off the coast fronting Tanara, for a distance of $3\frac{1}{2}$ miles; from this position it passes half a mile northward of Tyankir (Jangkir) island, and at about $1\frac{1}{2}$ miles off the coast. Towards Kaik point the bank nears the shore, so that near Toasia small craft can approach close to. With the exception of that portion of the bank off Tanara, which is steep to, it may be approached by the lead.

Reefs.—Off Pasir-Panjang is a reef of small extent with a depth of one foot; it lies N. by E. about $1\frac{1}{2}$ miles from Pasir river.

Two reefs, both of which dry at low water, lie N. $\frac{1}{2}$ E. and N.N.E. distant respectively 4 and 8 cables from Tyankir islet. This islet will be distinguished by its dark trees standing out in relief against the coast. A reef extends nearly 2 cables eastward of it.

TANARA is a place of some importance situated about one mile inland, on the Jikandi river, which forms the boundary between the residencies of Batavia and Bantam. The depth in the river as far as Tanara is from 2 to 3 fathoms; but the bar at the entrance has barely one foot at low water. The channel is usually marked by fishing stakes, but mount Karang (Bantam peak) kept in line with the mouth of the river leads in the best water.

Anchorage.—Leading Mark.—The conspicuous trees eastward of the mouth of Jikandi river, (and which may be seen from about 9 miles off shore,) kept between the bearings of S.S.W. and S.W., leads between the mud bank off Tanara and the shoals northward of Tyankir islet, to the anchorage, in from 2 to 4 fathoms.

COAST.—From Kaik point the coast trends in an easterly direction to Untung Java, a distance of $8\frac{1}{2}$ miles, thence turning south-eastward into Batavia road.

Between these points the coast is low and marshy with some high trees in the background. Near the shore are the villages of Serang, Keramit, and Pasir, the positions of which will be seen by the Kelapa trees growing around them. At Burang point, the Tydanie river enters the sea by several mouths, forming a delta. The bank of hard mud and sand, which fronts the coast of the bight, extends off about one mile; off Keramat are several shallow patches on this bank, which break in bad weather.

WESTERN APPROACHES TO BATAVIA.

GENERAL REMARKS.—Batavia road is approached from the westward by the Inner or Dutch channel, or by Outer channel; both of which may with ordinary caution be considered safe. Inner channel is the shorter route and the one generally used; vessels can anchor in any portion of it, whilst Outer channel is much deeper. Working in, Outer channel is to be preferred. At night, Inner channel should not be attempted. These fairways are marked by Herbert's beacon buoys surmounted by staff and ball; white buoys and beacons mark the starboard side of the channel from seaward, black buoys the port side; middle grounds, which may be passed on either side are marked by red buoys; and dangers outside fairways are marked by buoys with black and white rings.*

As other shoals, which are not charted, may exist in these channels, caution should be used when navigating them.

INNER or DUTCH CHANNEL.—Islets and reefs.—**Menschen-eter reef** is a bank of hard sand and mud, with patches

* See Admiralty chart:—Sunda strait and its approaches, No. 2,056; and Batavia road, No. 933, scale $m = 1$ inch.

of stones on which the sea breaks at times, extending $3\frac{1}{2}$ miles northward of Kaik point, south side of Inner channel.

Buoy.—A white beacon buoy marks its north extreme in $3\frac{3}{4}$ fathoms.

Menschen-eter (Laki) island is low, covered with tall trees, and about half a mile in diameter. It is separated from Menschen-eter reef by a narrow channel having depth of 4 to 10 fathoms. South-west of the island there is good anchorage during the easterly monsoon.

Serang reef, dry at low water, lies near the eastern edge of Menschen-eter reef, and N.E. $\frac{3}{4}$ N. about $1\frac{1}{4}$ miles from Kaik point. Tenga, a small patch of $1\frac{1}{2}$ feet, lies 6 cables N.E. by N. of Serang reef. Between Tenga and Menschen-eter reef are several rocks which nearly dry.

Karang di Tenga, with a least depth of $1\frac{1}{2}$ fathoms near its western edge, is 8 cables in extent. The shallow spot lies N.N.E. $\frac{1}{4}$ E., distant $1\frac{5}{8}$ miles from Serang village point. Its north extreme is marked by a white buoy.

Untung Java reef extends $1\frac{1}{2}$ miles north-north-eastward of Untung Java point, and is a continuation of the mud bank fringing the shore on either side of it. Near its extreme are patches of sand and stones which dry at low water.

Buoy.—A white beacon buoy marks the north extreme of the reef which is steep to, there being eight fathoms just beyond the buoy.

The following islets and dangers form the north side of Inner channel, and separate it from Outer channel:—

Struisvogel rocks, the western of these dangers, form a group of six coral patches, covering a space of about one mile in extent in a north and south direction. The least depth on these patches is $2\frac{1}{4}$ fathoms, with from 12 to 20 fathoms between and around them.

Beacons.—A white beacon buoy marks the north edge of Purak, the northern patch, also marking the south side of Outer channel; and a black beacon with cone is erected on Besar, the southern patch, marking the north side of Inner channel. From this beacon Menschen-eter island bears S.E. $\frac{1}{2}$ S. distance about $4\frac{3}{4}$ miles.

Karang Laut, two patches with a least depth of $3\frac{1}{2}$ fathoms, together about $1\frac{1}{2}$ cables in extent, lie about E. $\frac{1}{4}$ N. about $2\frac{1}{4}$ miles from Struisvogel beacon.

Tongara reef is a small coral patch of 3 fathoms and steep-to, lying S.E. $\frac{1}{2}$ E. distance $1\frac{3}{4}$ miles from Karang Laut. A red beacon buoy marks its south side. Tenga reef, a small coral patch of 8 fathoms in Outer channel, lies E.N.E. distant 2 miles from Tongara reef.

Pedynab reef is about $1\frac{1}{2}$ cables in extent, with a least depth of 4 feet, and steep-to. It lies with the west extreme of Great Kombuis bearing E. by N. $\frac{3}{4}$ N. distant about 8 cables. A black beacon buoy marks its south-west edge.

Kombuis (Lantyang) islands.—These low islands, three in number, are covered with bushes and low trees, and separate Inner and Outer channels. The two western islands are known as Great Kombuis; they are $1\frac{1}{2}$ cables apart, and stand on a reef which extends north-eastward and southward of the smaller island a distance of 3 to 4 cables. Trees are growing on some dry patches on the north-eastern part of this reef. The western and largest island is about three-quarters of a mile in extent.

Several shoal patches lie between Great Kombuis and Pedynab reef; Tykara reef, of $2\frac{1}{2}$ fathoms, lies 2 cables off the north-east side of Kombuis reef; and East reefs with 4 fathoms least water, lie from 4 to 6 cables south-eastward of that reef.

Light.—From an iron support on the north side of Great Kombuis, and near the west extreme, is exhibited at an elevation of 40 feet, a *fixed* white light which should be visible from a distance of 10 miles.

Little Kombuis island (Pulo Bokor) is about 3 cables in extent, low and covered with trees, and encircled by a reef which in places extends to the distance of $2\frac{1}{2}$ cables. It lies $2\frac{1}{2}$ miles eastward of Great Kombuis.

Hordyk and Tiga reefs.—Southward of Kombuis islands are several small coral patches. Hordyk reef, the western of these, lies about one mile S.E. from the eastern island of Great Kombuis. Tiga reef of $3\frac{1}{2}$ fathoms, lies about $1\frac{1}{2}$ miles S.E. by E. from Hordyk reef.

Lumbang reef of $1\frac{3}{4}$ fathoms, lies between Hordyk and Tiga reefs, at about 8 cables south-westward of Little Kombuis. At 3 cables northward of Lumbang there is a patch of 3 fathoms. Pari patches of $4\frac{1}{4}$ and $4\frac{1}{2}$ fathoms, lie north-eastward of Tiga reef.

Meinderts shoal, of $1\frac{3}{4}$ fathoms, is $1\frac{1}{2}$ cables in extent, and lies midway between Tiga reef and Middleburg island.

Ketapang reef, a small patch of $2\frac{3}{4}$ fathoms, lies S.E. by E. about one mile from Meinderts shoal. Sonko reef, of $4\frac{1}{4}$ fathoms, lies 2 cables southward of Ketapang. Between Middleburgh island and Meinderts and Ketapang reefs are many isolated patches.

Buoys.—Black beacon buoys mark the south sides of Hordyk, Tiga, Meinderts and Ketapang reefs, also the south-west extreme of the shoal extending from Middleburg island; a black beacon with cone marks the shoal extending south-eastward from that island.

Middleburg island is low, uninhabited, covered with tall trees, and encircled by a coral reef. Between the black buoy marking the south-west edge of the reef, and the white buoy off Untung Java reef, the Inner channel is but 3 cables in breadth. This is the turning point into Batavia road. Westward and northward of Middleburg island, some of the dangers are marked by beacons or buoys, but as the patches are numerous, the chart will afford more information than a written description of what may be considered unnavigable waters.

OUTER CHANNEL.—Islets and Dangers on South side.—The dangers forming the south side of Outer channel, as far eastward as Little Kombuis, are those described as forming the north side of Inner channel; the description of the south side dangers are continued from that island eastward.

Lekapo reef is the north-west patch of a group of isolated reefs covering a space of about 2 miles square, lying north-westward of Middleburg island. It is a small coral patch with $2\frac{3}{4}$ fathoms water, at $1\frac{3}{4}$ miles E. $\frac{3}{4}$ N. of Little Kombuis.

Sau reef, half a cable in extent with 4 fathoms water, lies $1\frac{1}{2}$ miles north-eastward of Lekapo reef, between and southward of which are Bubara and Kotak reefs, with $2\frac{1}{2}$ and 3 fathoms over them. Udyung patches of $4\frac{3}{4}$ fathoms, at 3 and $3\frac{1}{2}$ cables north-eastward of Sau reef, lie in, or on the south side of Outer channel, and must be avoided by heavy draught vessels. Here, Outer channel is but one mile wide.

South-eastward of Sau reef shoal patches will be found for a distance of $1\frac{1}{2}$ miles; Makiam patch of 7 fathoms lies at that distance, and the ground to the westward and between it and Middleburg island, is all foul and must be avoided.

Buoys.—White beacon buoys mark the north edges of Lekapo and Sau reefs, forming the south side of Outer channel.

Dapur island is a narrow islet about 260 yards in length, lying between the northern and western approaches to Batavia road, at about $3\frac{1}{2}$ miles north-eastward of Middleburg island. It is covered with bushes amongst which stands a tall tree, and encircled by a coral reef which in places extends nearly one cable. Tanda reef is a small coral patch with 2 fathoms of water, situated $1\frac{1}{2}$ cables eastward of the island.

The Gusongs are three detached reefs, 3 cables in extent, with a least depth of $1\frac{1}{2}$ fathoms, lying about 4 cables north-eastward of Dapur island. A white buoy marks the north side of the Gusongs.

The continuation of Outer channel, eastward of Sau reefs, is northward of Dapur island and of this buoy, the channel westward of Dapur island being named the Middle channel.

Middle grounds.—**Buoys.**—Outer channel, between Kombuis islands and the Agenieten islands is divided into two branches; the southern one running along the north side of Kombuis island and Lekapo and Sau reef, and the northern one running close southward of the Agenieten islands. Between these channels isolated patches extend 4 miles in an east and west direction, 2 miles north and south, and may be termed the middle grounds.

Delima reef, at the western extreme of this group, is half a cable in extent, with a depth of $2\frac{1}{2}$ fathoms, and 18 to 20 fathoms close to. A

red beacon buoy marks its north side with the west point of Pari island (Agenieten islands), bearing N. $\frac{1}{4}$ W. distant about $1\frac{1}{2}$ miles.

Jantur and Tandul reefs.—Jantur reef, with a depth of $4\frac{3}{4}$ fathoms, lies at the south-west corner of the Middle grounds. Tandul reef, with $3\frac{1}{2}$ fathoms, lies nearly 3 cables eastward of Jantur, and is marked on its south side by a black beacon buoy.

Menjumbang reef, with a depth of $3\frac{1}{2}$ fathoms, is the south-eastern-most of the Middle ground buoyed patches. A red beacon buoy marks its south side. Southward of Menjumbang, and extending into Outer channel, is Seluku reef with $6\frac{1}{2}$ fathoms, Badju with $4\frac{1}{2}$ fathoms, and Mortuti reef with $4\frac{1}{2}$ fathoms; these patches should be avoided by heavy draught vessels when navigating Outer channel.

Panjang di Laut reef, the northern shoal of the Middle ground, is 2 cables in extent, with a least depth of 2 fathoms, and lies about $1\frac{3}{4}$ miles W. by N. $\frac{1}{2}$ N. of Menjumbang reef, and nearly midway between Tandul reef and the east extreme of Pari island. A white beacon buoy marks its north extreme.

NOTE.—This buoy, with the red buoys on Delima and Menjumbang reefs, form the south side of the northern branch of Outer channel; and these two red buoys together with the black buoy on Tandul reef form the north side of the southern branch of Outer channel.

This completes the circuit of the Middle ground; several isolated reefs lie within this area, the principal of which are, the Serasa, Panjang, and the Pederingan, all of which are guarded by the buoys marking the reefs already described.

AGENIETEN ISLANDS, lie on the north side of Outer channel, at about 4 miles northward of Great Kombuis. The group consists of five low islands, entirely surrounded by a coral reef which is 4 miles long in an east and west direction, and nearly 2 miles broad. The edge of this reef is steep to and nearly dry, and may be distinguished by the discolouration of the water; the weather side of the reef always breaks. At about 2 cables within the edge are narrow ridges of dry coral, which on the north-eastern side have trees and bushes growing on them.

Pari island the largest and most eastern of the group, is one mile in length. It is thickly wooded, and inhabited by a few fishermen, whose village may be recognised by the kelapa trees. The other islets named Kongsu, Kampung, Burung, and Tikus are thickly wooded, but small, and lie on the reef, westward of Pari. Westward of Tikus is a patch of coral with brushwood growing on it, not far from the western extreme of the main reef.

Jong reef, lying half a mile eastward of Agenieten islands reef, is $1\frac{1}{2}$ cables in extent, with a patch of coral sand always above water, and

which may usually be seen at the distance of 2 miles. The edge of the reef is steep-to, with depths of 20 to 25 fathoms around it.

A patch of 3 fathoms, one cable in extent, lies E.N.E. distance one cable from Jong reef, with depths of 20 fathoms around.

Buoy.—A black beacon buoy marks the south side of this 3 fathom patch.

THE HOORN ISLANDS, three in number, are named Payung, and Great and Little Tidung islands.

Payung island, probably so named on account of the umbrella shaped trees growing on it, lies about $2\frac{1}{2}$ miles north-westward of Agenieten islands reef. It is about 6 cables in length thickly covered with vegetation and uninhabited. A shallow reef which is steep-to, encircles the island, extending 4 cables eastward, 3 cables westward, and about $1\frac{1}{2}$ cables northward and southward of it; bushes are growing on the dry spots. At the distance of 3 cables northward of Payung island, and at $1\frac{1}{2}$ cables from the edge of Payung island reef, is a narrow reef nearly one mile in length. Brushwood is growing on the dry portion.

Great and Little Tidung islands.—These islands stand on a narrow coral reef, 4 miles in length in an east and west direction, and steep-to; Great Tidung is about 2 miles in length, and Little Tidung nearly one mile; neither are more than one cable in breadth. The tops of the *kelapa* trees are visible from a distance of 10 miles. The point of the reef extending eastward of the islands has a dry patch near its extreme, and bushes are growing on the northern portion of the reef; westward of the island reef are isolated patches. A few fishermen live on the islands, and on the larger is a well of water.

Karbau reef.—Westward of Tidung island the bottom is foul in places for a distance of $2\frac{1}{2}$ miles. Karbou reef on which probably the American barque *Bessie* struck, appears to be the western of the shoal patches; it is about 2 cables in extent, with a depth of 2 fathoms, 9 to 12 fathoms close-to, and rapidly increasing to 20 fathoms. From the reef the west point of Great Tidung bears E.S.E., distant $2\frac{1}{2}$ miles.

Sepilah reef, with a depth of one fathom, lies E. by S. $\frac{1}{2}$ S. distant $5\frac{1}{2}$ cables from Karbou reef.

Selatan reef, with a depth of $2\frac{1}{2}$ fathoms, lies S.E. $\frac{1}{4}$ E. distant 7 cables from Sepilah reef, and with the west point of Great Tidung bearing E. by S. $\frac{1}{2}$ S. distant $1\frac{1}{4}$ miles. Other shoal heads lie between Selatan and Great Tidung.

All these reefs are steep to, and should be given a wide berth. From the centre of Selatan, the southermost reef, Payung island is just touching the south side of Great Tidung island; these islands therefore should be kept well open.

NOTE.—This completes the description of the islands and dangers in the western approaches to Batavia, directions for which will follow the description of Batavia bay and road, page 287.

BATAVIA BAY lies between Untung Java point on the west, and Kerawang point on the east, a distance of about 20 miles, and is about 9 miles in depth from north to south, between Edam island and Batavia. In the bay are several islets covered with trees and encircled by reefs, and many shoals, the most dangerous of which are marked by buoys. The depths in the bay decrease gradually from 14 or 15 fathoms near Edam island, to 3 fathoms at about one from the shore; the bottom is mud, mixed with sand near the reefs, and also the shore.

The coast of the bay fronting Batavia is a muddy marsh from one to $1\frac{1}{2}$ miles in width, extending many miles, and interspersed with shallow streams, some of which have been converted into canals navigable for boats. Southward of the sea coast marshes, for 5 or 6 miles east and west of the town, are low-lying lands, rice fields, native gardens &c., intersected by canals.

BATAVIA.—The old town of Batavia (lower town) originally stood on the sea shore, but the advance of the land has been such, that it is now one mile from it. The piers bordering the river or canal have been advanced from time to time, and are nearly $1\frac{1}{2}$ miles in length, a passage for boats being left in the eastern pier, abreast the main light. The old town is an oblong of about three-quarters of a mile in length, and half a mile in width, covered with stone buildings arranged in squares and intersected by canals, traversed by numerous bridges. The principal channel which runs through the middle of it is from 160 to 180 feet wide. The place is unhealthy and the merchants and officials retire to the southern suburbs as soon as the day's business is over, thus partly avoiding the miasma arising from the swamps, which is carried seaward by the land wind prevailing at night. South of Old Batavia is the closely packed Chinese and native town, of about one square mile, also intersected by canals. Thence for about one mile along the main road and Molenvliet canal the town becomes a mere strip, and there is a considerable breadth of open ground between the old town and the suburbs.

Between the fourth and sixth miles from the shore is the great suburb of New Batavia, (upper town) also 2 miles in breadth, a wide spreading collection of villas, gardens, native bazaars, barracks and drill ground. It is also intersected by canals, but they are less numerous. These suburbs are named, commencing with the most northerly, Molenvliet, Nordwyk, Ryswyk, Weltewreden, and Parapatan, southward of this the ground begins to rise. The city, as seen from the sea, appears almost sunk in a flat beach, the Weltewreden parade being only 16 or 17 feet above the sea.

The Naval establishments are on Onrust and Kuiper islands. See page 283.

Population.—The population of Batavia (including the suburbs) is about, 170,000, comprising 6,000 Europeans, 24,000 Chinese, and 140,000 Javanese, Malays, and other natives.

Climate.—The lower town of Batavia is rendered unhealthy by the exhalations from the marshes which extend along the foreshore of the bay. Inland the island is more healthy. Batavia fever prevails at the change of the monsoons, more particularly about October, the latter part of the dry season. Vessels intending to make a long stay in the road are recommended to anchor well off shore, to avoid as much as possible the miasma thrown off shore by the land wind. Sleeping on shore should be avoided.* The mean temperature, morning and evening, is from 70° to 74°; at noon from 80° to 82°, occasionally rising to 90°. The north-west monsoon begins about the beginning of November, and with its strong winds and heavy rains greatly cool the atmosphere. The climate is moist, and rain falls during every month of the year, the greatest falls occurring from December to March, and the least from July to September.

Cholera in an epidemic form carried off 48,000 persons in Java and Madura during the four months ending December 1881.

Trade.—The principal exports are sugar, coffee, rice, tea, indigo, tobacco, tin, rattans, spices, and chinchona bark; the imports are, cotton goods, coal, iron, copper, lead, earthenware and spirits.

The aggregate value of exports for the island of Java (1885) was 9,330,000*l.*; and imports 4,352,000*l.*

Shipping.—The total arrival of vessels at Batavia in the year 1884, including coasting craft, amounted to 909 of 1,900,000 tons, the departures to 915; of these 170 were British, and 653 Dutch.

Telegraphs.—Batavia is in connexion by electric telegraph with the principal towns in Java, and by submarine cables with all parts of the world. With Europe by way of Singapore; with Australia, by cable from Banjouangie to port Darwin; and with Sumatra, by cable from Anjer to Kalianda.

Mails.—Direct communication is maintained between Batavia and Holland by three lines of steamers, one of which, the Netherland Steam Navigation Company despatch a steamer every 10 days. A fortnightly mail service is maintained with Singapore; the monthly steamers of the Queensland Royal Mail line, carrying the mails from Aden call here, and a French company run steamers every three weeks between Java and Marseilles; there are also intermediate steamers.

Supplies of all kinds may be procured at Batavia; poultry, excellent fruit, and vegetables are plentiful and moderate in price, water is distilled

* Quarantine station, see page 284.

for sale to the shipping. Onrust, the Government dockyard, has steam machinery and other appliances for the repair of engines &c.; there are also two private machine shops at Batavia, and probably the same facilities are afforded at Tanjong Priok. There is a quarantine station on Hoorn island (Ayer Besar), and the military hospital at Batavia receives sick patients.

Coals.—The Dutch government coaling stations are at Kuiper island, and at a wharf in the inner harbour at Tanjong Priok; at the latter are also coaling wharves where large supplies are kept for merchant steamers, with a depth of 23 feet alongside. Vessels in the road can obtain coal by lighters, but during the wet season (November to March) delays sometimes occur.

Docks.*—In the harbour at Tanjong Priok there is a floating dock 180 feet long, by 40 feet broad; at Amsterdam island a floating dock 200 feet long, by 45 feet broad, with a depth over sill of 24 feet;† and at Onrust island is the Government floating dock, *see* page 283.

Time Signals.—At Batavia, from a post on the rampart, 69 feet above the ground, on the west shore of the river near the Observatory, a time disc is dropped twice daily, Sundays and fête days excepted, viz.: at Noon, Batavia observatory mean time, corresponding to 16h. 52m. 45·5s. Greenwich mean time; and at 1h. 7m. 14·5s. Batavia observatory mean time, corresponding to 18h. 0m. 0s. Greenwich mean time.

The disc is inclined at an angle of 45° at 5 minutes before signal, placed vertical at 2 minutes before signal, and falls into a horizontal position at noon.

Near the entrance to the inner harbour, at Tanjong Priok, a time signal consisting of four circular discs, placed on an iron frame, is made once daily (Sundays and fête days excepted). The discs are inclined at an angle of 45° at 5 minutes before signal, placed vertical at 2 minutes before signal, and dropped into a horizontal position at Tanjong Priok mean noon, corresponding to 16h. 52m. 27·5s. Greenwich mean time.

Position of time signal is lat. 6° 5' 48" S., longitude 106° 53' 0·7" E. Batavia observatory being in long. 106° 48' 37" E.‡

LIGHTS.—From an iron lighthouse with a white stone dwelling house, erected on the west point of Edam island, is exhibited at an elevation of 182 feet above high water, a *fixed* white light, which should be visible in clear weather from a distance of 17 to 20 miles.

At about 710 yards within the extremity of the western pier at Batavia, from a white tower with red roof, is exhibited at an elevation of 57 feet above high water, a *fixed* white light, visible from a distance of 13 miles

* Two dry docks, intended to be 443 feet and 328 feet long, were begun in Tanjong Priok harbour in 1882, but their state of progress is not known.

† Said to be in a state of decay in 1885.

‡ The Dutch reckon Batavia observatory as being in 106° 48' 25·5" E.

in clear weather. On the outer extreme of the same pier, a *fixed* light is shown from a pole, for the use of small craft entering the river.

From iron supports on the extremities of the breakwaters at Tanjong Priok, at elevations of 42 feet above high water, are exhibited *fixed* white lights, visible about 8 miles.

Weather Signal.—In the westerly monsoon, when there is danger in entering Batavia river, on account of the sea, a blue flag is hoisted on the signal mast in the river, on the Weltevreden palace, and on the buildings of the Societe di Harmonie.

HARBOUR.—At Tanjong Priok, $4\frac{1}{2}$ miles eastward of Batavia, a fine harbour has been constructed. The outer portion nearly one mile in length, and from 600 to 1,000 yards in width, is formed by two artificial breakwaters, each about one mile in length, with a depth between them of nearly 28 feet. The inner harbour is about 1,100 yards long by 200 yards wide, deepened to 25 feet. A quay 330 yards in length has been set apart for the use of the Government as a coaling quay. Spaces on the main quay have been conceded to the various steamship companies represented at Batavia for the purpose of erecting piers and coal sheds for the use of their own vessels. There is a custom house, railway station, telegraph office, harbour master's office, and a crane capable of lifting 25 tons at the entrance to the inner harbour; it is in connexion with the towns by railway and canal; the latter is navigable by lighters and small steamers. Eucalyptus and other trees planted in the vicinity of the harbour with the object of freeing it from miasma, and rendering it less unhealthy, has met with some success, the complaints from masters of vessels regarding the health of their crews in the harbour, being considerably less than formerly.

Buoys.—A white buoy lies near the extremity of the western breakwater, and a black buoy near the extremity of the eastern breakwater.

BATAVIA OLD ROAD is between the following limits, viz., southward of a line joining Rÿnland and Neptunus reef; eastward of Rÿnland shoal buoy bearing N. $\frac{3}{4}$ E., and westward of Neptunus reef buoys bearing N. by W. $\frac{1}{4}$ W.

The old road is considered safe, for although vessels roll considerably during the strength of the westerly monsoon, and are consequently compelled to strike upper masts and yards, no danger is to be apprehended from dragging, from the excellency of the holding ground. The usual anchorage is in from 5 to $5\frac{1}{2}$ fathoms, one mile off the outer pier light. Vessels seldom moor, as the anchors sink into the soft bottom, and it is advisable to lift them occasionally. From this light to the landing place in the river is a further distance of $1\frac{1}{2}$ miles, and the channel is with difficulty kept to a depth of 6 feet by the constant use of a steam dredger. At times the state of the sea is such as to render very difficult and sometimes impossible the loading and unloading of vessels in the road; the length of time even in

favourable weather occupied in going and returning by the lighters is such; that it is said two steamers unloading at the same time exhaust their carrying powers.

Batavia new road is the anchorage ground northward of the New harbour, with depths of $5\frac{1}{2}$ to 7 fathoms. The remarks on the old roadstead will also apply to this, but it is more conveniently situated with regard to the harbour.

Tides.—During the monsoons there is only one tide in the 24 hours; in the easterly monsoon it is high water, full and change at 10 p.m., and in the westerly monsoon at 10 a.m. During the period when the one monsoon is changing to the other, (April and October) there are two tides. The range of tide at springs is about 4 feet (maximum).

Currents.—The currents in the channels of the western approaches to Batavia run with the prevailing monsoon, and are little affected by the tidal stream. It attains its greatest strength in the narrow portion of Inner channel, between Middleburg island and Untung Java reef, where it sometimes runs at the rate of 2 miles an hour. See also page 260.

ISLETS and REEFS.—Middleburg island, and the islets and dangers westward of it, have been described with the Inner and Outer channels, see page 274. The dangers, eastward of Middleburg island, will now be described.

Shore bank.—From the buoy marking the north extreme of Untung Java reef, south side of Inner channel, the mud bank within a depth of 3 fathoms, fronting the shore of Batavia bay, trends south-eastward, gradually nearly the shore until abreast Onrust island where it is distant about 4 cables; thence it increases its distance to about three-quarters of a mile from the shore towards Batavia and the harbour at Tanjong Priok.

Three white buoys mark dangers lying off the edge of this bank, hereafter described.

Amsterdam island (Untung Java), on the north side of Inner channel, is separated from Middleburg island by a passage $1\frac{1}{2}$ cables in breadth between the projecting reefs, with a patch of $3\frac{1}{4}$ fathoms near the centre of it.

The island is low, covered with trees, and inhabited by a few fishermen. Excepting on the south side the island is surrounded by a reef, which in places extends to the distance of $1\frac{1}{2}$ cables. On the island are buildings belonging to a floating dry dock, which has fallen into a state of decay. Westward of this dock and close to the shore, is a similar dock, which has sunk; portions of it show above water.

Schiedam island (Ubi Kechil) is a small island about one cable in extent, with a few trees on its eastern end. The reef around the islet extends northwards and eastwards for the distance of one cable, but on the west side for only a short distance.

Rotterdam island (Ubi Besar) is $1\frac{1}{2}$ cables in length, and covered with trees; a coral reef surrounds the island and extends in places to the distance of one cable, with 9 to 10 fathoms close-to.

Ubi reef, or rock, with a depth of 2 fathoms, lies East, distant $2\frac{3}{4}$ cables from the east point of Rotterdam island. On its north-east side is a white beacon buoy, marking the west side of Middle channel.

A reef, about $2\frac{1}{2}$ cables in extent, with a least depth of $1\frac{1}{2}$ feet, lies about 3 cables S.S.E. $\frac{1}{2}$ E. of Rotterdam island. Detached patches lie close off its east and west extremes. A similar patch with $1\frac{1}{2}$ fathoms least water, and steep-to, lies nearly midway between Rotterdam and Kerkhof islands, with the former bearing N.W. $\frac{1}{2}$ N., and the latter S. by W. $\frac{1}{2}$ W.; detached rocks lie off its north-east and west sides.

A patch of $2\frac{3}{4}$ fathoms lies with Kerkhof island bearing S. $\frac{3}{4}$ E., distant $5\frac{1}{2}$ cables.

Kerkhof island (Kelor) lies $1\frac{1}{2}$ miles southward of Rotterdam. It is about one cable in extent, covered with trees, and has a stone tower on its north-west extreme. The island stands on the western edge of a reef which extends nearly 2 cables northward and eastward of it. A patch of 3 fathoms lies S.W. by W. $\frac{1}{4}$ W. about 3 cables from the middle of the west side of the islet, and a small patch of one fathom lies nearly 3 cables south of the north-west extreme of it.

Tengnagel rock, of small extent, with a depth of 3 fathoms, and 7 fathoms close-to, lies with the masting crane at Onrust bearing S. $\frac{3}{4}$ E., and Mathilde rock S.W.

Stone of Onrust, a small coral reef of $2\frac{1}{2}$ fathoms, and 5 fathoms, mud, around it, lies with the north-west point of Onrust bearing S.E. by S. about 4 cables; a black beacon buoy marks its west side. Between the stone of Onrust and Kerkhof island are several isolated patches.

Mathilde rock (Karang Perut) a small patch of 2 fathoms, lies $4\frac{1}{2}$ cables W. $\frac{1}{2}$ N. from the stone of Onrust, and nearly 2 cables off the edge of the shore mud bank. A white buoy marks its north side in 3 fathoms. Inner channel is between this buoy and the black buoy marking the stone of Onrust.

Onrust island (Pulo Kapal) on the western side of the bay, is about 400 yards in extent; on the north and east sides a reef extends to the distance of one cable, but the south and south-west sides are clear.

Dockyard.—The island is built completely over with the houses and stores of the Dutch naval establishment, which is centred here. There is a depth of 24 feet alongside the jetty, powerful cranes, steam saw mills, smitheries, and every convenience for refitting on the island; also a floating dock 340 feet in length, with a breadth of entrance of 62 feet. This dock has taken a vessel of 5,700 tons, 289 feet long, and drawing 23 feet water.

Coal.—Dutch vessels of war coa at the naval depôt on Kuiper island; and also at the Government wharf in New harbour.

Kuiper island is a small island lying close southward of Onrust, it has a long mole extending from its north side in the direction of that island. A reef extends from its eastern side to the distance of 2 cables, and from the west side beyond the pier, for about one cable; the south-west point of the island at which there is a coaling pier for Dutch vessels of war, is clear. A beacon marks the west side of the reef, but south-westward of it for a short distance there is but 3 fathoms of water.

Close off the edge of the reef extending eastward of Kuiper island, is a patch of one fathom. A beacon buoy, with black and white rings, marks its north-east side.

Kuiper reef (Jambatan), a small patch of $2\frac{3}{4}$ fathoms, with about 4 fathoms around, lies S. by W. $\frac{3}{4}$ W. distant $4\frac{1}{2}$ cables from Kuiper island. Its north-east side is marked by a white beacon buoy. Inner channel lies between this buoy and Kuiper island.

Reigersdaal shoal of 2 fathoms, with 5 and 6 fathoms close to, lies $1\frac{1}{2}$ miles S.E. $\frac{1}{4}$ S. from Kuiper reef; its north-east side is also marked by a white buoy. Thence to Batavia road there are no dangers.

Purmerend island (Pulo Sakit), is about $1\frac{1}{2}$ cables in length and covered with tall trees. This island, except at its south-west point, is encircled by a reef, which on its east side extends to the distance of 2 cables; at half a cable eastward of the reef is an isolated patch of 4 feet.

Purmerend reef (Karang Sakit), with a least depth of $1\frac{3}{4}$ fathoms, is nearly 3 cables in length, and lies with the south point of Purmerend island bearing N.W. $\frac{3}{4}$ N. distant $3\frac{1}{2}$ cables.

A beacon, with cone stands on its south-west extreme; and a beacon buoy with black and white rings, lies north-eastward of a patch of $3\frac{3}{4}$ fathoms, lying off the north-east side of Purmerend reef.

Purmerend bank (Karang Jalan), is 2 cables in diameter, with a least depth of $1\frac{1}{2}$ feet, and 6 to 9 fathoms close-to. It lies nearly in the fairway of Middle channel, with the centre of Purmerend island bearing nearly due West and distant $1\frac{3}{4}$ miles. A black buoy marks its south-west side, and a white buoy its north-east side.

Hoorn island (Ayer Besar), lies about 2 miles northward of Purmerend bank, and with Haarlem island, lies between Middle and Outer channels, approaching Batavia road from the northward. Hoorn island is about 3 cables in length, and covered with tall trees. It stands on a reef which on the north-east side extends to the distance of nearly one cable, with 10 to 11 fathoms close-to. The south-west point of the island is clear.

Quarantine.—On Hoorn island there is a quarantine establishment.

Vessels arriving with any infectious disease must hoist a yellow flag, and await the arrival of the medical officer before communicating.

Ayer rock of $2\frac{1}{2}$ fathoms, lies W. $\frac{1}{2}$ N. distant $3\frac{1}{2}$ cables from the north-west point of Hoorn island. Its west side is marked by a black beacon buoy.

Haarlem island (Ayer Kechil), lies $1\frac{1}{2}$ miles north-westward of Hoorn island. It is $1\frac{1}{2}$ cables in extent, covered with trees, and encircled by a reef, which is steep-to, extending (as is the case with all these islands, farthest from the east sides) to about one cable. A patch of $3\frac{1}{2}$ fathoms lies $1\frac{1}{2}$ cables north-east of the island.

Monnikendam reef is about 2 cables in extent, and steep-to, with a patch of sand which dries at low water. It lies with the centre of Haarlem island bearing W. $\frac{3}{4}$ N. distant one mile. A white beacon buoy marks its north-east side.

NORTHERN APPROACH.—Edam island (Damar Besar), the largest island in the bay, lies between the outer channel route from the westward, and the approach to Batavia from northward and eastward. It is about $3\frac{1}{2}$ cables in diameter, covered with tall trees, and encircled by a reef, which on the north and east sides extend to the distance of one cable; near the edge of the reef are depths of 14 to 20 fathoms. *See lights.*

Edam reef, about 2 cables in diameter, and with a sand bank dry at low water on its southern part, is steep-to, with 16 to 18 fathoms at a short distance. The sand bank lies with Edam lighthouse bearing S. $\frac{1}{2}$ W., distant 6 cables. A beacon buoy, with black and white rings lies on the north side of the reef.

Kroya reef or Nassau bank is about $1\frac{1}{2}$ cables in extent, with a depth of $1\frac{3}{4}$ fathoms on the shoalest ledge, 3 to 4 fathoms around, and 16 to 17 fathoms at a short distance. It lies with Edam lighthouse bearing S. $\frac{3}{4}$ E. distant $8\frac{1}{2}$ miles, and South Watcher about N.W. $\frac{1}{2}$ W. distant about 9 miles. A patch of 6 fathoms lies $2\frac{1}{4}$ miles S.W. by W. of it, but no other patches are known of in this locality.

Clearing Mark.—The whole of Alkmaar island open eastward or westward of Edam islands leads clear of Kroya reef.

Alkmaar island (Damar Kechil), lies $1\frac{1}{2}$ miles southward of Edam island. It is about 260 yards in length, covered with trees, and encircled by a reef which on its north-east side extends to the distance of one cable, with a depth of 13 fathoms close-to.

Enkhuizen island (Nyamuk Kechil), is similar to Alkmaar island; the encircling reef extends about $1\frac{1}{4}$ cables northward of it, with about 11 fathoms close-to.

Leiden island (Nyamuk Besar), lying $1\frac{1}{2}$ miles south-eastward of Enkhuizen, is about 450 yards in length, covered with bushes, and encircled by a reef which extends one cable to the south-westward, and $2\frac{1}{2}$ cables eastward of it. A rock of $1\frac{1}{2}$ fathoms (Amstel shoal) lies just

southward of the east point of the reef, and a sand bank, which dries, lies on the reef northward of the island. Near the edge of the reef the depths are from 10 to 11 fathoms.

Rynlands shoal (Karang Tahan), is the westernmost of the several isolated shoals fronting the shore between Batavia and Tanjong Priok, and forming the northern limit of the anchorage, with depths of about 7 fathoms around. It is a small coral patch of $2\frac{1}{2}$ fathoms, and lies with the light on the extremity of Batavia pier bearing S. by E. $\frac{1}{2}$ E. distant $1\frac{6}{10}$ miles. A red beacon buoy marks the north-east side of the reef.

Pipa reef, a small patch of $2\frac{1}{2}$ fathoms, lies E. $\frac{1}{4}$ S. one mile from Rynlands shoal. A black beacon buoy marks its west side.

Pasop (Karang Tengelim), a small patch of 2 fathoms, lies N. by E. distant 2 cables from Pipa reef; a black beacon buoy marks its north side.

Neptunus shoal (Karang Pasir) is nearly 3 cables in extent, with a least depth of $1\frac{1}{2}$ feet; its centre lies N.E. by N. distant $5\frac{1}{2}$ cables from Pasop shoal. A black beacon buoy marks its north-west extreme, and a beacon buoy with black and white rings marks its south-east extreme.

Neerstuk reef is about $2\frac{1}{2}$ cables in extent, with a least depth of $1\frac{1}{2}$ feet; its centre lies E. by S. distant nearly one mile from Pasop. Beacon buoys with black and white rings marks the north and south extremes of the reef.

Vader Smit shoal (Pulo Puteri), is a coral reef $2\frac{1}{2}$ cables in diameter, with its middle portion always above water. It lies about $1\frac{1}{2}$ miles E.N.E. of Neerstuk, and $1\frac{3}{4}$ miles W.N.W. of the entrance to Tanjong Priok harbour. The north-east and south sides of the reef are marked by beacon buoys with black and white rings.

A small patch of 4 fathoms, lies about one mile eastward of Vader Smit shoal; its north-east side is marked by a beacon buoy with black and white rings.

Priok rocks are five patches of coral, lying from half a mile to about one mile westward of Tanjong Priok harbour, between the depths of 3 and 5 fathoms. The outer patches have from $2\frac{1}{2}$ to 3 fathoms, and the inner from $1\frac{1}{2}$ to $2\frac{1}{2}$ fathoms. Several rocky patches lie off the shore within the depth of 3 fathoms.

Berunda reef, a small coral patch of $3\frac{1}{2}$ fathoms, lies E. by N. $\frac{3}{4}$ N. distant $2\frac{1}{2}$ miles from the entrance to Tanjong Priok harbour. A black beacon buoy marks its north-west side.

St. Nicolas reef is a small patch of $4\frac{1}{4}$ fathoms, lying N.N.W. $\frac{3}{4}$ W. distant half a mile from Berunda reef, with a depth of 7 fathoms around it. Eastward of this reef the bay is clear of dangers, seaward of the five fathoms line.

This completes the description of the known dangers in Batavia bay.

DIRECTIONS.—Inner or Dutch channel.—Having passed through Sunda strait, and rounded St. Nicholas point, distant about 2 miles, a course about E. $\frac{1}{2}$ S. will lead to the entrance of Inner channel, which is usually taken by steamers, and sailing vessels with a fair wind. It lies southward of Struisvogel rocks, Kombuis and Middleburg islands, and westward of Onrust island. In clear weather, and under favourable circumstances, the reefs with a less depth than 3 fathoms will be seen by the discolouration of the water, and along the coast fishing stakes in many places extend out to depths of 4 or 5 fathoms, and occasionally into the channels, a look out for which must be kept to avoid fouling the screws of steamers.

From abreast Babi island the high trees just eastward of Tanara will be seen, and soon afterwards the Kombuis and Menschen-eter islands, the tall tree on Kaik point, and Mauk wood known as False Menschen-eter, will come in sight. Struisvogel rocks separate Inner from Outer channel, and the black beacon marking the southern rock must be left on the port hand; in mid-channel abreast the beacon the depth is from 10 to 12 fathoms, mud, deepening towards the rocks. Thence to Middleburg island the course is about E. by S. $\frac{1}{2}$ S., northward of the white buoy on Menschen-eter reef, and southward of all the black buoys, the depth decreasing to 10 and 9 fathoms.

Abreast Middleburg island, the channel between the black buoy and beacon marking the island reef, and the white buoy on Untung Java reef, which is steep-to, is but $3\frac{1}{2}$ cables wide, with a depth of about 10 fathoms in mid-channel; from abreast Middleburg beacon, bearing North, the course is S.E. $\frac{1}{2}$ E. until Schiedam island bears East, thence the course is S.S.E. $\frac{1}{4}$ E. direct for the black buoy on the stone of Onrust, (taking care not to bring Schiedam island westward of North, to avoid Tengenagel rock), altering course when near the buoy to S. by E., to pass between it and the white buoy on Mathilde rock; the depth will have decreased from 7 fathoms, west of Schiedam, to $5\frac{1}{2}$ fathoms abreast the stone of Onrust. Continue S.E. by E. until the south point of Onrust island bears East, when alter course to S.E. by S. to pass eastward of the white buoy on Jambatan rock, from abreast which the course is S.E. by E. $\frac{3}{4}$ E. about 5 miles to Batavia road, passing about half a mile northward of the white buoy on Reigersdaal shoal. If proceeding to the harbour at Tanjong Priok, course must be altered to pass northward or southward of Ryuland shoal and the shoals lying eastward of it.

Outer channel lies northward of Struisvogel rocks, Kombuis and Middleburg islands, and southward of Hoorn and Agenieten islands; thence northward of Dapur islands, and between Edam and Enkhuizen island on the east, and Haarlem and Hoorn islands on the west side.

On approaching Struisvogel rocks, as directed for Inner channel, the white buoy marking the northern rock must be left to the southward; here the channel between it and Hoorn islands is 5 miles wide, with a depth of about 30 fathoms, mud, which becomes mixed with sand towards the islands and rocks. If approaching Outer channel from northward of Babi island, Payung island must be kept well open southward of Hoorn islands, to avoid Karbou rock and the foul ground westward of those islands. From a position one mile north of Struisvogel buoy, the course is parallel to Inner channel, or E. by S. $\frac{1}{2}$ S., (taking care to avoid Laut rock of $3\frac{1}{2}$ fathoms, which is steep-to, by keeping Little Kombuis open northward of Great Kombuis), passing about $1\frac{1}{2}$ miles northward of Great Kombuis, where the depth is about 15 fathoms, and southward of Tandul reef black buoy. From close southward of Tandul buoy, the red buoy on Menjambang may be steered for, passing about 2 cables southward of it, this course avoids the patches of $4\frac{1}{2}$ fathoms lying in the fairway; or, taking the south side of the channel, pass half a mile northward of Lekapo and Sau reef white buoys, keeping (when abreast the latter) Great Kombuis light, or the north side of that island, bearing about W. $\frac{2}{3}$ S. astern. This bearing will lead northward of the white buoy lying north-eastward of Dapur island.

Vessels of deep draught wishing to avoid the $4\frac{1}{2}$ fathom patches in this fairway, should take the branch of the outer channel, one mile in width in its narrowest part, which leads close southward of Agenieten islands reef, (always visible by the discolouration of the water,) and northward of the Middle grounds, the latter marked on their north side by Delima reef, and Panjang di Laut buoys. When eastward of the buoys shape course to pass northward of Dapur island shoals as before. From one mile north-eastward of Dapur island steer about S.E., passing westward of Enkhuizen island if bound to Batavia road, and eastward of it if going to the harbour, giving the island a berth of half a mile; thence to the road, the course lies between Rynland and Pipa reef buoys; and to the harbour, eastward of Leiden island. Vessels may pass southward of Dapur island, and between Haarlem and Rotterdam islands, the dangers in which are marked by buoys, for which the mariner is referred to the chart. This is known as the Middle channel.

At night.—It does not appear advisable to attempt the navigation of the Inner channel at night, without local knowledge. The following directions are for Outer channel, and must be used with caution:—

Great Kombuis island light must be approached bearing S.E. by E., which leads northward of Struisvogel rocks, and when the water shoals to 15 fathoms, course should be altered to E. by S., passing within one mile of the island; when the light bears W. $\frac{2}{3}$ S., bring it astern, which

bearing will lead clear of the $4\frac{1}{2}$ fathom patches in the fairway; and when Eden island light bears S.E. by E., steer S.E. by S. until Batavia light bears South, then steer for it on that bearing to the roadstead.

Vessels being northward of Struisvögel rocks, at dusk, may take the channel between Payung and the Agenieten islands, which is 2 miles in width, with depths of about 45 fathoms, and haul down for Edam island when it bears S.E. by E., then proceed as before.

Working in.—From Babi island to as far eastward as Little Kombuis, vessels working in may stand across both Inner and Outer channels, as the principal dangers are all buoyed. In the Inner channel there is good anchorage everywhere, and vessels should anchor at dusk; but in Outer channel the water is deep.

Standing towards Pontang point; the mud bank which is steep-to, is marked by a wreck with a beacon; eastward of the point the bank may be approached by the lead as far as Tanara, but the north side of Great Panjang, should be kept southward of West. Standing into the bight, Pontang point should be kept westward of W. $\frac{1}{2}$ N., until the clump of trees eastward of Tanara bears westward of S. by W.; the north and north-east sides of Tanara bank is steep-to, and the lead gives no warning when approaching it from this direction. Eastward of it stand into the bight according to draught, avoiding the patches dry at low water, extending 8 cables northward of Jangkir islet, by keeping Kaik point southward of East. Menschen-eter reef may be approached on its west side by the lead, but its north point (marked by a white buoy), and its east side are steep-to, as is also the extreme of Untung Java point reef. In the bight between, the bank is shelving, but standing towards Serana reef, the centre of Menschen-eter island must be kept southward of S.W. by W. $\frac{1}{2}$ W. Standing to the northward, the channel is clear between Struisvögel rocks and Great Kombuis, with the exception of Tongara rock, marked by a black buoy, and Laut rock of $3\frac{1}{2}$ fathoms, not marked; between Great and Little Kombuis there is another good channel, and also eastward of the latter, for which the chart is the best guide.

Towards the Hoorn islands, Payung island should be kept well open southward of Great Tidong, to avoid the reefs westward of it; the reefs around Payung and the Agenieten islands will be seen by the discolouration of the water. Eastward of Little Kombuis, vessels should keep to the Outer channels, avoiding the neighbourhood of the dangerous shoals lying between Middleburg island and Sau reef buoy, and working up between the buoys marking the channels, or northward of the Agenieten islands, eastward of which there is little danger with ordinary caution in reaching the roadstead.

Northern Channels.—Approaching Batavia road from Banka strait and the northward presents no difficulties. Having passed the North Watcher, course may be shaped almost direct for South Watcher, giving a berth to the eastermost of the Thousand islands. Pass about one mile eastward or westward of the South Watcher, and then steer direct for Edam island, westward of Kroya reef, which will be avoided by keeping Alkmar island open westward of Edam island. A patch of 6 fathoms lies in this route, but no other shoal water is believed to exist. Thence by giving the islands in the bay a berth of about one mile, course may be shaped for the road, or for Tanjong Priok harbour, avoiding the dangers, which are all buoyed.

At night.—Having passed the North Watcher bring the light to bear N.W., and steer S.E. until Edam island light is sighted bearing about South. Bring it to bear S. $\frac{1}{2}$ W. and steer in on that bearing, which leads eastward of Kroya reef; as soon as Batavia light is sighted bring it to bear South, and steer for it to the road, clear of all dangers.

Coming from the eastward give Krawang point a berth of 2 miles, then shape course for the road.

At night, keep Edam light southward of W.S.W. to avoid the mud bank extending off Krawang point, then pass between Edam and Alkmar islands, bringing Batavia light to bear South, thence direct for it to the road.

CHAPTER VI.

BANKA STRAIT—AND NORTH-WEST AND NORTH COASTS OF
BANKA ISLAND.

VARIATION, 2° 15' East, in 1886.

GENERAL DESCRIPTION.—Banka strait separates the islands of Banka and Sumatra, and trends with many bends to the north-westward.*

The coast of Sumatra is very low, densely covered with wood, and offers no other variation than a few points, which are only clearly distinct at short distances, and are easily mistaken for the so-called False points, which are observed immediately after rounding the real points. The shore being inundated at high water, the distance from it is generally over-estimated.

Banka island is covered with hills and mountains, varying from 900 to 2,600 feet in height; and it is remarkable that, notwithstanding their comparatively small height, their summits are generally covered with clouds.

On the Banka coast are prominent points, sandy beaches, and in some places deep bights, as on the Sumatra side; as a rule, wherever sand occurs, casuarina trees will be found; the other trees are principally pine, teak, and aspen. Near the western point of Banka stands Muntok, the capital of the colony (or residency) of Banka, and its roadstead is much visited by the coasters that supply the Chinese miners with rice.

The whole coast of Sumatra is bordered by a mud-flat, which is narrower off the points, but in some of the bights is from 2 to 4 miles wide. Towards the Banka side the bottom becomes gradually harder, and even rocky. Besides the few small islets and rocks in this strait there is the group of Nangka islands, where vessels sometimes proceed to procure fresh water and wood. Many rivers discharge themselves into the strait,

* See Admiralty charts:—Gaspar and Banka straits, with plans of Lucipara and Stanton channels, and Nangka islands, No. 2,149; scale, $m = 0\cdot14$ of an inch. Banka strait with views, No. 2,597; scale, $m = 0\cdot25$ of an inch. Banka strait, south entrance, showing Lucipara and Stanton channels, No. 2,808; scale, $m = 0\cdot7$ of an inch.

Remarks on the whole of Banka strait, by Mr. W. Stanton, master in command of H.M. surveying vessel *Saracen*, 1859–60.

of which the principal are the Sungsang and the Asing, both navigable to a considerable distance.

The entrance to Banka strait is encumbered with numerous long and narrow banks of sand, having deep channels between; only two of which, however, viz., the Lucipara and the Stanton, are available for the ordinary purposes of navigation.

Stanton channel, nearly three miles wide in its narrowest part, and with depths varying from 7 to 20 fathoms, lies between Lucipara and Banka. Mr. Stanton states that this channel will be found to possess many advantages over that of Lucipara, for it is one mile wider, the approaches are marked by well defined hills on Banka island, and a vessel of the largest draught may pass through at any time of tide.

The water also being much deeper than in Lucipara, causes the banks, which are mostly of sand, to be easily recognised by the light colour of the water on them. The tide also ebbs and flows more regularly in this channel, and sets directly through it, which enables vessels even in calms to drop through; whereas in light winds and calms they are often set over amongst the dangerous banks whilst rounding First point in endeavouring to get through Lucipara channel.

The wind in the north-west monsoon blows off the Banka coast, and throughout the year land breezes generally occur during the night. A strong land wind from the north-east has been experienced in Stanton channel during the south-east monsoon, when the wind was blowing directly through Lucipara from the southward.

There is but little variation in the depth of water between the Sumatra coast and the Lucipara shoals; and during the months of January, February, and March, when the north-west monsoon is at its full strength, the southern current is so strong as to make it almost impossible for an indifferent sailing vessel to make any progress against it. Also during the latter part of the south-east monsoon it frequently blows hard from the south-west, accompanied with much rain; this would considerably retard vessels going to the southward through Lucipara channel, and offer a fair wind to those proceeding through Stanton channel.

Pilots of vessels from Singapore still invariably use Lucipara channel, as they say, "We always know where we are by the lead, as we keep it constantly in hand, whereas in Stanton channel we have to stop to get a cast. Also that the points on the west side of Banka strait are easily distinguished from a distance of 7 or 8 miles."*

WINDS.—The winds in Banka strait follow the direction of the coasts, though with slight variations from the influence of the land and sea

* Commander W. Chimmo, H.M.S. *Nassau*, 1870.

breezes; and fresh breezes may always be expected when working against the monsoon. *See* monsoons, page 260.

TIDES, and CURRENTS.—The tides in Banka Strait are strong but irregular, and are greatly influenced by the monsoons. The flood-tide enters the strait at both ends, meeting near the Nangka islands. The direction of the streams is entirely influenced by the windings of the strait, forming, at their meeting, whirls and eddies in the bights of the land.

In Lucipara channel and the southern parts of the strait, sometimes there are two, but generally only one ebb and flood in the 24 hours, the former running to the southward and the latter running to the northward. During the months of January, February, and March, at the greatest strength of the north-west monsoon, the southern stream continues often from 14 to 18 hours successively, with a rate of 2 to $3\frac{1}{2}$ knots; the flood-tide is then very trifling, and sometimes not at all perceptible. On the contrary, during the south-east monsoon, the stream of flood runs sometimes 14 to 18 hours with great velocity into the strait, and the ebb runs out during the other 10 or 6 hours with but little strength.

In the northern parts of the strait during the north-west monsoon, the southern stream or flood remains longer and is stronger than the ebb, and the reverse during the eastern monsoon. The velocity of the tide is sometimes 2 or $2\frac{1}{2}$ knots, and the range from 7 to 12 feet, and sometimes more; and in the mouth of the rivers the water during the western monsoon, from the heavy rains which prevail at that period, is much higher than during the south-east monsoon.

It is high water, full and change, in the south-east monsoon about 8 h. 30 m. p.m., at the south end of the strait, and 6 h. 30 m. at the north end; in the north-west monsoon high water takes place about $1\frac{1}{2}$ hours later, but in the morning. *See* page 318.

Between the monsoons flood and ebb succeed each other generally every 12 hours, and the one or the other is then stronger, according to the wind being northward or southward.

Mr. Stanton observes, that on the Sumatra shore, when the monsoon is blowing strong, a constant surface current will be found setting to leeward, and extending nearly to mid-channel, except between Fourth and Batakarang points, where it is influenced by the numerous branches of Palembang river.

On the Banka coast, owing to the formation of the land more regular tides will be found, therefore vessels in working should only keep on the Sumatra side between Batakarang and Fourth points, and then work along the Banka coast, as by so doing and leaving either extremity of the strait

at low water, they may carry a fair tide all the way through, and generally have the advantage of a land wind at night.

Eddies in the Bights.—When working through the middle of the strait during the strength of the monsoons, continuous and contrary currents are certain, and the skilful seaman will therefore find great advantage in availing himself of the eddies, as well as of the more regular changes of tide, by standing into the bights and bays in those parts of the strait where he can safely approach the land.

at **Inshore Tides.**—In Toboali channel, also in the bay north of Nangka islands, and in the passage between Karang Brom-Brom and Banka, we meet, even in the north-west monsoon, a regular succession in the roadstead tides. It has been often observed, when passing Muntok road, that the vessels were lying with their heads in a contrary direction to those at anchor upon the bank outside. In that road the flood comes from the westward, and the ebb from the eastward; but near the mouth of Sungai Asing the contrary occurs; the flood there runs west and the ebb east. In the bays between First and Second points, and again between Third and Fourth points, there are probably eddies of which vessels of light draught may make use, and heavier vessels may no doubt, in many places, run close enough to the shore to keep out of the influence of the tides.

Freshets.—Between Batakarang and Fourth points after heavy rains, the ordinary stream is considerably accelerated and diverted by the freshets from the many rivers in this vicinity, in the direction of Kalian point, until it reaches mid-channel. Vessels sometimes take advantage of this to complete water, as it is frequently quite fresh on the surface.

During the north-west monsoon, which is the rainy season, these freshets set out of the rivers on the Sumatra coast with great force, and they require to be carefully guarded against in the night.

WESTERN SHORE OF BANKA STRAIT.

LUCIPARA ISLAND, 164 feet high, at the southern entrance of Banka strait, 9 miles East of Lucipara point, is half a mile long, a quarter of a mile broad, and covered with trees; the island is visible in clear weather at the distance of 14 or 15 miles. It is surrounded by a reef, which from its south-east end extends rather more than $1\frac{1}{2}$ miles; and around this reef is a bank, with $2\frac{1}{2}$ and 3 fathoms, extending about $1\frac{1}{4}$ miles to the north-westward from the island, and 2 miles south-eastward of it.*

* See Admiralty chart:—Banka strait, No. 2,597; scale, $m = 0.25$ of an inch.

Rocky Patches.—Lucipara should not be approached on its south east side nearer than $3\frac{1}{2}$ miles, for a rocky patch with $2\frac{1}{2}$ fathoms water, lies S.E. by E. $\frac{1}{2}$ E., distant nearly $2\frac{1}{2}$ miles from the island.

Lucipara point, which forms the south-western limit of Banka strait, is covered with trees, the tops of the highest being about 90 feet above the level of the sea.

The coast between Lucipara and First points is formed of mangrove jungle, and was found in the survey of 1859 to have extended considerably. This extension may be attributed to the sediment from the numerous small rivers in that vicinity affording more soil for the growth of the prolific mangrove.

Dutch naval officers state that the whole coast of Sumatra facing Banka strait in the bights, and wherever mangrove is found growing, is annually progressing outwards. This remark applies to the bays, and more especially to the outlet of rivers, but not to First, Second, and the other principal points, where a different kind of tree will be found, and the rapid current sweeping round these abrupt points prevents any further extension taking place.

GREEN POINT, so called from the trees on it being of a lighter and brighter green than elsewhere, bears N. $\frac{1}{2}$ W., distant 9 miles from Lucipara point, the coast between forming a bight about $1\frac{1}{2}$ miles deep. Between these points is a ridge of high trees standing about $1\frac{1}{2}$ miles back from the coast line, with a conspicuous tree about 150 feet high, near their centre.

FIRST POINT, lies 4 miles northward of Green point, the coast between forming a bight. The trees on it are about 60 feet high, and present a level appearance.

The coast from First point trends in a west-north-westerly direction for $6\frac{1}{2}$ miles to False First point, having a small bight between. From False First point it recedes S.W. by W., about 3 miles, and then forming a deep bay gradually curves round to a small point, whence it extends nearly straight for 7 miles to Second point.

Mud-bank.—From the southward the coast line approaches Lucipara point in a north-easterly direction; but the 3-fathoms line, which may be considered the edge of the mud-bank which fronts the whole coast of Sumatra, approaches it nearly straight in a N. by W. direction, from a distance of 10 or 12 miles southward of the point, and passing it about 2 miles off, follows, with a slight curve in towards the coast the same general direction until abreast of Green point, from which it extends a little over one mile; it then takes a direction a little more westerly until abreast of the south part of First point, from which it is distant three-

quarters of a mile, then decreasing on its north-east side to the distance of a quarter of a mile from the shore.

From about 10 miles southward of Lucipara point, to within 2 miles of Green point, the soundings decrease regularly towards the mud-bank, but just southward of, and fronting Green point, the water shoals suddenly from 6 to 3 fathoms, and therefore this part of the flat should never be approached into less water than 7 fathoms. Near First point the bank is also steep-to, especially on the north-east side, and should not be approached under 12 fathoms, or within one mile of the point.

The mud-bank projects two-thirds of a mile from False First point, and more than 3 miles from the shore in the depth of First bight between False First point and Second point. The bank is steep close-to, and should not be approached under a depth of 12 fathoms near the points, nor under 10 fathoms in the bight.

False First Point.—The trees upon this point are more elevated than those on First point, being 105 feet high. Lalarie point on the Banka side is distant $7\frac{1}{2}$ miles.

SECOND POINT (Tanjong Tapa), the trees on which are about 80 feet high, bears N.W. $24\frac{1}{2}$ miles from First point. Between it and Third point, distant 20 miles, the coast recedes and forms Second bight, which is about 5 miles deep.

The mud-bank between Second and Third points lies nearly straight from point to point, filling the bight. The depths here do not, as a general rule, shoal so suddenly as they have been described to do between the other points, but at 2 or 3 miles south of Third point the bank curves out considerably, and is dangerous to strangers, particularly when coming from the northward, as they are likely to infer that the bank recedes in the direction of the land. The depths, too, here again begin to shoal suddenly, adding to the danger, so that it is necessary to exercise caution and give a good berth to this part of the bank.

A Spit extends $1\frac{1}{2}$ miles from the mud-flat in Second bight, and thence in a south-easterly direction for 2 miles, with depths of $2\frac{1}{2}$ to 3 fathoms, mud, and 4 to 5 fathoms between it and the flat; in passing this spit Second point should not be brought eastward of S.S.E. until Parmassang peak bears southward of E. $\frac{3}{4}$ S.

THIRD POINT (Tanjong Kesugian), bearing N.N.W. $\frac{3}{4}$ W. $20\frac{1}{2}$ miles from Second point, is 78 feet high. From this point the coast trends about W.S.W. for 2 miles to the entrance of a small river, named Sungai Kesugian, which, from native information, is said to connect with a branch of Palembang river; the coast then curves in a W. by N. direction to Fourth point.

The mud-bank does not extend more than half a mile off Third point, but it is very steep-to, and should not be approached under three-quarters of a mile, or in less than 13 fathoms water. Between Third and Fourth points the bank is straight, its edge being distant one to $1\frac{1}{2}$ miles from the shore, except in front of the bight just to the westward of Third point, where it is two miles distant.

The soundings between Third and Fourth points are irregular, but vessels may, with careful attention to the lead, stand towards the mud-bank into 7 or 6 fathoms, until nearly abreast of Fourth point, where the bank is steeper, having 10 fathoms close-to, and only 8 fathoms a little farther off.

FOURTH POINT (Katima Bongko), lies W. $\frac{1}{2}$ N. distant 23 miles from Third point. The trees upon it are about 112 feet high.

The coast from Fourth point stretches westward for 22 or 23 miles, and in this space the different branches of Palembang river fall into the strait.

BANKS.—A mud-bank, about 2 miles in length, and three-quarters of a mile in breadth, and having depths of $4\frac{1}{4}$ fathoms, lies about 8 miles eastward of Fourth point, and nearly 3 miles from the shore; between this bank and the edge of the mud-flat extending from the shore, is a channel about three-quarters of a mile broad, with 7 to 9 fathoms water.

A bank of sand and shells, having $4\frac{3}{4}$ fathoms water, lies 4 miles off Fourth point. It is 3 miles long in a north-west and south-east direction, about $1\frac{1}{4}$ miles broad, and from its western extreme Fourth point bears S.W. distant 4 miles. Between it and the mud-bank extending from the shore there are depths of 7 to 9 fathoms. Depths of 6 fathoms will be found between this bank and the $4\frac{1}{4}$ fathoms bank lying about 4 miles to the eastward.

Another patch, about one mile in extent, and having a depth of 6 fathoms, lies with Fourth point bearing S.W. $\frac{1}{4}$ S. $6\frac{1}{2}$ miles, and the dry rocks on Karang Brom-Brom N.E. by N. 3 miles.

The mud-bank from Fourth point trends in a W.N.W. direction for 18 miles, thence nearly South, forming one side of the entrance to Sungai Sungsang; a spit projecting from the land forms the other side of the entrance to that river, as also the south-east side of the entrance to Sungai Asing.

Caution.—This bank for 6 miles westward of Fourth point is composed of hard sand, covered with a thin stratum of soft mud, and is exceedingly dangerous, being steep-to, and many vessels have grounded upon it. The lead cannot at all be relied upon for giving warning in time to avoid it, for 11 fathoms may be had and the vessel be aground the next

instant. The safest plan is not to pass Fourth point within 3 miles, and to preserve that distance from the edge of the bank.

Depths of 10 to 12 fathoms will be obtained close to this steep bank, outside of which there are 8 and 9 fathoms; increasing again to 10 and 13 fathoms, so that it is not possible to discover a vessel's position by the lead only. The depths, however, become more regular off the mouths of the Palembang rivers, and towards and abreast Batakarang point, and if the lead in those localities be properly attended to, a vessel can proceed with ease and safety, as the soundings decrease regularly towards the shore.

Great care, however, is requisite in navigating this part of the strait during the rainy season, for large drifts are then brought down these rivers by the freshes, which set strong over to the west end of Banka; and as the flood runs strong into them on the springs, a vessel may be driven too near either shore, both sides of which are fronted by dangers. (See page 294.)

SUNGI SUNGSANG or Palembang River.—At about 18 miles westward of Fourth point is the main entrance of Palembang river, navigable for vessels of light draught as far as Palembang. The two eastern mouths, named Saleh and Upan, are not navigable. Since the survey of the north-west part of Banka strait in 1860, a deeper and more direct entrance to the main channel of this river has been formed, having 9 feet at low, and 21 feet at high-water springs.

Buoys.—Two Herbert buoys have been laid outside the bar of the Sungsang to mark the entrance. The white buoy lies in 18 feet, distant $5\frac{1}{2}$ miles N. by E. $\frac{1}{2}$ E. from Alangan point; and the black buoy lies in 16 feet E.S.E. distant $6\frac{1}{2}$ cables from it.

The channel into the river is marked with beacon poles, but on account of the many floating trees and strong freshes they must not be depended on, but it is said a vessel of moderate draught may safely enter at high water by bringing the trees, forming the west point of the river entrance to bear S. by W. $\frac{3}{4}$ W., and steering for them on that bearing until Pulo Payung (Umbrella island) bears South; then steer for the island, but take care in approaching it to keep close to the eastern bank of the river, to avoid the spit extending off its north end. If a pilot be required one may be obtained at Kampong Sungsang, the small village on the left bank, but there is no channel available for vessels on the west side of Payung.

This branch of Sungi Sungsang at its entrance is upwards of a mile wide, but within the navigable channel is contracted in some places to the width of a cable by the different islands and banks, until close to the town of Palembang, when the river widens to three-quarters of a mile with 5 and 6 fathoms close to the shore.

The river is navigable for vessels as far as the town by keeping close to the right bank; but those of large draft are recommended, when passing Pulo Singris and the bank of Kampong Maya, to keep near the opposite shore. Both sides of the river are wooded, and on nearly all the isolated banks there are small trees, and on others fishing stakes, consequently there will not be much difficulty in avoiding them.

Palembang, one of the largest Malay towns in the Archipelago, and the largest in Sumatra, derives its name from the many bridges across the numerous creeks that intersect it. A Dutch resident and other officials reside here, and to support their authority there is a military force. The population of the town is about 50,000, and the climate in the vicinity is considered so salubrious that convalescent soldiers are sent here from Banka.

Near the extreme end of the town, commanding the mouth of the Ogan river, is a large fort; there are several smaller forts some distance up the river.

Covered boats (called bedahs) daily arrive from the interior, laden with large supplies of cotton for exportation. This useful article grows quite wild some distance up the river, in some places close to the stream, and covering many miles of land. The greater portion of it is sent to Batavia.

All the necessaries of life are here found in abundance. The country abounds in large game, deer, wild pigs, &c.; and the river with fish. Beef, fruit, vegetables, &c. are cheap and plentiful. The export trade, consists principally of pepper, rattans, cotton, honey, dye woods, and gutta-percha.

Freshets.—From November to March rains prevail, and the wind varies from N.W. to N.E. At this period vessels belonging to Palembang either remain in port or trade to other places, as it is almost impossible for sailing vessels at this period to make any progress up the river against the freshets. During a stay of five days off the town in January, the influence of the flood was not once felt. The ebb slackened during the day, but at night it often ran 5 knots. After much rain the freshets out of the river are felt as far as Muntok bay.

Sungi Banju Asing, which lies close to the westward of Sungi Sungsang, offers the best passage to Palembang, being at all times navigable for vessels of heavy burden.* At the entrance, in mid-channel there are 8 to 10 fathoms. Higher up this river the Pontian and Jarang channels are as good as that through the Sungsang.

The difficulties in going up Asing river, caused by the narrowness of Pontian, Sebalick, and Jarang rivers, and the necessity of stopping so

* Seaman's guide round Java, page 267.

often to wait for the tide, are amply compensated by the advantage that vessels of even the greatest burden suffer no delay at its mouth.

DIRECTIONS.—To enter Sungai Banju Asing, bring Monopin hill to bear N.E. by E., and False Point N.W. by N., then steer in a S.W. direction, according to the state of the tide, for the ebb runs strongly towards the banks fronting the Sungsang and the flood towards the inner banks on the western shore of the river.

Having reached Api point, take the mid-channel, between the beacon-poles, towards Bayam point, and then keep rather towards the Laga point side, round which the Pontian channel is entered. With a flood tide keep on the eastern shore, as the stream runs with force past that channel; taking care, at the same time to avoid the shoals which surround the point. In this river care is necessary when passing the points, as from most of them project small mud-banks.

Pontian and other Affluents.—The junction of Pontian, Kietjar, Gassing, and Sebalick rivers, which last unites Pontian to Jarang river, causes a part of the ebb to run from the first two rivers, through Sebalick, and compels vessels having come so far with the flood to anchor, and wait for the ebb. Pontian river is generally deepest on its western side, except near its mouth, where the greatest depth is in the middle; but again towards the western side, higher up, and in front of the shoal off the point, between Kietjar and Sebalick rivers. When near its junction with Sleino and Jarang rivers, keep close to the eastern shore, in 6 to 8 fathoms, to avoid the reef which projects from the point between Sebalick and Jarang. When there is no wind it is necessary to anchor and wait for the flood coming up by Sleino river, in order to proceed up Jarang, and it will be found that a great part of the flood goes into Tambagadin river, while that going up Jarang is very trifling. Having reached Jarang Kechil, anchor again till high water, to wait for the ebb from this river, which will soon take the vessel into Sungai Sungsang. Remarks on the freshets (page 299) apply also to Asing river.

Jarang Bank.—The bank off Jarang river is very shallow, but on the north side there is a narrow passage with 5 or 6 fathoms. Vessels of less draught than 15 feet can also find a passage on the south side.

BATAKARANG POINT, the north-west boundary of Banka strait, bears N.W. $\frac{3}{4}$ W. about 30 miles from Fourth point, and may be identified by a group of trees, 130 feet high, which gives it a bluff and jagged appearance. False point is more sloping and flat, and lies about 9 miles to the south-eastward of Batakarang point.

The mud-bank projects 7 miles northward from Batakarang point, 4 miles north-eastward of it, and 2 miles off False point; thence trending

south-westward, bounding the entrance of Sungai Asing on its north-west side, to Tanjong Kampeh, from which it projects not quite a mile.

The soundings off Batakarang point are regular, and the point may be passed in from 6 to $4\frac{1}{2}$ fathoms water.

EASTERN SHORE OF BANKA STRAIT.

The south coast, which separates Banka and Gaspar straits, is treated of here, as being intimately connected with the former, for Mr. Stanton observes that at the entrance of Banka strait, in the south-east monsoon, the ebb tide during the night at springs will be found setting to the south-eastward; consequently many vessels, although steering a course for the strait, get set between Dapur islands and Baginda point.*

The coast between Tanjong Baginda and Dapur islands, in extent about 14 miles E. $\frac{3}{4}$ N. and W. $\frac{3}{4}$ S., is generally low, and covered with trees, it presents, however, some points sloping down from hills of moderate elevation. It is fronted with a mud-bank extending in places nearly 2 miles from the shore, upon which are many rocks above, and many others below water.

BAGINDA POINT, the south-eastern extreme of Banka, slopes gradually in a south-easterly direction from a hill 387 feet high. Two miles inside the point, in a N.W. by W. $\frac{1}{2}$ W. direction, is Baginda peak, 521 feet high.†

Duya Point, situated 2 miles south-westward of Baginda point, is separated from it by a bay about half a mile deep. At one mile N.N.W. from this point is a hill 432 feet high, from which the land slopes down to the coast.

Keyang point, 2 miles westward of Duya point, is separated by a sandy bay about half a mile deep.

Bantil point.—The bay between Keyang point and Bantil point, 3 miles to the westward, seems to be full of rocks.

Tanah-Robu point, $3\frac{1}{2}$ miles westward of Bantil point, has several rocks, above and below water, projecting nearly a mile off.

Banks.—Rocks, some of which are above water, extend southward of Duya point and for more than a mile along the coast westward, to the distance of half a mile. The east end of a sand-bank lies about $1\frac{1}{2}$ miles S.S.E. $\frac{1}{2}$ E. from Duya point, and extends westward until it meets the mud-bank which fronts the coast to the distance of one mile, as far as Tanah-robu point, where it terminates; on this sand-bank are several rocky patches.

* See Admiralty chart :—Banka strait, No. 2,597; scale, $m = 0.25$ of an inch.

† For description of coast eastward of Baginda point, see p. 334.

Belayer (Layer) reef is above water, and lies on the outer edge of the bank just mentioned, and S.W. by W. distant $1\frac{3}{4}$ miles from the east extreme of Keyang point.

Dapur point.—The coast from Tanah-robu point trends west about one mile, and then curving north-westward into a small bay about half a mile deep, extends with a ragged outline to Dapur point, under Toboali Lama peak, which forms the south-western extreme of Banka. Adjoining Dapur point is an islet or rock 40 feet high, with smaller rocks above water on both sides of it.

From a distance of 7 to 10 miles the rocks on Dapur point appear like a large town, showing out white against the trees in the background.

Dapur Islands* are two islets about a cable in diameter, connected at low water by rocks; they lie about one mile S. by E. from Dapur point, and form the south-eastern limit of the entrance to Banka strait. The southern one, 120 feet high, is fronted by a sandy beach; rocks above water lie about one cable to the southward, and a rock under water about 2 cables south-eastward of the islet.

There is a channel half a mile wide, with depths of $5\frac{1}{2}$ fathoms, between Dapur islands and point; thence to Nangka point there are several white rocks lying close to the shore.

The bottom, off the south end of Banka is very irregular, and composed of long sand-ridges, with deep water over a muddy bottom between. None of these banks have less than 5 fathoms on them, with the exception of one, the west end of which lies S.E. $1\frac{1}{2}$ miles from Dapur islands, thence extending about 5 miles to the eastward, where there are several patches of $3\frac{1}{2}$ fathoms over a sandy ground. At about 4 miles E. by S. of these patches, and separated by deeper water, is a bank of 4 and $4\frac{1}{2}$ fathoms, coral and sand, extending in an easterly direction for 3 miles; it appears to be a continuation of the Dapur bank, and from its shoalest part Baginda point bears N.E. $\frac{3}{4}$ N., distance 7 miles.

The survey of this locality should give mariners confidence to approach the south coast of Banka, and enable them at night to know their position by the soundings.

Overfalls.—At full and change great overfalls occur, caused by the meeting of the ebb stream from Banka and Gaspar straits over an uneven bottom.

TOBOALI BAY.—Nangka point, the south-east extreme of Toboali bay, lies 2 miles N.W. from Dapur point, and the coast between is fronted by rocks, extending about half a mile off shore. The edge of the

* Dapur, means cooking place. Native boats, in passing, generally land on these islands to catch turtle, as it is the only place in Banka strait where they are seen.

mud bank is nearly one mile off Nangka point, and has 5 fathoms water close-to, so that it must be approached carefully. The point may easily be distinguished by a round hillock over it 264 feet high, and also the land receding, forming Toboali bay, the shore of which is low, and fringed at high water with sandy beaches inside the mud-flat, which here extends 2 miles off the land.*

Toboali Lama is a hill situated $1\frac{1}{2}$ miles eastward of Nangka point. Its peak is of pyramidal form, and rises to an elevation of 512 feet.

Toboali point, bearing N.W. by N., distant $5\frac{1}{2}$ miles from Nangka point, has several white rocks near, and a conspicuous single tree on its summit; it is 213 feet in height, and visible 14 miles off.

Toboali fort, with its red-roofed barracks, stands half a mile south-east of Toboali point, upon a mound 60 feet in height, at the right point of entrance of a small river, on the banks of which is the village of Sabang, situated close to the fort, and containing a mixed population of about 600 Malays and Chinese. At low water the river dries to a distance of 3 cables from its mouth. A Dutch Administrator, and a Captain with a small military force garrison the fort. Position of fort, lat. $3^{\circ} 0' 48''$ S., long. $106^{\circ} 27' 22''$ E.

Mount St. Paul, 5 miles E.N.E. from Toboali point, rises with a gradual acclivity on its south-eastern shoulder to a peak 990 feet in height, with two others adjoining, of nearly the same elevation, the western peak terminating rather abruptly to a lower spur in the direction of Gadong peak. When westward of Puni island, owing to a projecting spur from the middle peak, the eastern peak of St. Paul is hidden, and the western one then appears the highest, and forms, with the north-west brow, a saddle hill.

Gadong peak is pyramidal, 593 feet high, and lies W. by N. distant nearly $2\frac{1}{2}$ miles from mount St. Paul; it is a good landmark.

Owing to the land contiguous to these hills and to Toboali Lama being low, they appear as islands beyond the distance of 15 miles.

Gosong point bears N.W. by W. 4 miles from Toboali point, the land between forming a deep bay with low mangrove trees. A small stream falls into the sea on the north side of the point.

From Gosong to Labu point the land is more elevated, the highest part being 250 feet in height, with rocky points and sandy beaches, between which are numerous rocks close to the shore.

Puni islet, lying midway between Gosong and Labu points, is small, 47 feet in height, and conspicuous from the white granite rocks forming its base, and other rocks of a similar appearance near it.

* See also plan of Stanton channel, scale, $m = 0.35$ of an inch, on Admiralty chart, No. 2,149.

Labu Point bears N.W. $\frac{3}{4}$ W. distant 12 miles from Nangka point, and may be considered the western extreme of Toboali bay. A hill, 250 feet high, lies about a mile eastward of it, and another, about the same height, the same distance northward. This point from the south-eastward presents a shelving appearance, with large white rocks extending from it, which, when seen from the westward have the appearance of a village, from the contrast they offer to the green verdure of the point.

The anchorage in Toboali bay is off the fort in 4 fathoms, mud, with Lama peak bearing S.E. by E. $\frac{1}{2}$ E., and Gadong peak in line with the fort N.E. $\frac{1}{2}$ N.; smaller vessels may approach on the latter bearing nearer the shore as the soundings decrease regularly. This bearing also leads into the anchorage, from Stanton channel, southward of the banks. In southerly and south-westerly winds there is a heavy swell here which makes landing difficult.

Supplies.—Water and wood may be obtained here; the former from the river, or at a small stream half a mile eastward of it, from half flood to half ebb. Medical assistance may be obtained here by application to the Dutch authorities.

DAWUN POINT is situated 7 miles N.W. by W. $\frac{1}{4}$ W. from Labu point, and the shore between is low and covered with mangroves; a range of hillocks extends parallel to the coast, the highest of which is elevated 230 feet; there are also several small rivers.*

The land at Dawun point attains a greater elevation, and is faced with sandy beaches and rocky points. At $4\frac{1}{2}$ miles N.N.E. from the point is a round woody hill, 315 feet in height.

Sail Tree.—Close to the coast, 2 miles N. by W. $\frac{1}{2}$ W. from Labu point, is a clump of trees, one of which (Sail tree) is a conspicuous square tree, 167 feet high, there being no others of the same elevation near it; in clear weather it may be seen 12 miles off, closely resembling a vessel under sail.

Pulo Dawun, 30 feet in height, is one of a cluster of rocks lying off Dawun point, nearly all of which are covered at high water. It is remarkable by its having a solitary tree on it, whence its name, Dawun, in Malay meaning leaf or bough.

Panjang Hill or Long Hill rises close to the coast between Dawun and Banka points. When seen from the south-eastward it shows as a wedge, with its greatest elevation, 316 feet, on the eastern end. From the north-westward it appears as a long hill rising to a peak near its centre, with one conspicuous tree.

* See Admiralty chart:—Banka strait, No. 2,597.

Water.—A stream of fresh water runs close to the north side of this hill; the coast between it and Pulo Besar is low and covered with mangroves, off which there are several ledges of rocks.

BANKA POINT and HILL.—Banka point, situated $12\frac{1}{2}$ miles N.W. by W. $\frac{3}{4}$ W. from Labu point, is about 60 feet high. At $1\frac{1}{2}$ miles northward it rises to Banka hill, which from the south-eastward appears of similar shape to Panjang hill, but differs in having the highest part on its western extremity. From the north-westward it shows with a flat top, having three clumps of trees on its summit, the whole height being 256 feet.

Pulo Besar is nearly connected with Banka point by rocks. Although its name in Malay signifies large, it can only be so in comparison with Pulo Dawun, it being but one-third of a mile in extent, and 63 feet high.

The COAST, from the foot of Banka hill, takes a westerly direction to Lalarie point. It is covered with mangrove trees, and assumes the usual irregular outline of such coasts. The trees upon Pudi point, nearly midway, are 108 feet high, and form two mounds, with a small gap between them.

Mamelon Hummock is a small round hill 256 feet high, standing by itself 3 miles inland in a N. by E. direction from Pudi point.

At the distance of $2\frac{1}{2}$ miles E. by N. of Mamelon Hummock is another small hill, with small ranges behind it.

LALARIE (Pangong) Point, 75 feet high, is covered with trees, and presents a bold bluff appearance on all bearings. It is the turning point into the main part of the strait for vessels that have passed through Stanton channel.

Anchorage.—Good anchorage may be obtained to the north-westward of Lalarie point, in about 7 fathoms, mud, with Lalarie point bearing S.E. $\frac{1}{2}$ E., and Brani point N. $\frac{3}{4}$ W.

A mud-bank fronts the whole coast between Dapur and Lalarie points. The 3-fathoms line may be considered to mark its edge, which, in most places, shoals very quickly inside that line.

From the rock close to Dapur point, the edge of this bank extends off only about a cable, whence it curves outward; beyond this, its distance from the shore is from a half to one mile off the points, and from 2 to $2\frac{1}{2}$ miles off the bights. Between Toboali and Labu points, are several narrow isolated banks about 2 miles in length, with depths of from 2 to 3 fathoms, lying parallel to and nearly midway between the shore mud-bank and the sand-bank forming the eastern limit of Stanton channel. (*See page 307.*)

From abreast Pulo Dawun to Lalarie point the bank is steep-to, there being 6 fathoms close to the 3-fathoms line, and in many places, but half a fathom just within; it must not be approached under a depth of 10 fathoms.

Casuarina Point, 123 feet high, lies nearly midway between Lalarie and Brani points. The coast between is low, with sandy beaches at high-water mark; several hills, from 300 to 400 feet high, rise at 3 to 4 miles inland.

BRANI, or Bold Point, 11 miles N. by W. $\frac{3}{4}$ W. from Lalarie point, is a termination of a spur from the Parmassang range, with a conical peak 516 feet high, showing very prominently both from the northward and southward.

Timbaga or Copper Rocks, so named from their reddish colour, are three small rocks, lying east and west of each other, about one cable in extent. The highest and westernmost rock is 4 feet above high water, with Second point bearing W. $\frac{1}{4}$ N. $5\frac{3}{4}$ miles, and Brani point N. by E. 3 miles. Shoal water, about half a mile in breadth, extends nearly half a mile northward of the group, and $2\frac{1}{2}$ miles to the southward, between which and the mud-bank fronting the Banka shore is a channel three-quarters of a mile wide.

Patches of coral and sand, about a cable apart, with 2 fathoms least water, and 8 fathoms close to, have been found nearly $1\frac{1}{3}$ miles W.N.W. from these rocks, but they are all inside the 10 fathoms line, the depth vessels are cautioned not to go within when passing them. In approaching them the soundings shoal suddenly from 20 to 10 fathoms.

From the middle patch of 2 fathoms, Timbaga rocks appear nearly in line with a sharp peak, 330 feet high, south of Bukit Limmaun, bearing E.S.E.; and the apex of Riah hill, 657 feet high, is just open west of a white rock off Tanjung Bedaau, N. by E. $\frac{1}{8}$ E.

A rocky bank, about a mile in extent east and west, and half a mile north and south, having 7 to 9 fathoms water, and 14 to 20 fathoms close to all around, lies W.N.W. of the shoal patches just mentioned. Lalarie point, bearing S.E. $\frac{1}{4}$ S., leads clear of Timbaga rocks, of the 2 fathom patches, and also just to the westward of this bank.

Water may be procured at a stream about half a mile to the northward of Timbaga rocks, from half flood to half ebb, after which the mud prevents a boat approaching near the shore.

Parmassang Range is a chain of hills extending from Brani point in a N.E. by N. direction for nearly 7 miles; the highest peak, near the centre, rises to an elevation of 1,608 feet.

When seen from the northward, a peak, which is not the highest appears to be so, owing to the north-easterly direction of the chain. A

spur of the range extends in a N.N.W. direction towards the coast, the end of which, named Bukit Salle, is 442 feet high.

TANJONG BEDAAU is a bold headland, 3 miles northward of Brani point, the coast between forming a bay half a mile deep. A conspicuous white rock, 45 feet high, lies immediately off the point.

Pulo Pemain is a small round island, 59 feet high, lying on the edge of the mud bank, N.W. by N. 2 miles from Tanjung Bedaau.

Tanjung Karra, 171 feet high, lies 3 miles north-eastward of Tanjung Bedaau; rocks, some above water, extend more than half a mile off this point.

SLAN BAY.—The coast from Tanjung Bedaau recedes to the eastward, and between Tanjung Karra and a point about 2 miles eastward of Nangka islands, is Slan bay, a deep shallow bight, about 8 miles across, in which are the Kotta and Slan rivers. On the coast line in the depth of Slan bay is a conspicuous tree 196 feet high.

Slan is the chief town of a pangkal, or district, and is municipally governed by the administrator of the tin mines; here, as at all other chief towns of districts, a small number of Dutch troops are stationed.

Shore Mud-bank.—The edge of the bank (page 305), lies nearly one mile off Lalarie point, and thence its direction is nearly straight, passing Casuarina and Brani points at a little less than half a mile. Pulo Pemain stands on its outer edge, thence the bank assumes somewhat the form of Slan bay which it fronts, and surrounding Great Nangka islands trends in a north-easterly direction towards Tanjung Tedong, from which it extends a little more than one mile.

Northward of Timbaga rocks the bank may be approached to 8 or 7 fathoms, as far as two miles northward of Pulo Pemain, when vessels may stand into 7 or 6 fathoms until near Nangka islands, which should not be approached on the west side nearer than 12 fathoms.

NANGKA ISLANDS, three in number, lie about the middle part of the strait, $1\frac{1}{2}$ to 3 miles distant from the shore of Banka island, and 8 to 9 miles eastward of Third point, on the Sumatra coast. Great Nangka, 285 feet high, is $1\frac{3}{4}$ miles long north and south, and $1\frac{1}{4}$ miles broad; Middle and West Nangka are each about half a mile long, the former being 125 feet, and the latter 205 feet high.*

Great Nangka is nearly half a mile within the edge of the mud bank which extends from the Banka shore. A rock awash at low water, lies 3 cables west of the north point of the island.

From Middle Nangka a bank of 2 to 3 fathoms extends S.S.E. $1\frac{1}{4}$ miles; from West Nangka a similar bank projects to the southward nearly one

* See Admiralty plan of Nangka islands, scale, $m = 1$ inch, on chart No. 2,149.

mile; and S.S.E. distant three-quarters of a mile from its extreme is a $3\frac{1}{4}$ -fathoms patch.

A small flat rock, 6 feet high, named West reef, lies $1\frac{1}{2}$ cables off the west end of West Nangka; and another 32 feet high, named Tree rock, lies 3 cables south-eastward of Middle Nangka.

North reef, with some rocks above water lies 2 cables off the north end of Middle Nangka, the mud-bank extending off in the same direction about a quarter of a mile farther.

Between the banks which surround the islands are intricate channels from 2 to 4 cables broad, having depths of from 4 to 7 fathoms.

Water.—There is a stream of water on the west side of Great Nangka, and another and smaller stream on the north-east side; but they are frequently dry in the south-east monsoon, and owing to the mud-flats surrounding the islands, the watering places are difficult of approach by boats. The natives are not to be trusted, but on the contrary much caution is necessary while watering.

Anchorage.—The south extreme of Great Nangka bearing E. $\frac{1}{2}$ N., leads about half a mile southward of the bank extending S.S.E. of the Middle Nangka; and Tree rock N. by W. $\frac{1}{4}$ W., clears the mud-bank off the west side of Great Nangka nearly the same distance. A vessel can anchor, with both these bearings on, in 5 fathoms, and be about $1\frac{1}{4}$ miles from the watering place; she should, however, approach this position with caution, and not attempt to go closer in.

Tides.—In the north-west monsoon it is high water, full and change, at Nangka islands at 7h. a.m., and the rise is about 10 feet. Many eddies and small races will be met with in the vicinity of these islands, caused by the tidal flood wave from the China sea meeting the flood from the southward.

TANJONG TEDONG, lying about 2 miles northward from Great Nangka, is a conspicuous point 234 feet high. A large cluster of rocks, some above water, lie about one mile north-westward of the point, at a short distance from the edge of the shore mud-bank.*

The coast from Tanjong Tedong trends north-eastward into a bay, at the bottom of which is the small river Sembulan; thence it curves north-westward to Tanjong Penegan, from which it recedes about one mile to the entrance of a small river of that name. The coast line from this river rounds the foot of the higher land sloping down from Mundo peak, and then trends N.N.W. to Mundo point, when it again bends to the north-east for $1\frac{1}{2}$ miles to Mundo river.

Meddang Islands are three in number, lying about 3 miles off the entrance of Mundo river, and forming the south-western extreme of

* See Admiralty chart :—Banka strait, No. 2,597.

Mundo bay, being joined to the main land by the mud-flat. The largest island is 147 feet high. A small island named Pulu Antu, lies about $1\frac{1}{2}$ miles north-eastward of Meddang islands.

Mundo bay.—From Mundo river the coast trends north-westward about 8 miles to Tanjong Jurong-patt, 240 feet high, forming Mundo bay, with a point about the centre of it projecting nearly one mile. The shore of this bay is low, and covered with trees, which, at the entrance of Kotta Waringin river, are about 120 feet high. The land near Tanjong Jurong-patt becomes more elevated, and continues so as far as the entrance of Jiring river.

The coast from Tanjong Jurong-patt trends in a westerly direction nearly 3 miles to Tanjong Raya, where it recedes northerly about one mile to Tempelang river; thence it takes again a westerly direction past Pulo Sumbayang, 175 feet high, for nearly 4 miles to Tanjong Ressam, the eastern extreme of Jiring bay.

Jiring bay is the deep bight between Tanjong Ressam and Tanjong Tadah, a distance of 9 miles. At the head of the bay is Jiring river. The shore of the bay is low, with three conspicuous trees 150 feet high in its north-west part. Tanjong Tadah, 203 feet high, is readily recognised, the land on both sides being lower and curving into two bays, giving it a prominent appearance.

Tanjong Anisi.—Between Tanjong Tadah and Tanjong Puni, about 8 miles apart, there are two bays, each about three-quarters of a mile deep, with Tanjong Anisi having a hummock 256 feet high, midway between.

Karang Saribu are a cluster of rocks, some above water, extending 2 miles from Tanjong Anisi.

Tanjong Sukal, 2 miles eastward of Tanjong Puni, has a hill 209 feet high, and a small river on its west side.

Tanjong Puni is low, and the coast line rounds away gradually on either side. Thence to Tanjong Kalian, 11 miles west-north-westward, the coast recedes and forms Muntok bay, about 2 miles deep.

Landmarks.—There are several hills from 100 to 600 feet high on the part of the coast just described between Tanjong Tedong and Mundo river; Mundo peak, 512 feet high, eastward of Meddang islands, is the most convenient for determining the position of a vessel.

At 3 miles N.E. from Tempelang river entrance is Bukit Tempelang, 412 feet high, north-westward of which is Bukit Pandin, 585 feet high, a useful mark when in this part of the strait.

Bukit Assam, a solitary sharp peak, 660 feet high, standing by itself, $10\frac{1}{2}$ miles northward of Tanjong Tadah, is also useful as a landmark.

Four or 5 miles inland between Tanjong Puni and Muntok are some hills, one of which, Bukit Belu, 773 feet high, serves as a clearing mark for Brom-Brom reef, and Amelia bank.

Monopin Hill rises near the west end of Banka; its summit being 1,456 feet high, may be seen at a considerable distance, and serves as a guide in approaching to or departing from the north end of Banka strait. It frequently happens that this hill is the only visible object, especially when a vessel is near Sumatra in 5 or 6 fathoms water.

BANKS.—Shore mud-bank.—The edge of the shore mud-bank (page 307), after passing a distance of one cable outside the rocks off Tanjong Tedong, takes a N.N.W. direction, till abreast Meddang islands, outside of which it extends nearly one mile. Thence it curves round Mundo bay, projecting 4 miles southward of Tanjong Jurung-patt; it then turns westward, passing Tanjong Ressim at $4\frac{1}{2}$ miles, and Tanjong Tadah at nearly 3 miles.

From Tanjong Tadah the bank still follows a westerly direction till south of Tanjong Puni, when it trends away sharply to the north-westward, following the curve of the coast line at an average distance of about $1\frac{1}{4}$ miles until abreast the point eastward of Muntok, from which it is distant only half a mile.

Between Tanjong Tedong and Tanjong Tadah, the soundings decrease regularly towards the bank, which may there be approached to 5 or 4 fathoms, except near Meddang islands, where a vessel should not shoal under 5 fathoms. At Tanjong Tadah the bank begins to get steeper-to, and abreast of Karang Saribu, there are depths of 9 and 10 fathoms close to its edge.

Clearing Mark.—Mundo peak, well open to the southward of Meddang islands, leads clear southward of this bank as far westward as Tanjong Tadah.

The bank south of Tanjong Puni is shallow and steep-to, having from 11 to 16 fathoms, almost close to its edge. Tanjong Tadah bearing E.N.E. leads just clear to the eastward of this dangerous spit; and Monopin hill, N.W. by N. leads just clear to the westward.

Karang Brom-Brom is an extensive shoal of rocks and sand, dry in places at low water, lying $4\frac{1}{2}$ miles south from Tanjong Sukal. It is a little more than 2 miles long in an east and west direction, and nearly half a mile wide at its western end, where the rocks are, and from which Monopin hill bears N.W. $\frac{1}{2}$ N.; the eastern end tapers away to a sandy point.

Buoy.—On the south side of Karang Brom-Brom lies a red beacon buoy, in 5 fathoms.

The highest part of Tanjong Anisi bearing N. $\frac{1}{4}$ E., or the highest part of Tanjong Tadah bearing N.E. $\frac{3}{4}$ N., leads half a mile eastward of the shoal; and Bukit Belu, bearing N. $\frac{3}{4}$ W., leads nearly a mile westward of it.

A Channel 2 miles wide, having 7 to 15 fathoms water, lies between Karang Brom-Brom and the shore mud-bank. A vessel may easily work through this channel by day, during the western monsoon, because she can take advantage of the tides, whereas on the coast of Sumatra, a strong easterly current runs with little interruption; she must, however, be careful when standing towards Tanjong Puni, as the bank is steep-to, and she might suddenly fall from 7 to 3 fathoms before there would be time for a second cast of the lead.

Amelia bank is a small patch of hard ground, with $2\frac{3}{4}$ fathoms water, at the south-east extreme of Muntok bank; it is connected to the shoal patches of that bank by a ridge having 4 to 5 fathoms water. From Amelia bank the western extreme of Karang Brom-Brom bears East $4\frac{1}{2}$ miles, and Monopin hill N.N. W., 12 miles.

Bukit Belu bearing N. $\frac{1}{4}$ E., leads one mile eastward of Amelia bank; and the same hill N. by E. $\frac{1}{4}$ E., leads the same distance westward. The dry rocks of Karang Brom-Brom bearing E. by N. clears the south side of the bank, which should not be approached under a depth of 10 fathoms.

Muntok bank extends from Amelia bank in a direction nearly parallel to the shore, for a distance of $10\frac{1}{2}$ miles, to within about a third of a mile of Karang Hadji, off Tanjong Kalian. It is composed of hard sand, and has several patches of $2\frac{1}{2}$ and 3 fathoms water, and 4 or 5 fathoms between.

A 2-fathoms patch lies N.W. by N. $2\frac{1}{2}$ miles from Amelia bank: Bukit Belu, bearing N. by E. $\frac{1}{4}$ E. which leads to the westward of Amelia bank, leads to the eastward of this patch.

From this patch, others of $2\frac{1}{2}$ and 3 fathoms extend N.W. by W. for 5 miles, this part of the bank being about $1\frac{1}{2}$ miles wide. For 3 miles farther in the same direction the bank has from $4\frac{1}{2}$ to 7 fathoms, the deepest water appearing to be with Muntok fort flagstaff in line with the pier head, bearing about N. by E. $\frac{1}{4}$ E.

Another $2\frac{1}{2}$ -fathoms patch lies with the lighthouse on Tanjong Kalian bearing N. $\frac{1}{4}$ E., $1\frac{1}{2}$ miles; from which depths of 5 fathoms may be obtained towards Karang Hadji until very close to it, when the water will suddenly deepen to 11, 17, or 20 fathoms. Monopin hill in line with the lighthouse on Tanjong Kalian, N.E. by N., leads westward of the $2\frac{1}{2}$ -fathoms patch, between it and Karang Hadji.

Working through the strait, and standing towards Muntok bank, vessels should not bring the lighthouse on Tanjong Kalian to the westward of N.N.W. $\frac{1}{2}$ W., when northward of Amelia bank.

Karang Hadji is a dangerous reef of rocks and sand lying close to the north-west end of Muntok bank; the rocks are all covered at high water, but many are visible at half tide. The reef is $1\frac{1}{2}$ miles long in an east and west direction, and half a mile broad, and from its western and outer extreme Tanjong Ular is in line with Tanjong Bersiap; its eastern extreme bears S.W. by W. $1\frac{1}{4}$ miles from Tanjong Kalian light. Close to on the north, west, and south sides, are irregular depths of from 16 to 21 fathoms.

Tanjong Ular kept well open of Tanjong Bersiap leads westward of this reef; the highest part of Monopin hill in line with the lighthouse, leads eastward of it; and Tanjong Puni bearing E. $\frac{1}{2}$ S., leads to the southward.

Buoy.—On the north-west edge of Karang Hadji lies a white beacon buoy in $4\frac{1}{2}$ fathoms.

A rock, with 12 feet water, lies about 2 cables northward of Karang Hadji, with Tanjong Bersiap, bearing North, and lighthouse on Tanjong Kalian E. $\frac{1}{4}$ N.

Binnen bank, of hard sand, with $2\frac{1}{2}$ fathoms water and 7 or 8 fathoms close-to, extends East $1\frac{3}{4}$ miles from Tanjong Kalian, receding thence to the north-west for about half a mile; it forms a spit projecting to the eastward, thence curves into the sand-bank which extends half a mile from the shore of Muntok.

Two-thirds of a mile E. by S. from this spit is a 3-fathoms patch, from which Muntok pier-head bears N.N.W. $\frac{3}{4}$ W., distant two-thirds of a mile, and Tanjong Kalian lighthouse West.

TANJONG KALIAN, low and sandy, with some trees behind it, is the south-west extreme of the west end of Banka. About three-quarters of a mile north-westward, is Tanjong Berani (Batu-brani), with trees about 130 feet high.

LIGHT.—The lighthouse upon Tanjong Kalian is a white stone tower with a red lantern with white roof, from which is exhibited, at an elevation of 170 feet, a *fixed* white light, visible in clear weather from a distance of 20 miles. Position $2^{\circ} 41\frac{1}{2}'$ S., long. $105^{\circ} 8\frac{1}{4}'$ E.

Kalian Ledge is a small reef, with one fathom water, lying a little more than one mile N.W. by W. of Tanjong Kalian.

Buoy.—A black beacon buoy lies in $4\frac{3}{4}$ fathoms W.S.W. of Berani point, and marks the eastern side of Kalian pass.

Kalian Pass, formed between Tanjong Kalian and ledge, and Karang Hadji, is three-quarters of a mile wide, with depths of 25 to

32 fathoms. This channel is generally used by vessels coming from the northward and proceeding to Muntok bay, and with a fair wind is preferable to the passage southward of Karang Hadji; but the great depth, bad anchorage, and strong currents, render it unadvisable to attempt to work through.

The lighthouse bearing E. by S., leads through between Kalian ledge and Karang Hadji; the sandy point upon which the lighthouse stands may be passed tolerably close to.

MUNTOK or MINTOK.—At two miles E.N.E. from Tanjong Kalian on the banks of a small river is the town of Muntok, the capital of the island, having a fort upon a hill, and some stone houses close to the shore, the red roofs of which are visible at a distance. The Resident and other Dutch officers have houses on the hill near the fort, most of the native houses being nearer the sea. The population of Muntok in 1884 consisted of 80 Europeans, mostly Dutch, and 9,000 Malays and Chinese. The island of Banka has a population of about 200 Europeans, 50,000 Malays, and 20,000 Chinese.

Pier.—A pier nearly half a mile long extends from the western point of the river, but there is only a depth of 5 feet at its extremity at low water. There is a small camber, westward of the pier, where small trading vessels load and discharge.

Lights.—A fixed *red* light is exhibited from the outer extremity of the pier, and a *fixed* white light is shown from a wooden tower, painted white, on the inner extreme of the pier, visible about 8 miles.

Supplies.—Coals may be obtained here from the Dutch Government by application to the harbour master, but it is tedious to get off, there being only one lighter. Ships' boats can coal from the pier at any time. Provisions are dear, with the exception of fowls. Medical assistance may be had by application to the Governor.

Mail steamers running between Batavia and Singapore, five times each way monthly, call here.

Anchorage.—The best anchorage for large vessels in Muntok road is in 6 to 10 fathoms, about $1\frac{3}{4}$ miles from the shore, with Monopin hill bearing about N. by E., and Tanjong Kalian from W.N.W. to W. by N. The ordinary anchorage of the Dutch man-of-war stationed in Banka strait, and of the merchant vessels trading to Muntok, which are usually of a small class, is in $4\frac{1}{2}$ or 5 fathoms inside the 3-fathoms patch lying off the spit which extends from Binnen bank, at any convenient distance and direction from the pier-head.

When the entrance to the river is dangerous, a blue flag is hoisted at the harbour master's office at the inner end of the pier.

DIRECTIONS.—The usual route to Muntok road is across Muntok bank. A vessel coming from the northward and bound for the road, may proceed either through Kalian pass, or she may pass outside Karang Hadji and then follow the usual track across Muntok bank. A good mark for crossing the bank is Monopin hill in line with the flagstaff on the fort bearing N. by E. $\frac{1}{4}$ E., which leads in 5 or 6 fathoms water; another good mark is Monopin hill in line with the lighthouse N.E. by N.

No vessel can cross the bank in safety with Monopin hill bearing to the westward of North. When over the bank, the water will deepen to 18 or 20 fathoms, soft muddy bottom, and shoal again quickly towards the inner bank and the shore.

With a working wind keep Monopin hill between N. $\frac{1}{4}$ E. and N.N.E.

Working into Muntok road from the eastward a vessel should keep between the shore and Muntok bank, being careful not to bring Tanjong Tadah to the eastward of E.N.E., until Monopin hill bears N.W. by N.

A hard sandy bottom and shoal water will show when near the edge of Muntok bank; while, to avoid the shallow bank along the coast, Monopin hill must not be brought more to the westward than N.W. by N., and taking care not to shoal to less than 5 fathoms.

Tides.—It is high water, full and change, at Tanjong Kalian, in the north-west monsoon at about 8h. a.m., and in the south-east monsoon at 8 p.m.; springs rise $12\frac{1}{2}$ feet.

TANJONG BERSIAP, 168 feet high, lies 3 miles northward of Tanjong Kalian. The coast between is fronted by a bank extending nearly a mile off, with from 7 to 10 fathoms close-to. Inside the edge of this bank, and lying some distance off Tanjong Bersiap, is a cluster of rocks, some of which are above water.

Bersiap Hill, 336 feet high, is small and isolated, and stands about $1\frac{1}{2}$ miles north-east of the point. At 2 miles north-east of the hill is the extreme of the Monopin range, a conspicuous peak 709 feet high.

TANJONG ULAR, 156 feet high, is about 4 miles northward from Tanjong Bersiap, the coast between forming a bay about one mile deep; nearly in the centre is a remarkable yellow cliff. A reef, with rocks above water in places, extends nearly one mile off Tanjong Ular.

Water.—About three-quarters of a mile northward of the yellow cliff is a stream of water.

LIGHT.—From an iron lighthouse, painted white, erected on Tanjong Ular, is exhibited, at an elevation of 53 feet, a fixed red light, visible in clear weather about 5 miles.

ULAR REEFS is the name given to the rocky and uneven ground, with rocks above water in places, extending from one to $1\frac{1}{2}$ miles off shore between Tanjong Bersiap and Tanjong Ular.

Transit rock, on which H.M.S. *Transit* was wrecked (1857), lies at the western extremity of this rocky uneven ground at $2\frac{1}{2}$ miles off shore, and W. $\frac{1}{2}$ N. 8 cables from O'Flaherty reef which generally shows, except at high tides, with 6 and 10 fathoms between them. The least depth on the rock is 12 feet, with Tanjong Ular bearing N.E. by E. $\frac{1}{4}$ E., and Monopin hill E. by S. $\frac{3}{8}$ S. There is a depth of 20 fathoms at one cable westward of the rock; the depths around varying from 5 to 14 fathoms over irregular bottom.

A rock awash, at low-water springs, lies E. $\frac{1}{2}$ N. 2 cables from Transit rock; and a patch of $4\frac{1}{2}$ fathoms (perhaps less) rocky bottom, at half a mile northward of Transit rock, with 20 fathoms close-to; the locality of the latter is indicated by strong ripples.

Clearing marks.—Tanjong Berani, bearing S.S.E. $\frac{1}{2}$ E., leads westward of Transit rock; and Tanjong Biat, bearing E.N.E., leads northward.

A rocky patch of 7 fathoms lies nearly midway between Transit rock and Frederick Henry rocks, with Kalian lighthouse bearing S.E., distant $8\frac{1}{2}$ miles.

TANJONG BIAT, 3 miles north-eastward from Tanjong Ular, has rocks above and below water, extending nearly one mile off.

Water.—In the bay between Tanjong Ular and Biat is a small stream of water with a village close to.

Sebidung Uma, a rocky patch of 3 fathoms or less, lies about $1\frac{3}{4}$ miles off the coast, midway between Tanjong Ular and Tanjong Biat, with depths of 10 to 12 fathoms between it and the shore bank.

As this bank is steep-to, great caution is necessary when navigating in this locality.

Ular lighthouse bearing S. by E. $\frac{1}{2}$ E., leads half a mile westward of these dangers; and Bukit Batu, a hill 708 feet high, about 12 miles eastward of Tanjong Biat, bearing E. $\frac{1}{2}$ S., leads one mile northward of the patch.

FREDERICK HENRY ROCKS lie at the northern entrance of Banka strait, nearly midway between Batakarang point on the Sumatra coast and Transit rock off the Banka coast. They consist of two rocky patches, lying north and south of each other, having 9 feet on the northern patch, and 3 feet on the southern. The two patches occupy a space about one mile long, and half a mile broad.

From the 3-foot patch Monopin hill bears E. $\frac{3}{4}$ S. 14 miles; and the lighthouse on Tanjong Kalian S.E. by E. $\frac{1}{8}$ E. $12\frac{1}{2}$ miles.

Close around the rocks the depths are 16 to 20 fathoms water, except to the southward, where a bank with depths of 8 to 10 fathoms stretches about one mile southward of the south patch.

Buoy.—A red buoy, surmounted with a staff, and the letters F.H. on a vane, is moored in 5 fathoms on the north edge of the 3-foot patch.

Clearing Marks.—Monopin hill, E. $\frac{1}{2}$ S., leads about half a mile southward of the 3-foot patch; and Monopin hill in line with the remarkable yellow cliff between Bersiap and Ular points, E. by S. $\frac{2}{3}$ S., leads 2 miles northward of the northern patch.

Caution.—The buoys and beacons in Banka strait are not to be depended upon.

STANTON AND LUCIPARA CHANNELS.

STANTON CHANNEL,* lying along the south-western coast of Banka, is 19 miles long, and nearly 3 miles wide at its narrowest part, with depths in mid-channel increasing gradually from 7 fathoms at its south-eastern entrance to 20 fathoms near the other extreme. The approaches from the southward are marked by the well-defined mount St. Paul, and the conical hills of Gadong and Toboali Lama, and in fine clear weather by the more distant range of Padang; these cannot fail to point out the entrance, and the water being deep within half a mile of Dapur islands, will give strangers confidence in steering for the land. Prominent points and hills will also be seen along the Banka coast, bearings of which will enable a vessel at any time to ascertain her position.

The channel is bounded by narrow sand-banks extending in a N.W. by W. and S.E. by E. direction, with a mixture of mud and sand between. The two marking the western boundary of the channel are named Smits and Melvill banks, after the late Lieutenants Smit and Melvill of the Dutch Royal Navy, whose valuable contributions to hydrography in the Java sea are so well known to seamen.

Smits Bank consists of four smaller banks, nearly connected, and forming within the depth of 5 fathoms one long narrow ridge 15 miles in length, with its shoalest part of 2 feet, lying 6 miles, and the next shoalest of 10 feet, 3 miles from the north-western end; two other patches of 3 fathoms and $2\frac{3}{4}$ fathoms lie on the south-east part of the bank.

Panjang hill, bearing N.E. $\frac{1}{4}$ N., leads north-eastward of Smits bank, and between it and Nemesis bank, in 6 fathoms at low water. Gadong peak in line with Toboali point N.E. $\frac{1}{8}$ E., or Lucipara island S.W., clears the south-eastern end in 4 fathoms; the north-eastern side should not be approached under a depth of 10 fathoms.

* See Admiralty chart of Banka strait, South entrance, No. 2,808, scale, $m = 0.7$ of an inch.

Melvill Bank, 5 miles long, and nearly half a mile broad, lies a quarter of a mile eastward of the south-eastern part of Smits bank, with a depth of 7 and 8 fathoms between. The shoalest part of this bank, 2 to 3 fathoms, is near its north-western extremity, and is about 2 miles in length.*

Laboh point bearing N. by E. $\frac{1}{2}$ E., leads south of the bank, in 7 fathoms; and Mamelon hummock just open of Pulo Besar leads $1\frac{1}{2}$ miles eastward of Melvill bank, in about mid-channel.

Between the above banks and Lucipara island, there are many others all trending in the same direction, with narrow deep water channels between; but as these channels are exceedingly narrow, and no marks can be given to clear the banks, they are not available for vessels.

Eastern Bank.—The bank marking the eastern side of Stanton channel is 13 miles long and nearly one mile wide abreast Laboh point, which is the broadest and shoalest part. It is formed by three smaller banks nearly joined together, with from $1\frac{1}{2}$ to 3 fathoms on the north-western, 4 feet on the middle, and $2\frac{3}{4}$ to 3 fathoms on the south-eastern bank. The north-western extremity is separated from a horn extending from the shore mud-flat abreast of Pulo Dahuu, by a narrow channel having 6 fathoms water.

Gadong peak, in line with Toboali fort, bearing N.E. $\frac{1}{2}$ N., leads southward of Eastern bank in $4\frac{1}{2}$ fathoms; Dapur island E. by S. $\frac{3}{4}$ S. leads westward; and Mamelon hummock on with, or kept open to the westward of Pulo Besar, also leads westward of the bank.†

A small bank of sand lies one mile to the westward of the south-eastern extreme of Eastern bank, but as not less than $4\frac{1}{2}$ fathoms were found at low water, it is not dangerous to vessels passing through.

Between Eastern bank and the Banka coast there is an inner channel nearly a mile wide, with 4 to 6 fathoms water, but being encumbered with shoals it is only navigable for small vessels. Dapur island bearing S.E. by E. $\frac{1}{4}$ E., leads nearly in mid-channel.

There are also two outlets from this channel into Stanton channel, over Eastern bank; Pulo Dahuu bearing N. by E. $\frac{1}{2}$ E. leads through in 5 fathoms; and Pulo Puni in line with Gossong point, E. by N. leads through in 4 fathoms.

Nemesis Bank, lying nearly mid-channel between Pudi point and False First point, is a long ridge of sand extending 9 miles in a north-west and south-east direction, with irregular soundings of 3 to 10 fathoms. The shoalest part consists of two patches of 3 fathoms, half a mile apart,

* This bank appears to have shoaled considerably, as trees which are visible about 6 miles are said to be growing upon it. Pola. Hyd. Notice No. 24 of 1885. See page 320, foot note.

† Mamelon hummock is said to be difficult to distinguish at this distance.

each about 2 cables in extent, and from the western patch Lalarie point bears N.N.W. $\frac{3}{4}$ W. $4\frac{1}{2}$ miles.

Casuarina point kept open of Lalarie point bearing N. by W. $\frac{3}{4}$ W. leads westward of Nemesis bank, in 14 fathoms water; Mamelon hummock N. by E. $\frac{1}{4}$ E., leads eastward; and Lalarie point bearing N.W. $\frac{1}{4}$ N. leads northward. There is a patch of 5 fathoms lying 2 miles from the south-eastern extreme of the bank, with False First point bearing W. $\frac{1}{2}$ S., distant $6\frac{1}{2}$ miles.

Anchorage may be found in any part of Stanton channel, but vessels bringing up with their kedje or stream anchor must always be prepared to let go the bower anchor, as there will be experienced, particularly during the change of the monsoons, very dangerous squalls, with heavy rain, thunder, and lightning, which generally lasts for about an hour.

Tides.—In the south-east monsoon it is high water, full and change, at Toboali point, on the Banka shore, at 8h. 30m. p.m., and at 10 a.m. in the north-west monsoon; ordinary springs rise $10\frac{3}{4}$ feet, and sometimes 12 feet. The highest tide generally occurs two days after full and change. The rate at springs is $2\frac{1}{2}$ knots. The flood stream sets to the N.W. and runs for about 12 hours, and the ebb the same period in the opposite direction, but they are both sometimes influenced by the strength of the monsoon. When it is blowing strong from the S.E. the flood stream often runs from 14 to 18 hours.

It is high water, full and change, at Labu point at 11h. p.m. in the south-east monsoon; ordinary springs rise 10 feet.

Northward of Lalarie point, in the south-east monsoon the flood sets N.N.W., and the ebb to the S.S.E., along the Banka shore.

The time of high water at Labu point being $2\frac{1}{2}$ hours later than at Toboali point in the southern part of Stanton channel, for a few days after full and change the tides will be found, (as there is generally 12 hours flow and ebb,) to run in one direction all night, and the opposite direction during the day, with a velocity of $2\frac{1}{2}$ to 3 knots. The current also setting directly in mid-channel, the flood N.W. by W., and the ebb S.E. by E., vessels may take advantage of it in light airs to drop through.

DIRECTIONS.—Vessels from the southward intending to proceed into Banka strait by Stanton channel cannot fail, in approaching the coast of Banka, to recognise mount St. Paul by its flattish top having several nipples of nearly the same elevation, and Gadong and Toboali Lama peaks by their conical appearance. Should the weather be clear, the distant high range of Padang will be visible. The highest peak of this range is quoin-shaped, attaining from its western shoulder an elevation of 2,217

feet, with several lower hills of a rounder and more conical appearance adjoining, the two westernmost being about 1,200 and 1,400 feet high.*

After recognising mount St. Paul and Toboali Lama peak, approach the latter on a North bearing, and when about 3 miles southward of Dapur islands steer N.W. by W., which course will lead nearly mid-channel to abreast Banka point: observing that Mamelon hummock (if it can be distinguished) just open of Pulo Besar, leads well clear to the eastward of Melvill and Smits banks.

When off Labu point, the high range of Parmassang will be visible, rising from a gradual slope on its western shoulder to a flat top peak, with two lower peaks adjoining. The three hills, Banka, Panjang, and Woody, will also be seen; the two former may be known by their wedge shape and the latter by its isolated position.

When Pulo Dahun bears North, care must be taken to avoid the spit which extends in a south-easterly direction from the shore mud-flat between Pulo Dahun and Banka point. The Mamelon hummock, well open to the westward of Pulo Besar, bearing N.W., clears this spit. From abreast Banka point a course may be shaped along the Banka shore, passing Lalarie point at a distance of $1\frac{1}{2}$ or 2 miles, as the tides are strong and set towards the point, and thence to Second point. From Lalarie point to Timbaga rocks the shore bank may be avoided by not shoaling under a depth of 10 fathoms. From Lalarie point, *see* page 323.

Working through Stanton channel from the eastward, vessels may stand towards the south extreme of Dapur islands to a distance of half a mile, as these islands have deep water at 4 cables from them. Between this and Toboali the shore mud-flat may be approached until Dapur islands bear S.E. by E., and Lucipara island may be neared to a distance of 4 miles; but when Gadong peak comes in line with Toboali fort N.E. $\frac{1}{2}$ N., Pulo Dapur must not be brought to the southward of E.S.E. to clear Eastern bank.

Parmassang peak kept eastward of Pulo Besar, or Banka hill bearing N.W. $\frac{1}{2}$ N. will clear Melvill bank; and when Labu point bears N.E., by not shoaling under 10 fathoms, all the banks on both sides will be cleared.

The shoal patches on Nemesis bank should not be approached under a depth of 10 fathoms until Casuarina point comes open of Lalarie point, and in rounding the latter point take care not to come into a less depth than 10 fathoms, as the bank is here steep-to. Timbaga rocks may also be avoided by following the same precaution, and from thence it is recommended to work up from Second point along the Sumatra coast.

* *See Admiralty charts:—Banka strait, south entrance, No. 2,808; Banka strait, No. 2,597; and Banka strait to Singapore, No. 2,757.*

From the westward.—Proceeding through Stanton channel from the westward, when abreast and $1\frac{1}{2}$ miles distant from Lalarie point, an E.S.E. course will lead nearly mid-channel between Nemesis bank and the bank extending from the Banka shore, until Mamelon hummock is only just open of Pulo Besar, or Parinassang summit is eastward of that islet, either of these marks kept astern will lead through the channel between Melville and Eastern banks.

Working through from the westward in the south-east monsoon, the same precaution must be taken as already mentioned to avoid the shoalest part of Nemesis bank, which will be passed when Mamelon hummock bears N. by E. $\frac{1}{4}$ E.; and should a strong flood tide be then running it would be advisable to anchor in 8 or 9 fathoms, sand, on Nemesis bank, as the water on both sides is deep, and wait for a change of tide, or the chance of the land breeze, which blows generally either during the night or early in the morning from the Banka shore. When Panjang hill bears N.E., Lalarie point must not be brought to the northward of N.W. by W. $\frac{1}{4}$ W. to avoid Smits bank, and the same directions as already given in not approaching the banks under 10 fathoms until Labu point bears N.E. $\frac{1}{2}$ N. will be quite sufficient to enable any vessel to work through.

LUCIPARA CHANNEL.—The south entrance to this channel is between Lucipara island and Lucipara point. The western side of the channel is bounded by the mud-flat which projects from the coast of Sumatra for 2 miles and more; and its eastern side, by various hard and dangerous sand-banks, which narrow the breadth of the passage to $1\frac{1}{2}$ and 2 miles.*

Round Shoal.—The southern sand-bank in this channel is nearly 2 miles long, and one mile broad. The least water, $1\frac{1}{2}$ fathoms, is near the centre, with the summit of Lucipara island bearing S.E. $\frac{1}{4}$ E. distant 8 miles.

The narrowest part of Lucipara channel, $1\frac{1}{2}$ miles, is between the western extreme of this bank, and the mud-flat extending from the Sumatra coast.

A light vessel, in 5 fathoms, and $8\frac{2}{3}$ miles N.W. $\frac{3}{4}$ W. of Lucipara island, marks the western extremity of Round shoal, and exhibits at an elevation of 28 feet above the sea a *fixed* white light, visible in clear weather from a distance of 8 miles. The vessel is painted black, with the

* In 1860 Mr. Stanton was of opinion that this channel would, within a few years, become unnavigable for vessels of large draught, owing to the rapid extension of the mud-flat projecting from the Sumatra coast on the western side, and to the extension, also, of the sand-banks on the eastern side.

word *Lucipara* on either side in white letters, and has one mast surmounted by a black ball.

Hindustan Bank lies close northward of Round shoal, and is about $3\frac{1}{2}$ miles in length. The depths on the southern and middle parts are one to 3 fathoms, but about three-quarters of a mile from its northern extreme is a patch of hard sand with only 3 feet water. From this position Green point bears W. by N. $\frac{1}{4}$ N. distant $3\frac{1}{4}$ miles.

Merapie Shoal, the most northern of the banks on the eastern side of Lucipara channel, is composed, like the others, of hard sand, and is three-quarters of a mile in extent north and south, and more than half a mile broad. The least water is $2\frac{1}{4}$ fathoms, and lies with First point bearing W. by N. $\frac{1}{2}$ N. distant 3 miles; False First point is just in sight.

DIRECTIONS.—Lucipara Channel from the southward.—When bound towards Banka strait from the southward, Lucipara island is generally made between the bearings of N. by E. and N.W., in depths of $5\frac{1}{2}$ to 8 or 9 fathoms; but should it, when first seen, have a more westerly bearing, run to the westward till it bears North, distant 4 or 5 miles; and then, by steering N.W., the vessel will pass between it and Lucipara point. With westerly winds it is advisable to keep on the western side of the channel in $4\frac{3}{4}$ to $5\frac{1}{2}$ fathoms.

In Lucipara channel the bottom is generally hard sand on the banks towards the eastern side, and soft mud on the western or Sumatra side; yet close to the north-western edge of Hindostan bank, the bottom is also soft, with $5\frac{1}{2}$ and 6 fathoms; it is therefore advisable not to keep in too soft bottom, but in the middle of the channel.*

In clear weather, when the Parmassang range is visible, the highest peak on the western extreme of the range in line with First point, N. by W. $\frac{3}{4}$ W., will lead into Lucipara channel, nearly three-quarters of a mile clear of the 3-fathoms edge of the mud-bank projecting from Lucipara point.† When Lucipara island bears S.E. by E. $\frac{1}{4}$ E., Lucipara light vessel should be N.E. by N. about one mile, and Mamelon hummock N. by W., this latter mark being steered for on that bearing will lead through between the bank off First point, and Merapie shoal. When False First point opens, a vessel may edge away to the westward to round First point, taking care not to approach it nearer than one mile, as the bank projecting from the point is steep-to, especially on its north-east side. After rounding First point a N.W. by W. course will lead midway between False First

* Seaman's guide round Java, page 252.

† Formerly this mark led through the middle of the channel, but owing to the mud bank having become of late years considerably more extended, it no longer answers that purpose.

point and Nemesis bank, and when Lalarie point bears N. by W. $\frac{3}{4}$ W. course may be altered to N.W. From Lalarie point, *see* page 323.

A vessel entering this channel with Parmassang peak in line with First point, N. by W. $\frac{3}{4}$ W., will have about 4 fathoms at low water, with an occasional cast of $4\frac{1}{4}$ or $4\frac{1}{2}$ fathoms, until Lucipara island bears E. by S. $\frac{1}{2}$ S. when the soundings will deepen to $4\frac{3}{4}$ and 5 fathoms, and shortly afterwards to $5\frac{1}{2}$ and 6 fathoms, till abreast the light vessel off Round shoal; thence 6, 7, and 8 fathoms until nearly abreast Merapie shoal, when the water will suddenly deepen to 11 or 12 fathoms. If, from the haziness of the weather, Parmassang peak cannot be seen, keep midway between Lucipara island and the coast, taking care not to bring the island to bear southward of S.E. by E., until First point bears N. by W. $\frac{3}{4}$ W., or Mamelon hummock N. by W.

From the northward.—Entering Lucipara channel from the northward, First point must be rounded with caution, on account of its being steep-to, especially on its north-eastern side, and it must not be approached nearer than one mile; at the same time if the tide is running to the south-eastward it will be necessary to use proper care that, in giving a safe berth to First point, the vessel is not set too near Merapie shoal, which the tide will be likely to do unless guarded against. Mamelon hummock, kept astern, bearing N. by W. is the leading mark through, until abreast Lucipara light vessel, whence Parmassang high peak should be kept in line with First point, astern, steering S. by E. $\frac{3}{4}$ E., which will lead clear of the Sumatra shore bank; or a S.E. by S. course may be steered, which will lead midway between Lucipara island and the main.

Working through this channel a vessel may stand towards the Sumatra bank safely by attending carefully to the lead, but must not stand into less than $6\frac{1}{2}$ fathoms when near the elbow projecting off Green point. Lucipara island must not be approached nearer than 2 miles, when bearing northward of N.E.

Careful attention to the lead and a good look-out, will also give sufficient warning when standing towards the banks on the eastern side.

Caution.—Many vessels passing through Lucipara channel have grounded on the mud-flat extending from the coast of Sumatra, especially a short distance southward of Green point, where the flat extends farther out, and all have been obliged, before they could get off, either to tranship or to throw a part of the cargo overboard, as the anchors which were laid out on the soft muddy bottom to heave them off came home. This part of the flat shoals suddenly from 6 to 3 fathoms, and therefore should never be approached to a less depth than $6\frac{1}{2}$ fathoms.

It will also be necessary to use great caution when working through this channel from the southward and standing to the eastward to avoid being

set on the banks by the tides, which sweep over them with great strength, and would soon carry a vessel into danger, if due allowance be not made. This is very likely to happen when southward of Round shoal, and standing to the eastward.

In working through this channel from the northward similar caution is required. With light winds it is difficult to get into the northern entrance, the tides sweeping vessels away to the south-eastward amongst the banks.

DIRECTIONS.—From Lalarie Point through Banka Strait.*—Having passed through either Stanton or Lucipara channels, and brought Lalarie point to bear about East, distant 3 miles, a N.W. by N. course for about 10 miles will lead midway between the rocky bank of 7 or 8 fathoms water, lying north-westward of Timbaga rocks, and the mud-bank projecting from Second point, and in this track the soundings will be from 20 to 22 fathoms water, with an occasional east 2 or 3 fathoms deeper. Continuing the same course for 6 or 7 miles farther, the water will have shoaled gradually to 10 or perhaps 6 fathoms, and the vessel will then be from one to $1\frac{1}{2}$ miles outside the spit projecting from the Sumatra flat. On the same course for another 5 or 6 miles the depths will be from 6 to 10 fathoms, thence deepening to 11 and 14 fathoms; the latter depth will then be obtained for 8 or 9 miles farther, to Third point. At night, Kalian light will be seen some time before reaching Third point.

If a vessel following this track, after having passed Second point, should shoal the soundings under 6 fathoms, she will be getting too near the Sumatra flat, and should haul out to the eastward; remembering that Second point must not be brought eastward of S.S.E. until Parmassang peak bears E. $\frac{3}{4}$ S., to clear the spit projecting from the bank.

From 2 miles off Third point, a W. by N. $\frac{1}{4}$ N. course may be steered for about 30 miles, which, if the vessel be not affected by tides or currents, will lead about 4 miles off Fourth point, and place her in a position from which Fourth point will bear about S.E. by S., distant 7 miles, and Monopin hill North.

Thence steer about N.W., paying particular attention to the tides, which frequently set strong into or out of Palembang rivers (page 298).

With Kalian lighthouse in line with Monopin hill bearing N.E. by N., distant about 5 miles, course may be shaped to pass eastward or westward of Frederick Henry rocks. Formerly, the western channel was recommended as being the safest, especially at night, on account of the depths in it being more moderate, and decreasing regularly towards the Sumatra coast; whereas in the eastern channel the water is deeper and the depths irregular. Since the establishment of a light on Tanjong Ular, which,

* See Admiralty chart :—Banka strait, No. 2,597, scale, $m = 0.25$ of an inch.

with that on Tanjong Kalian, afford good marks for ascertaining a vessel's position, the eastern channel, which is nearly 8 miles wide between Frederick Henry and Transit rocks, should be easier navigated.

From East channel, Gunong Penyabung, Paree, and Busukan, on the north-west part of Banka, appear like islets. Penyabung, bearing N.E., leads 2 miles eastward of Frederick Henry rocks (marked by a buoy), 3 miles westward of Transit rock, and 2 miles north-westward of Sebidung Uma, the outer dangers bordering this channel.

Passing westward of Frederick Henry rocks, between them and Sumatra, vessels should keep in $4\frac{1}{2}$ to 7 fathoms water on the edge of the Bank off Batakarang point, and not more to the eastward than in 9 or 10 fathoms, while Monopin hill is between the bearings of East and E. by S.

Working through Banka Strait from the Southward.

—Directions have already been given for working through Stanton and Lucipara channels to Lalarie point at pages 319 and 322. In working between Lalarie point and Nangka islands the lead is a good guide, as the soundings decrease regularly, except near Lalarie point and Timbaga rocks, where they decrease rather suddenly from a depth of 10 fathoms; if, however, Lalarie point be not brought southward of S.E. $\frac{1}{4}$ S. until Brani peak bears E.N.E., a vessel will keep clear of all danger near Timbaga rocks. Having arrived within 3 miles of Great Nangka, the spit extending from the south end of that island should not be approached under a depth of 7 fathoms; and to avoid the rocky ledges extending from Middle and West Nangka, West reef rock, 6 feet above water, should not be brought to the westward of North after the peak of Great Nangka bears N.E., until the vessel is northward of Nangka islands.

From Nangka islands to Tanjong Tadah the shore may be safely approached by the lead, as the soundings are shoal with a gradual decrease. When Tanjong Tadah bears N.E. $\frac{3}{4}$ N., (which clears the eastern side of Karang Brom-Brom,) vessels should cross over towards Fourth point on the Sumatra coast.

The bank fronting the Sumatra coast may be conveniently approached, when well between the points, by common attention to the lead; but off the points, and for a few miles on either side of them, great attention must be paid to the soundings, and the bank approached with caution, and never under a depth of 10 fathoms, as the water shoals suddenly from that depth. The most dangerous part of the bank is between Fourth point and 6 miles to the westward of it (page 297), which must be approached with the utmost caution.

Westward of this dangerous part of the bank, the bank becomes shelving; and may be approached to 5 or $4\frac{1}{2}$ fathoms. Working westward of

Frederick Henry rocks, the shore bank should be approached to those depths off Batakarang point; standing towards the rocks, a vessel should tack when the water deepens to 9 fathoms, which depth will keep a vessel about one mile westward of the rocks, there being from 12 to 16 fathoms close to them. Working through eastward of Frederick Henry rocks (should the buoy be adrift), it must be remembered that Monopin hill bearing E. $\frac{1}{2}$ S. leads one-third of a mile southward of the rocks, and bearing E. by S. leads the same distance northward of them. The clearing marks for Transit rock must also be observed. See page 315.

Mr. Stanton strongly recommends vessels working in either direction through the strait, or proceeding through with a fair wind and contrary tide, to avoid the Sumatra coast and keep on the Banka shore, between Lalarie point and Tanjong Tadah. He observes that hitherto it has been the custom for all vessels to work along the Sumatra coast, where they have not only a strong wind but a constant current to contend with, consequently sailing vessels have been delayed two or three weeks, and instances are known of vessels being a month making the passage through Banka strait, whereas a smart sailing vessel, by keeping on the Banka side, taking advantage of the tides and following the directions given below, may make the passage even in the full strength of the monsoon in three or four days.

The advantages gained by keeping on the Banka coast are as follows:—

A vessel may carry a fair tide all the way through by starting from either extremity at low water, as the tidal waves from the China and Java seas meet near Nangka islands; prominent hills and points, with a gradual decrease in the soundings give confidence to mariners when steering for the land; a strong land wind will be generally experienced during the night, when the regular monsoon is blowing in the middle of the strait and near the Sumatra coast; and in the strength of the monsoon regular tides will be met with on the Banka shore, while strong currents will invariably be found setting to leeward along the Sumatra shore.

DIRECTIONS.—Banka Strait from the Northward.

—A vessel having passed the Tujuh or Seven islands, and steering to the southward for Banka strait, will find no difficulty in clear weather in determining her position, which can be readily done by cross bearings of Gunong Penyabung (Saddle hill) and Monopin hill; under such circumstances the strait can be entered on either side of Frederick Henry rocks by attending to the directions given at page 324. But in thick weather it often happens that no land can be seen until the vessel has arrived very near to the entrance of the strait and at such times it is important to

get hold of the bank extending from the Sumatra coast, and then proceed along its edge in 8 to 6 fathoms, carefully attending to the lead. Sometimes Monopin hill will be seen, but no other land, and in such case it will be prudent to proceed as before, keeping along the edge of the bank. . . .

With Monopin hill bearing S.E. $\frac{1}{2}$ E., a vessel will be about 7 miles, and with it bearing S.E. by E., about $5\frac{1}{2}$ miles northward of Frederick Henry rocks, and can pass westward of them as before directed. When Monopin hill bears about East, she will be 2 miles southward of the rocks, and may steer S.E., for about 11 or 12 miles, till Monopin hill is in line with the lighthouse on Tanjong Kalian N.E. by N. From this position it will be only necessary to reverse the order of the directions given at page 323.

Working through Banka Strait from the Northward.—The passage westward of Frederick Henry rocks is much to be preferred when the land is obscured and reliable bearings cannot be obtained. By reversing the directions given at page 234 for working through from the southward no difficulty will be experienced.

Vessels should keep towards the Sumatra coast until past Fourth point, which they should not approach nearer than 3 miles, and remembering that the shore bank for a distance of 6 miles westward of the point, is almost steep-to. When Tanjong Tadah bears N.E. $\frac{3}{4}$ N., they may cross over to the Banka side, taking care not to bring that point to the eastward of the above bearing. From Tanjong Tadah to Nangka islands they may stand inshore guided by the lead; but having arrived abreast of the latter, take care not to bring West reef rock to the westward of North, until the peak of Great Nangka island bears N.E., and not approach the spit off the south end of the island under 7 fathoms. From $2\frac{1}{2}$ miles south of Nangka islands the shore may be approached by the lead to any convenient depth of water, but when Brani peak bears E.N.E. the vessel will be nearing Timbaga rocks, and must not then come under 10 fathoms. Lalarie point bearing S.E. $\frac{1}{4}$ S. clears all the dangers near Timbaga rocks, and the point should not be brought to the southward of that bearing, until Casuarina point bears East. Thence to Lalarie point the shore may be again approached by the lead; but when nearing the point the soundings decrease more suddenly, and a vessel should not go into a less depth than 10 fathoms, and should round the point at the distance of about $1\frac{1}{2}$ miles. Thence she can proceed to the southward through either Stanton or Lucipara channels, according to the directions given at pages 320 and 322.

NORTH-WEST AND NORTH COASTS OF BANKA.

BULU or Jibuse Bay.—The north-west coast of Banka is 43 miles in extent, from Tanjong Ular to Tanjong Melalu; Bulu or Jibuse bay occupying more than half of that space. From Tanjong Biat (page 315), the south-western point of the bay, to Tanjong Ginting, its north point, the distance is $17\frac{1}{2}$ miles; the depth of the bay is 7 miles.*

In the greater portion of this bay a depth of 3 fathoms, foul ground, will be found at 2 miles from the shore. Off Tanjong Ginting, a long and low point, the foul ground extends but half a mile, close to which there is a depth of 8 fathoms. The rivers Bulu and Kampa enter the bay at its eastern end. The bay is much visited by coasters, and occasionally by larger vessels for the purpose of loading tin.

Kamudy rock, awash at low water, lies $2\frac{1}{4}$ miles W.S.W. of Kampa river entrance, with Tanjong Ginting bearing N.W. $\frac{1}{2}$ N. distant $5\frac{1}{4}$ miles.

Anchorage.—The eastern part of Bulu bay is known as Nepo bay; it affords anchorage in 5 fathoms, soft muddy bottom, with Tanjong Ginting bearing N. by E. $\frac{1}{2}$ E., distant $1\frac{1}{2}$ miles, and Sungi Kampa E. by S. $\frac{1}{2}$ S., about 5 miles. The water deepens quickly outside this position. Small vessels may go farther in according to draught.

Water.—Brackish water can be obtained with much trouble in a small bay about $1\frac{1}{2}$ miles eastward of Tanjong Ginting.

The COAST.—North-eastward of Tanjong Ginting are three conspicuous hills, named Gunong Parea, Gunong Penyabung, and Gunong Besukan, which at a great distance appear like islands. The first, 858 feet high, is the most southern one of the three, and rises 4 miles East of the point; Penyabung, a remarkable saddle-shaped hill, 794 feet high, very conspicuous from seaward, lies close to the coast, about 3 miles north-eastward of Tanjong Ginting; and Busukan, 657 feet high, is about 4 miles E.N.E. from Penyabung.

The coast between Tanjong Ginting and Gunong Penyabung forms a small and shallow bay, nearly filled with rocks. It then trends to the north-eastward for 4 miles to Pulo Pamuja, an islet lying close to the coast, thence in a direction a little more eastward for 5 miles to Tanjong Doyang, off which lies Pulo Prout, and several islets and rocks; it then trends E.N.E. about 9 miles to Tanjong Melala. The whole coast between Gunong Penyabung and Tanjong Melala is fronted by a reef which projects in places as much as one mile from the shore.

* See Admiralty charts:—Banka strait, No. 2,597; scale, $m=0\cdot25$ of an inch; also Banka strait to Singapore, No. 2,757; and Banka and Gasper straits, No. 2,149.

Malan Hyu, Malan Doyang, and Malan Guntur are three rocks lying off the coast between Tanjong Doyang and Tanjong Melala. Malan Hyu, about 30 feet in length, and covered with guano, lies about 3 miles North from Tanjong Doyang, with Penyabung hill bearing S.S.W. $\frac{3}{4}$ W., and mount Melala E. $\frac{1}{4}$ S.

Malan Doyang is the size of Malan Hyu, and not much above water. It lies about 4 miles off shore, with Malan Hyu bearing W. by S. $\frac{1}{2}$ S. distant 4 miles. Two rocks awash, lie between Malan Doyang and the shore, distant 2 and $2\frac{3}{4}$ miles W. by S. $\frac{1}{4}$ S. from Seangus point.

Malan Guntur, with two heads above water, is nearly midway between Malan Doyang and Tanjong Melala, and nearly one mile north of Seangus point. It lies within the limit of the 5 fathom depth off the coast.

Close northward of Malan Hyu and Doyang the depths are irregular, 12 to 24 fathoms; between them and the shore the depths are from 7 to 11 fathoms, rocky bottom. By keeping 4 miles off Banka these dangers are avoided.

KLABAT BAY.—Tanjong Melala is the western point of entrance of Klabat bay, and upon it is a hill of moderate height, known as mount Melala. A reef extends about one mile north-eastward of the point.

Tanjong Penyussu, the eastern point of Klabat bay, is a long low projection, with an islet and some rocky patches extending nearly 2 miles westward from it.

Klabat bay extends about 27 miles in a south-east direction from Tanjong Melala, and is 6 miles in width between the entrance points; it is encumbered with rocks and shoals, leaving only a narrow passage, of 4 or 5 fathoms water, by which vessels proceed as far as the mouth of Menjaungan river.

Gunong Maras (Crown peak).—At about 8 miles south-eastward of the head of the bay is situated the highest of the Banka mountains, named Gunong Maras or Crown peak, about 2,800 feet high. This beautiful mountain is easily recognised by its three peaks, the summits of which may often be seen when passing through Banka strait, presenting somewhat the appearance of a crown.

Karang Trasie Laut is a reef with one fathom water, and 7 to 10 fathoms around it, lying about 3 miles N.W. from Tanjong Penyussu.

Anchorage.—The usual anchorage is off the entrance, south-east of Trasie Laut, in $9\frac{1}{2}$ or 10 fathoms, soft muddy bottom, having Penyussu islet in line with Gunong Maras, and Melala point W. by S. $\frac{1}{2}$ S. Tin is shipped from here.

The Coast, from Tanjong Penyussu, trends in a direction about E. by N. for $10\frac{1}{2}$ miles, to a point abreast of a small islet named Pulo

Mengkudu ; and thence East for $2\frac{1}{2}$ miles to Tanjong Gràsak, the northernmost point of Banka.

Many rocks lie close to this part of the coast, and shoal water extends in places nearly one mile off. From Tanjong Grasak the coast trends south-eastward, forming the north-east coast of Banka.

Reefs.—A reef, having $3\frac{1}{4}$ fathoms water, lies nearly 3 miles off shore with Pulo Mengkudu bearing E. $\frac{1}{4}$ S. $4\frac{1}{2}$ miles.

A long spit of shoal ground extends from Sungi Pasarin to within half a mile of this reef.

A reef having about 6 feet water, lies 2 miles northward of Paku point, with Tanjong Grasak bearing W. $\frac{3}{4}$ N., distant $3\frac{1}{2}$ miles. For the eastern coast of Banka, *see* pages 357-361.

CHAPTER VII.

GASPAR STRAIT. — NORTH - EAST COAST OF BANKA. —
SHOALS NORTHWARD AND NORTH-WESTWARD OF GASPAR
STRAIT.

 VARIATION 2° 15' E., in 1886.

GASPAR STRAIT — General Description. — Gaspar strait, between the large islands of Banka and Billiton, derives its name, as we are informed by Horsburgh, from the Spanish captain who passed through it in 1724, though Captain Hurle had previously done so when returning from China in the *Macclesfield* galley, in March 1702. Many small islands divide the strait into three principal branches, having the names of Macclesfield, Clement, and Stolze channels. The first, through which the *Macclesfield* passed, is formed by Lepar and Leat islands. The second is named after Captain Clements, who commanded a fleet of English India ships in 1871, and who, on returning from China, chose the passage formed by Leat, Kwil, and Klambau islands to the westward, and Klemar and Ayer islands to the eastward. The third, Stolze channel, is bounded by Gresik island on the west side, and Mendanao, or Long island, on the east side, and is so named after the Dutch naval officer, J. Stolze, who was deputed to ascertain the positions of the islands on the west coast of Billiton.*

Although the navigation of this strait is encumbered with many dangers, yet as the course by it is more direct, and the distance less than by that of Banka, many seamen are induced to prefer it, especially when returning from China late in the north-east monsoon. The comparative advantages of both straits with reference to vessels bound to Singapore and China have been shown in page 220; and it will only be necessary here to add a few remarks with reference to those returning from China.

Most homeward bound vessels to whom saving of time is of the first importance, proceed through Gaspar strait; and there can be no doubt that

* See Admiralty charts :—Indian Ocean, No. 748*b*; China Sea, southern portion, No. 2,660*b*; Eastern archipelago, western portion, No. 941*a*; Gaspar and Banka straits, No. 2,149; Carimata strait, No. 2,160; Gaspar strait, No. 2,137.

they will continue to do so in preference to the more circuitous, although much safer route of Banka strait. Until, however, the correct positions of all the shoals and dangers known to exist to the northward of Gaspar strait are determined, a vigilant look out must be kept when approaching the strait from that direction, as dangers may exist that are not marked on the charts. Nor must vigilance be relaxed when getting near to Pulo Leat, and when passing through the strait. No opportunity should be lost of determining the vessel's exact position; and the greatest attention should be paid to ascertaining the set of the current and to guard against its effects. Many fine vessels have been lost in Gaspar strait; not a few on Alceste reef, from wrongly estimating their distance from the land; but in the majority of instances from causes which might have been guarded against by the exercise of due care and judgment.

Macclesfield channel is the one generally taken, although Stolze channel appears to be much less intricate and more free from danger. Clement channel is much narrower than either of the other two, and being encumbered with dangers in its narrowest part, its navigation is more difficult and unsafe.

SHOALS.—Southern approach.—Dangerous shoals extend for about 35 miles to the southward of Gaspar strait, rendering great caution necessary when approaching the strait from that direction.*

Hippogriffe rocks, the south-westernmost of these dangers, lie on the eastern side of Macclesfield strait. The northern patch, situated in lat. $3^{\circ} 34\frac{1}{4}'$ S., long. $106^{\circ} 55\frac{1}{2}'$ E., is a dangerous coral rock, with 3 feet water, and about 50 yards in diameter. Other rocks lie between the bearings of south-west and south-east, distant three-quarters of a mile from the northern rock.

Hancock shoal is a small patch about a quarter of a mile in extent, having one fathom of water, and 6 to 7 fathoms around. It lies 9 miles east of Hippogriffe rocks.

Turtle shoal, with a depth of 3 feet, and 7 fathoms close-to, lies about 2 miles N.E. by E. $\frac{1}{2}$ E. from Hancock shoal, and is of about the same extent. The tide ripples over it.

* See Admiralty chart:—Gaspar strait, No. 2,137; scale, $m = 0.4$ of an inch.

Doubtful dangers.—A doubtful rock was marked in former charts at $3\frac{3}{4}$ miles S.W. by W. $\frac{1}{4}$ W. of Hancock shoal; a small shoal of 6 feet, named *Mary Goddard*, at $4\frac{1}{2}$ miles S.S.E. of the Hancock; and another of 12 feet water, named *Sharpshooter reef*, at 11 miles W. $\frac{3}{4}$ S. from Hancock shoal; but a careful search having been made for these dangers in May 1866 by H.M. Surveying Vessel *Swallow*, without the slightest indication of their existence, they have been expunged from the charts.

Larabe shoal, distant 6 miles E. by N. $\frac{1}{2}$ N. from Hancock shoal, is about one-third of a mile in extent, having $3\frac{1}{4}$ fathoms water, and 5 to 8 fathoms around.

SAND ISLAND is the name given to a small patch of sand, awash at high water, with 8 fathoms around, lying about $3\frac{1}{2}$ miles N. $\frac{1}{2}$ W. from Larabe shoal.

At one-third of a mile E. by N. from Sand island, is a shoal patch about one-third of a mile in extent, having $2\frac{1}{2}$ fathoms water, and 8 to 9 fathoms around; the tide also ripples over this bank.

Padang reef lies about $1\frac{3}{4}$ miles W. by N. $\frac{1}{2}$ N. from Sand island; also, a reef named Haaijen is situated W. $\frac{3}{4}$ S., distant $3\frac{1}{4}$ miles from that island. Between Padang reef and Sand island there is a patch of 3 fathoms.

Middle reef, lying N.N.E. $\frac{3}{4}$ E. nearly $2\frac{1}{4}$ miles from Sand island, is a small sand patch having a rock which dries on its northern end, and 8 to 9 fathoms around.

Branding breakers.—North-west, nearly $1\frac{3}{4}$ miles from Middle reef, are two small patches occupying a space about 6 cables in extent, and with 12 fathoms water between them. The western patch has $1\frac{1}{4}$ fathoms water, and the eastern one 3 feet.

Fairlie rock, lies $10\frac{1}{2}$ miles westward from Sand island. It is a coral rock about one cable in diameter, nearly awash at low water, with from 6 to 7 fathoms close around. The sea breaks over the rock, and all around are overfalls caused by the rocky and uneven character of the bottom, particularly to the north-eastward. Shoal-water island bears N.E. by E., distant 15 miles, and just in sight from the deck; therefore, to avoid this rock, Shoal-water island must be below the horizon by the time it bears N.E. by E., and the lighthouse be visible only, this island being the only land distinctly visible from the rock.

Blas Mateu rock of $1\frac{1}{2}$ fathoms, lies in the fairway track of vessels proceeding through Gaspar strait by Macclesfield channel. It lies with Shoal-water island bearing E. by N., distant $17\frac{1}{2}$ miles.

SHOAL-WATER (Se Medang) ISLAND, or Embleton island, lying 10 miles N. by E. $\frac{1}{4}$ E. from Sand island, is a little more than half a mile in diameter; it is surrounded by a reef which extends from 5 to 7 cables off. Detached reefs lie off the eastern side at a distance of one mile.

Hancock island is small, and lies N.N.E. $\frac{1}{2}$ E. three-quarters of a mile from Shoal-water island. Off its north-east side a reef extends about one-third of a mile, and off its north-west side about three-quarters of a

mile, with some rocks above water on its outer edge. A patch of 3 fathoms lies 4 cables off the west edge of the reef.

Between Hancock and Shoal-water island reefs is a narrow channel with depths of 6 to 10 fathoms.

LIGHT.—From a white lighthouse, 200 feet high, erected on the west side of Shoal-water island, is exhibited at an elevation of 215 feet above high water, a *fixed* white light, visible in clear weather from a distance of 20 miles. Position, lat. $3^{\circ} 19\frac{1}{4}'$ S., long. $107^{\circ} 12\frac{3}{4}'$ E.

One-Fathom Patch.—A patch having a depth of one fathom, and 7 to 9 fathoms around, lies W. $\frac{1}{4}$ N. nearly 2 miles from Shoal-water island.

Embleton Rocks, awash, lie on a sand-bank which nearly dries, distant 2 miles N.W. by N. from Shoal-water island; there are depths of 11 to 14 fathoms around the bank.

Bliss Shoals, lie one mile north-eastward of Embleton rocks, and are about one-third of a mile in extent; the least depth is 2 feet, with 6 to 12 fathoms at a short distance. A patch of 3 fathoms lies midway between Bliss shoals and Hancock island.

VANSITTART SHOALS are a number of rocky patches extending 10 miles south-westward of Bakau island, east side of Macclesfield channel. The two southern patches of this group lie nearly east and west from each other, and about 3 miles apart. From the western patch of 4 feet, Kwil island bears N.N.E. $\frac{1}{4}$ E. distant $11\frac{1}{2}$ miles; from the eastern patch of $1\frac{1}{2}$ feet, Kwil island bears N. by E. distant 11 miles.

A patch of $3\frac{3}{4}$ fathoms lies with Bakou island bearing N. $\frac{1}{4}$ E., distant $7\frac{1}{2}$ miles.

Near the centre of the Vansittart group are patches extending about one mile, one of which nearly dries.

The northern patches of the group are 2 miles apart in an E.N.E. and W.S.W. direction. From the south-west patch of 4 feet, Kwil island bears N.N.E. distant $6\frac{1}{2}$ miles. From the north-east patch, of $1\frac{1}{4}$ fathoms, Bakau island bears N.E. distant $2\frac{1}{2}$ miles.

For the marks to clear Vansittart shoals, see page 340.

GEORGE BANKS is the name given to the banks lying southward and south-westward of Murong point.

Two-and-a-Half Fathoms Bank, formerly known as George bank, is $2\frac{1}{2}$ miles long, and one mile broad, within a depth of 5 fathoms. The least depth, $2\frac{1}{2}$ fathoms, lies with Murong point, bearing N. $\frac{1}{4}$ W., distant $6\frac{1}{2}$ miles.

Rocky point hill open eastward of Murong point, leads eastward of the bank.

About $2\frac{1}{2}$ miles W. $\frac{1}{2}$ N. of the $2\frac{1}{2}$ -fathoms bank is a small patch of 5 fathoms.

Falcon bank, with a least depth of $1\frac{1}{2}$ fathoms, lies with Pergam or Round island bearing N. $\frac{1}{2}$ W., and distant from its outer edge $2\frac{1}{2}$ miles. From this position the bank extends one mile eastward, and 6 miles south-westward, fronting Lepar strait. On the southern extreme is a patch of 3 fathoms, with Baginda hills bearing N.W. by W. distant $5\frac{1}{2}$ miles.*

Sand-banks.—At $12\frac{3}{4}$ miles South of Murong (Entrance point) is a patch of 5 fathoms; and at $2\frac{1}{2}$ miles W. $\frac{1}{2}$ S. of this is another of the same depth.

A doubtful bank, with $4\frac{1}{2}$ fathoms water, is reported to lie South from a remarkable hummock in Banka, in lat. about $3^{\circ} 18\frac{1}{2}''$ S.†

MACCLESFIELD CHANNEL.

The approach to Macclesfield channel from the southward is bounded on the eastern side by Hippogriffe and Fairlie rocks, and Vansittart shoals; and on the western side by George banks. Blas Mateu rock lies right in the fairway.

Hancock and Turtle shoals may be said to form a point, from which the shoals already mentioned as bounding the eastern limit of approach to Macclesfield channel diverge in one direction, whilst those forming the western limit of approach to Stolze and Clement channel diverge in another; these last may also be said to form the eastern limits of the southern entrance to Macclesfield channel, as vessels may stand to the eastward of Fairlie rock over towards them, if they should find it convenient to do so.

EAST COAST of BANKA.—From Tanjong Baginda, the south-western limit of Gaspar strait, the coast of Banka trends northward $4\frac{3}{4}$ miles to Roe point, forming the west side of Lepar strait, thence it recedes and forms a bay, the northern limit of which is Berikat point. There are several small rivers upon this part of the coast, the principal of which, Kumba river, is sometimes visited by coasters, but little is known of it.

Berikat point is the north-east extreme of Banka island, and the north-west limit of Gaspar strait. Berikat hill, 660 feet high, stands on the south part of the point. A rock 28 feet high, lies close off its north-east extreme.

* This bank was originally discovered by the ship *Falcon* striking on it. (Mercantile Magazine 1862). Since surveyed by the Dutch.

† The account of these sand-banks is from the "Seaman's guide round Java"; the $4\frac{1}{2}$ fathom patch was unsuccessfully searched for by H.M.S. *Saracen*. Other banks may exist in this neighbourhood, which has not been sounded out.

Berikat bank, fronts the eastern shore of Banka island from Lepar strait to Berikat point, from which point it extends 4 miles S.S.E., having $1\frac{1}{2}$ fathoms upon its outer edge, decreasing suddenly from 10 fathoms. The bank then takes a southerly and westerly direction, and has depths of 2 to 3 fathoms at 9 miles from the shore. The elbow, one mile west of Wilson bank, has a depth of 9 feet, with 6 fathoms close-to.

Wilson bank, on the eastern edge of Berikat bank, has 7 feet water on its shoalest spot, with the extreme of Berikat point bearing N.N.W. $\frac{1}{4}$ W. distant $6\frac{1}{8}$ miles; the hummock just inside the point, which is more conspicuous, bearing N.W. by N. The bank extends about one mile northward of the shoal patch, having 3 fathoms over that part of it, and is steep-to. The extreme of Berikat point bearing N.W. by N., leads one mile eastward of Wilson bank.

Lepar strait, between Banka and Pulo Lepar, is 7 miles wide at the south-east entrance, but narrows to $1\frac{1}{2}$ miles abreast Roe point. This entrance is barred by a flat which extends right across from Tanjong Baginda to Pergam point; the depth over the centre of this flat is about 2 fathoms, between banks which dry at low water.

The northern entrance has about the same depth, the strait, therefore, is only available for small craft, with local knowledge. Tingue island, with a sugar-loaf shaped peak, 915 feet high, lies within the north entrance of the strait.

PULO LEPAR is an irregularly shaped island, about 12 miles in length, and 10 miles in breadth, separated from the east coast of Banka by Lepar strait. On its southern part are several ranges of hills of moderate elevation; viz. :—Six-peak range 780 feet high, Maroon hill 850 feet, Four-peak range 750 feet, and two hills not named on the chart 650 feet high; near its western end is False Sugar-loaf, a hill 700 feet high.

Murong or Entrance Point is the south-eastern extreme of Pulo Lepar. The land over it is hilly, and the point is bordered by a reef, extending from one to 2 cables.

Pergam or Round island is a small islet surrounded by reefs lying $2\frac{1}{2}$ miles westward of Murong point, and about 2 cables off Pergam point, on the south coast of the island.

Water.—Northward of Murong point the coast forms a bay, in which are two small rivers, where water may be obtained, though slightly tinged with a red colour it produces no ill effects. Vessels may anchor about one mile north-eastward of the point, abreast of which position is a sandy beach.

Labu or Rocky Point is the north-east extreme of Pulo Lepar. Rocky point hill, 522 feet high, stands $1\frac{3}{4}$ miles westward of the point.

About 2 miles north-westward from Labu point is Tree point, from which the coast trends north-westward for about 5 miles to the north point of the island.

The coast between Murong and Rocky points is fronted by a bank, which midway extends off to the distance of $1\frac{1}{2}$ miles; its outer edge approaches Rocky point to within half a mile, increasing its distance off shore towards the north point of the island to $1\frac{1}{2}$ miles.

LIGHT.—On Labu or Rocky point a *fixed* white light is exhibited at an elevation of 39 feet above high water, and in clear weather should be visible from a distance of 8 miles.

Kilapan and Senior are two hilly islands lying 3 miles north of Pulo Lepar. Kilapan is about $1\frac{3}{4}$ miles in extent east and west, and three-quarters of a mile wide. Senior, lying $1\frac{3}{4}$ miles to the westward, is not quite so large as Kilapan.

Klippige Shoals is the name given to three or four reefs, having rocks above water, with deep channels between, lying off Labu point. The outer rock lies N.E. by E. $\frac{3}{4}$ E., distant 2 miles from the point; the southern shoal with a depth of $4\frac{3}{4}$ fathoms, lies $2\frac{1}{4}$ miles S.E. by E. $\frac{3}{4}$ E. from the same point.

Close to these shoals are depths varying from 9 to 14 fathoms.

Discovery rock lies near the centre of Macclesfield channel, and N.N.E. $\frac{1}{2}$ E., distant $4\frac{1}{4}$ miles from Labu point, with a shoal bank extending nearly half a mile north-eastward. It is about 30 yards in diameter with perpendicular sides, and a depth of 2 feet at low water; even at low water it seldom breaks. Close to the rock and bank are depths of 10 fathoms with 13 to 18 fathoms at a short distance.

A rocky Patch, with a depth of 3 feet, lies 2 miles W. by S. from Discovery rock.

PULO LEAT, which separates Macclesfield and Clement channels, is about $5\frac{3}{4}$ miles long, north and south, and $4\frac{3}{4}$ miles wide. Upon it are several hills, 400 to 600 feet high, which appear at a distance like a group of islands. Putat hill, on the south side is 613 feet high.

Fresh water may be obtained in the bay, half a mile northward of Whitewashed point, the south-east extreme of the island.

Pulo Jelaka is a small islet lying about 2 cables north-westward of the west point of Pulo Leat, with which it is connected by a reef.

LIGHT.—On Pulo Jelaka, at an elevation of 39 feet above high water, is exhibited a *fixed* white light, visible from seaward between the bearings of S.S.W. $\frac{3}{4}$ W. (through south and east) and N.N.W. $\frac{1}{4}$ W., and should be visible in clear weather from a distance of 8 miles.

Reefs.—The south and south-west coasts of Pulo Leat are fronted by a reef with detached patches, which, off Middle point, project one mile

from the shore. Off Whitewashed point, the south-east point of the island, are outlying rocks and dangers extending in a S. by W. direction for $2\frac{1}{2}$ miles.

Alceste reef.—The north-west shore of Pulo Leat, to a distance of $1\frac{1}{2}$ miles, is fronted by numerous outlying rocks and patches of reef, between which and the reef extending from the shore are some dry sand-banks. Alceste reef is the most northern of these patches, and lies $1\frac{1}{2}$ miles north-west of the north point of Pulo Leat, and has 2 fathoms water on its shoalest part.

Many vessels have been lost on this reef, or on some of the coral patches contiguous to it, all of which are steep-to; great caution therefore should be taken when approaching Pulo Leat.*

The eastern shore of Pulo Leat is fronted by a coral reef, which commences at about half a mile northward of Whitewashed point; in front of the bay about three-quarters of a mile northward of that point, the reef extends half a mile, but not quite so far from the eastern extreme of the island. Close northward of the eastern extreme, and upon the shore reef, is an islet named Pulo Anak, or Selagin.

Off the north-east coast of Pulo Leat, besides the reef projecting from the shore, are numerous out-lying coral patches extending 2 miles from the island, and rendering this part of the coast exceedingly dangerous.

Sandringham reef, with 7 feet water, is the northern of these patches, and lies with the north end of Pulo Leat bearing S.W., distant 2 miles; a small reef, awash at low water, lies one-third of a mile eastward of it.

Clearing marks.—A vessel will pass eastward of these dangers by keeping Whitewashed point westward of S. by W. $\frac{1}{2}$ W.; or Klemar island bearing S.E. $\frac{3}{4}$ S.

AKBAR SHOAL.—This shoal, lying 15 miles north-eastward of Pulo Leat, has been determined to lie in lat. $2^{\circ} 39' S.$, long. $107^{\circ} 15\frac{1}{4}' E.$, and to have a depth of 9 feet water. It is more directly in the approach to Clement strait than the Macclesfield, when coming from the northward.

BOOMPJES (TREE) ISLAND, distant $9\frac{1}{2}$ miles north-eastward from Berikat point, is a rock, 40 feet high, with two or three trees on the summit, giving it the appearance of a vessel under sail, and making it visible 15 miles. It is surrounded by a coral reef, which, off the south side extends half a mile with a rock above water on it. There is a

* Lammermuir rock, reported in lat. $2^{\circ} 53' S.$, long. $107^{\circ} 0' E.$; and Lied shoal, lat. $2^{\circ} 42' S.$, long. $107^{\circ} 5' E.$, having been unsuccessfully searched for, have been removed from the charts. See foot note, page 331.

cave upon this island where the Malays collect edible birds' nests, which are probably found also on the other islands.

A detached coral reef lies half a mile E. by N. of the island.

GASPAR ISLAND bears North, distant 24 miles from the north point of Pulo Leat. Its centre rises to a peak 812 feet high, which may be seen in clear weather at a distance of 30 miles, and is the principal mark for avoiding the shoals in sailing to or from the northern part of the strait. It is surrounded by a reef, which projects from the south and east points of the island about a third of a mile; the west and north points are bold-to within one cable. Position, east peak, lat. $2^{\circ} 24\frac{3}{4}'$ S., long. $107^{\circ} 5'$ E.

Water.—Fresh water is to be found upon this island.

Glassa Rock, 24 feet high, with some trees, lies about one mile westward of Gaspar island. It is surrounded by a reef extending about one-third of a mile south-eastward from it, but not quite so far in other directions.

Gaspar island, Glassa rock, and Tree island form the northern limit of Gaspar strait. Canning rock, Warren Hastings reef, and other dangers are described in pages 361–363.

Tides and Currents.—It is high water, full and change, in Macclesfield channel at about 2h. 30m., and the ordinary rise is about 4 feet. The tides are irregular, and there is but one rise and fall during the 24 hours. At the southern entrance the flood runs north-westward and the ebb south-eastward, or across the strait.*

The currents greatly depend upon the strength of the monsoon. When the monsoon is strong, the current will generally be found setting in the same direction at the rate of 2 or 3 knots an hour, but affected somewhat by the tides.

Depths in the Southern Approach.—The depths at about 30 miles southward of the dangers at the entrance of Macclesfield channel, vary from 11 to 14 fathoms, with an occasional cast perhaps of 10 or 9 fathoms. Near Hippogriffe rocks they decrease to 9, 8, or 7 fathoms, and in one spot, about $3\frac{1}{2}$ miles northward of Blas Mateu rock, to 7 fathoms. These shoal soundings are on an extensive bank of a very irregular form, which projects from the southern part of Banka strait, across the entrance of Macclesfield channel, and then trends many miles in a south and somewhat easterly direction. Most of the southern shoals at the entrance of

* It is probable that the direction of the tides in Gaspar strait, and also the times of high water and the rise, are similar to those in Carimata strait, and flow into the strait both from northward and southward (see page 369), but information is wanting on this point. The time of high water, given above, was obtained by the U.S. surveying vessels in 1854, and apply to the months of January—April.

the strait are on this bank, and there are also a few holes where the depths of water are 2 or 3 fathoms greater.

The depths near the small islands and shoals which separate Macclesfield and Clement channels, vary from 16 to 23 fathoms.

The lead will give but little warning when nearing the reefs extending from the north-west coast of Pulo Leat, close to which are depths of about 16 fathoms ; but on the Banka side, between Discovery rock and Wilson bank, vessels may stand in to 10 or 8 fathoms with safety.

Towards Murong point the bottom in many places is mud, but often coarse sand with shells and stones, and in some places rock, particularly in the vicinity of the shoals on the Banka shore. Sand and broken shells, with coral and mud in places, appears to be the character of the bottom all over the strait ; but about 5 miles N.W. $\frac{1}{2}$ W. from the north point of Pulo Leat the bottom is black clay, good holding ground, and the depth here being no more than 17 or 18 fathoms, it is recommended as a good position for a vessel to anchor, should she require to do so in this vicinity.

DIRECTIONS.—Macclesfield Channel from the Southward.—Proceeding towards Macclesfield channel during the south-east monsoon, having passed Two Brothers islands, steer about N.N.E., passing midway between Clifton shoal and Brouwers reefs. The depths in this track are pretty regular, 10 to 15 fathoms, soft bottom. In thick weather, or if uncertain of the vessel's position, the entrance of Gaspar strait should be approached with great caution, keeping a good look-out for broken or shoal water.

Be also guarded when in the vicinity of Hippogriffe and Blas Mateu rocks, observing that the Six-peak range on Pulo Lepar, kept N. $\frac{1}{2}$ W. will lead 4 miles westward of Blas Mateu rock ; and when Baginda hill bears N.W. $\frac{1}{2}$ N., and the water has deepened from about 8 fathoms to 12 or 15 fathoms, steer to the north-eastward until Rocky point hill is well open eastward of Murong point, which will lead clear of George banks.

Being 3 or 4 miles northward of Blas Mateu rock, a N. $\frac{1}{2}$ E. course—guarding against currents,—for 16 miles, will lead about 4 miles eastward of Murong point, and in this track the depths will be from 13 to 15 fathoms ; if the vessel gets too far to the eastward the water will deepen, and if to the westward it will shoal. From 4 miles eastward of Murong point a N. $\frac{1}{4}$ E. course for about 16 miles will lead nearly midway between Discovery rock and the shoals west of Jelaka. The vessel will now have arrived in a position with Kilapan island bearing S.W. by W., and the north point of Pulo Leat S.E. by E., and may steer N. by E. for Gaspar island, in which track she will have from 17 to 20 fathoms.

Since the survey of the sand-banks south of Banka, it is no longer dangerous to approach the coast to a less distance than 14 miles, and it

might be convenient for a vessel to make Murong point on a N. by E. or N.N.E. bearing, passing westward of the $2\frac{1}{2}$ -fathoms bank.

Working through from the Southward.—During the strength of the north-west monsoon it is almost impossible, to work through Gaspar strait; even in the latter part of the monsoon, about March, when the winds are light, vessels often are obliged to anchor on account of the rapidity of the southerly current. In the south-east monsoon also, vessels will often meet with light variable winds, rendering it impossible for them to preserve a direct course.

The approach to Macclesfield channel does not afford convenient objects as marks to keep vessels clear of danger, but the following have been taken from the chart as being, so far as we are able to judge, the best that can be given for that purpose; as, however, some of the objects are at a considerable distance from the dangers, navigators are cautioned not to depend too implicitly upon having made out, or being able to make out, such distant objects, but rather to rely upon a more general exercise of judgment, paying attention to the soundings, frequently referring to the chart, &c. It is indispensable that the greatest vigilance be observed, and careful regard had to the set of the tides and currents, in order to work a vessel safely through this channel.

Standing to the Eastward.—A vessel being northward of Hippogriffe rocks, and observing the mark for clearing Fairlie rock (page 332) may stand to the eastward towards Sand island, which is just awash at high water, until it is but 4 miles distant, or within half a mile of Haaijen reef; Blas Mateu, north-westward of Fairlie rock, must also be given a wide berth. Shoal-water island, bearing N.N.E. $\frac{1}{2}$ E., leads one mile westward of Branding breakers. This island should not be approached nearer than 3 miles, on account of the dangers lying westward of it.

To clear Vansittart shoals.—Murong point kept northward of N.W. leads southward of the shoals; and Klambau island summit bearing N. E. $\frac{1}{2}$ E. leads north-westward of the southern portion of the shoals. Putat peak, on Pulo Leat, kept eastward of North, leads westward of the north-west portion of Vansittart shoals; and Ayer island open northward of Bakau island leads northward of them.

Being northward of Vansittart shoals, Bakru island must not be brought southward of E. by S. $\frac{1}{2}$ S., or Slemar island westward of North, to avoid the shoals between those islands; and to clear the patches lying southward of Pulo Leat, keep Kwil island eastward of E.S.E., or Putat hill northward of N. by W. To clear the reefs southward of Pulo Jelaka, the south-east point of Pulo Leat should not be shut in by Middle point, until Pulo Jelaka bears N.N.E.; and to avoid the reefs westward of that islet, keep Middle

point eastward of E.S.E., until Pulo Jelaka bears East. Pulo Jelaka bearing East also leads northward of Discovery rocks.

To avoid the reefs extending off the north-west side of Pulo Leat, keep Rocky point southward of S.W. by S., until Pulo Kilapan bears S.W. by W. $\frac{1}{2}$ W.

Standing to the Westward.—To clear the $2\frac{1}{2}$ -fathoms bank southward of Pulo Lepar keep Rocky point hill open eastward of Murong point, bearing N. by W. $\frac{1}{2}$ W., until Baginda hill bears W. $\frac{1}{2}$ N., when a vessel may stand over until Murong point bears N. by E. $\frac{1}{2}$ E.

To clear Klippige shoals, do not bring Murong point southward of S.W. $\frac{3}{4}$ S., until the north extreme of Kilapan island bears N.W. $\frac{1}{2}$ W.

When standing towards Discovery rocks, do not bring Rocky point light southward of S.W. by S. until Pulo Jelaka bears East, when a vessel will be northward of the dangers, and may stand westward towards the bank into 8 fathoms, until near Wilson bank.

The Saddles, two hills on the Banka coast, 912 feet high, bearing W.N.W., or mount Padang W. $\frac{3}{4}$ N., lead about $1\frac{1}{2}$ miles southward of Wilson bank; and the extreme of Berikat point, N.W. by N., leads one mile eastward of that danger.

DIRECTIONS. — Macclesfield Channel from the Northward.—In the early part of the north-east monsoon, northerly and north-westerly winds prevail about the entrance of Gaspar strait, when strong south-easterly currents will generally be experienced between Gaspar island and Pulo Leat. It appears certain that the frequent accidents happening to vessels in the vicinity of Alceste reef arise principally from neglecting to guard against the effects of this current. A vessel, therefore, intending to proceed to the southward through Macclesfield channel, and having passed from one to 2 miles eastward of Gaspar island, should steer to the south-westward until Gaspar island bears N. by E., upon which bearing it should be kept until Pulo Kilapan is S.W. by W., the north point of Pulo Leat S.E. by E., and Pulo Jelaka in sight; here she will be in the fairway of the channel, and may steer South, carefully guarding against the effects of tides or currents by frequent cross bearings, passing midway between Discovery rock and Pulo Jelaka.

If, in consequence of light or baffling winds, it be found impossible to keep Gaspar island N. by E., but that as the vessel approaches Pulo Leat it is found northward of that bearing, great caution must be observed in passing Alceste reef, and Rocky point must not be brought to bear westward of S.W. by S.

When Whitewashed point, the south-east point of Pulo Leat, is open of Middle point, the vessel will be southward of Discovery rocks, and the South course may be continued, (observing that Murong point should bear

westward of S.W. by S., when abreast Klippige shoals), until Murong point bears about W. $\frac{1}{2}$ S., distant from 4 to $4\frac{1}{2}$ miles; then steer S. $\frac{1}{2}$ W. for 13 or 14 miles, or until Murong point bears N. by W. $\frac{1}{4}$ W., and Baginda hill N.W. $\frac{1}{2}$ W., when the vessel will be in about 10 fathoms on the outer edge of the bank extending northward of Blas Mateu rock; thence to clear that rock, steer about S.W. until the Six-peak range of hills on Pulo Lepar hears N. by W.; when a S.S.W. course may be shaped for Two Brothers islands.

Working through from the northward it will generally be advisable to get over towards the Banka shore as soon as possible, where a vessel will be more in the fairway of the channel, and will find more convenient depths of water for anchoring if it should be necessary.

If, however, when to the southward of Gaspar island, it should be found advantageous to stand well over to the eastward, care should be observed in rounding Alceste reef, not to bring Pulo Kilapan westward of S.W. by W. $\frac{3}{4}$ W. until Pulo Jelaka bears eastward of South.

Standing to the westward,—Boompjes island may be approached to about one mile, or until Gaspar island bears N.E. $\frac{1}{2}$ E. Berikat point bearing N.W. by N. will lead about one mile eastward of Wilson bank, and a vessel will be southward of this danger when the Saddles, on Banka, bear W.N.W., and may then stand on to the bank into 8 fathoms, until southward of Kilapan island, observing that the north extreme of that island bearing W. by N., leads northward of Discovery rock. Rocky point, S.W. by S. or more westerly, leads eastward of Discovery rocks.

Standing to the westward when southward of Discovery rocks, the North extreme of Kilapan island bearing N.W. $\frac{1}{2}$ W., or Murong point S.W. by S., clears Klippige shoals. After passing Murong point keep Rocky point hill open of Murong point until Baginda hill bears W.N.W., in order to clear the $2\frac{1}{2}$ -fathoms bank.

Standing to the eastward towards Pulo Jelaka, keep Rocky point southward of S.W. by S. until Middle point bears E.S.E., which leads southward of the dangers off Pulo Jelaka. Pulo Jelaka must then be kept eastward of N.N.E. until Whitewashed point is in sight, when Jelaka may be brought to bear North. To avoid the rocks off Whitewashed point do not bring Putat hill westward of N. by W., until Kwil island bears E.S.E. The east extreme of Pulo Leat bearing North will keep a vessel clear of the dangers extending from Slemar island; and Slemar island, if not brought to the westward of North, will clear the dangers south-eastward of it. Ayer island open northward of Bakau island, leads nearly 2 miles northward of the northern group of Vansittart shoals; Putat hill, bearing North, leads westward of the middle group; the same hill N. $\frac{1}{2}$ E. leads westward, and Murong point, N.W., leads southward of the south-west group.

Shoal-water island should not be approached from the westward nearer than 3 miles; bearing N.N.E. $\frac{1}{2}$ E. it will lead one mile westward of Branding breakers.

The Padang, Haaijen, Turtle, and Hancock shoals may be approached to one mile, if a good look-out be kept when in their vicinity.

CLEMENT CHANNEL.

This channel is much narrower and more encumbered with dangers than either Macclesfield or Stolze channels. It is separated from the former by the four small islands, named Bakau, Klambau, Sleamar, Kwil, and Pulo Leat, which form its western limit. To the eastward it is separated from Stolze channel by Ayer, Klemar, and Gresik, three small islands lying close together, so that the entrances to both channels, either from the southward or the northward, are common.

ISLETS AND REEFS.—**Bakau (Low) and Klambau (Saddle)**, are two small islands nearly one mile apart, and about half a mile in diameter, lying in a S.E. by S. direction about 8 miles from Pulo Leat. Bakau island, the westernmost, is 123 feet high; Klambau island has two hills forming a saddle, the western hill being 210 feet, and the eastern 266 feet high. Both islands are surrounded by reefs.

Reef.—A dangerous reef nearly one mile in extent lies one mile north-eastward of Klambau island.

Sleamar (Sand) Island, lying $3\frac{1}{2}$ miles north-westward of Bakau island, is small, low, and surrounded by rocks to the distance of one-third of a mile.

Kwil (Barn) Island, lying about $1\frac{1}{2}$ miles eastward from Sleamar island, is about a third of a mile in diameter, 154 feet high, and surrounded by a reef to the distance of about one-third of a mile.

Reefs, dry at low water, extend $1\frac{1}{2}$ miles between the bearings of S. by E., and S. by W. from Barn island.

Ayer (South) Island, one of the islands on the east side of Clement channel, lies S.E. by E. $\frac{1}{2}$ E., 10 miles from the south-east point of Pulo Leat. It is about one mile in diameter, 200 feet in height, and surrounded by a reef extending about half a mile; off its south extreme is an isolated reef, distant three-quarters of a mile. The reef is steep to.

Gresik or Table island, lying 2 miles eastward from Ayer island, and bordering Stolze channel, is described on page 350.

Klemar (North) Island, 240 feet high, lying $1\frac{1}{2}$ miles northward of Ayer island, is surrounded by a reef, which extends about one third of a mile. At three-quarters of a mile E.N.E. from the island is a reef dry at low water, with 16 fathoms close-to, and 15 fathoms between

it and the island reef; half a mile south-east from the centre of the island is a patch of less than 3 fathoms.

Sunken Rock.—This danger, having a depth of 9 feet, lies W. by S. distant 2 miles from Klemar island, in the middle of the fairway of Clement channel.

Middle Pass (Tominkor) Shoals are three coral patches lying close together, and extending nearly one mile in a north-east and south-west direction. From their southern extreme, which dries, Whitewashed point bears N.W. by W. $\frac{1}{2}$ W. distant $2\frac{3}{4}$ miles. Kwil island bearing S. by W., leads two-thirds of a mile eastward of the shoals.

Coral bank is a small patch awash, with 12 fathoms around, lying $1\frac{3}{4}$ miles N.W. by N. of Middle Pass shoals, and the same distance from Pulo Leat. From the bank, Whitewashed point bears S.W. by W. $\frac{1}{2}$ W., distant $1\frac{1}{2}$ miles; Whitewashed point bearing W. by S. leads southward of the bank; and Pulo Anak, N.W. by N. leads north-eastward.

Hewitt shoal, about 70 yards in extent, with a depth of $2\frac{1}{2}$ fathoms and 12 to 15 fathoms close-to, lies with the eastern hill of Klemar island bearing S. by E. $\frac{3}{4}$ E. distant 5 miles.

The summit of Ayer island open eastward or westward of Klemar island leads clear of Hewitt shoal.

Akbar shoal is described in page 337.

DIRECTIONS.—**Clement Channel from the Southward.**—Proceeding through Clement channel from the southward, having passed midway between Fairlie and Blas Mateu rocks, from which position Shoalwater island lighthouse should be seen bearing E.N.E., steer to pass 6 or 7 miles north-westward of it. When the summit of Ayer island is made out, bring it to bear N. by E. $\frac{1}{2}$ E. (taking care however not to mistake Ayer island); or Shoalwater island brought to bear South and kept astern, will lead in the fairway to Ayer island.

Approaching Ayer island on a N. by E. $\frac{1}{2}$ E. bearing, the soundings will be 9 to 14 fathoms until well up with Bakau island, when they will deepen to 20 fathoms, and to 25 or 30 fathoms when abreast of Klambau island. When Klambau island bears West, steer N. by W., passing about one mile westward of Ayer and Klemar islands, and eastward of the reef off the north-eastern side of Klambau island, and midway between Klemar island and Sunken rock. When the north extreme of Klemar island bears East, steer N.W. by N. to pass between Middle Pass shoals and Hewitt shoal, and when Whitewashed point bears W.S.W., a course N. by W. may be shaped for Gaspar island.

Klambau island bearing S. $\frac{1}{2}$ E. leads midway between Kwil island and Sunken rock, and between Middle Pass shoals and Hewitt shoal.

Working through.—No vessel would from choice attempt to work through Clement channel, as Macclesfield and Stolze channels are much better adapted for that purpose: but it is possible that a vessel, embarrassed by light baffling winds, may find it convenient to proceed through some part of this channel, and it is with this view that the following directions are given.

Clearing marks.—To keep eastward of Vansittart shoals do not bring Ayer island eastward of N.N.E., nor Bakau island northward of N. $\frac{1}{2}$ W. When the highest of the hills on Pulo Lepar bears W.N.W., a vessel will be northward of the south-eastern patch, and may stand to the westward until Bakau island bears N.N.E. $\frac{1}{2}$ E., which leads eastward of the middle and northern patches. Standing towards Bakau and Klambau islands, keep the summit of Ayer island northward of N.E. $\frac{1}{2}$ E. To clear the shoal lying off the north-east side of Klambau island, observe that the south point of Klambau island bearing West leads southward of it; the west extreme of Klemar island bearing N. by E. $\frac{1}{2}$ E. leads eastward, and the north point of Kwil island bearing W.N.W. leads north-eastward.

When standing towards the shoal patches, extending southward from Ayer island, keep the west extreme of Klemar island open westward of Ayer island, bearing North. Ayer and Klemar islands may be approached to the distance of half a mile. The west extreme of Ayer island bearing S.E. leads north-eastward of Sunken rock; and bearing E.S.E. leads south-westward; the east extreme of Klambau island S. by W. $\frac{1}{2}$ W. leads eastward of the rock, and bearing South, leads westward.

Standing towards the shoals extending southward of Kwil island, the west end of Bakau island must not be brought eastward of South. Kwil island S. $\frac{3}{4}$ W. leads eastward of Middle Pass shoals, and the peak of Ayer island S.E. $\frac{1}{4}$ E. leads north-eastward of them, and of Coral bank. The peak of Ayer island open westward of North island leads westward of Hewitt shoal, and the peak of Ayer island open eastward of Klemar island leads to the eastward. The north-eastern coast of Pulo Leat must not be approached nearer than 3 miles; Klemar island bearing S.E. by S. leads north-eastward of the dangers projecting from that coast, as will also the hill on Berikat point bearing N.W. by W.

Clement Channel from the Northward.—For the convenience of navigators, the directions for proceeding through this channel from the southward, with a fair wind, are here reversed; but for working through, it will not be necessary to give other directions than those just given, which are, in fact, merely the bearings of objects to avoid the various dangers, and apply equally to vessels proceeding in either direction.

Having passed about 2 miles eastward of Gaspar island, steer to bring it N. by W., and kept on that bearing steering S. by E. it will lead clear of the dangers lying off the north-east coast of Pulo Leat. When the north extreme of Pulo Leat bears West its south-east extreme should bear S.W. by S. Continue the S. by E. course until the south-east extreme of Pulo Leat bears W.S.W. The west extreme of Ayer island, S.E. by S., will lead between Sunken rock and Klemar island. When the north point of Klemar island bears East, steer S. by E. to pass between Ayer island and the shoal off the north-east side of Klambau island; and when the south extreme of Klambau island bears West, bring the peak of Ayer island N. by E. $\frac{1}{2}$ E., and keeping it on that bearing will lead eastward of Vansittart shoals.

If intending to pass westward of Sunken rock, preserve the S. by E. course until the south-east extreme of Pulo Leat bears West, when Klambau island must be brought to bear S. $\frac{1}{2}$ E. and steered for, which leads between Sunken rock and Kwil island. When Klemar island bears E. by N., steer S.E. $\frac{1}{2}$ E., taking care that the north extreme of Kwil island is not brought to the north of N.W. by W. $\frac{3}{4}$ W. to clear the dangers north-eastward of Klambau island; when the peak of Ayer island bears N. by E. $\frac{1}{2}$ E., steer S. by W. $\frac{1}{2}$ W., and proceed as before.

MIDDLE PASS, which unites Macclesfield and Clement channels, is formed by Slemar island, Kwil island, Sunken rock, and Klemar island on the south-east; and by the dangers projecting from the southern extreme of Pulo Leat and Middle Pass shoals on the north-west.

Directions.—To proceed from Macclesfield channel through Middle pass from the south-westward, steer between Murong point and Vansittart shoals towards Slemar island, the channel between which and the shoals extending from the southern end of Pulo Leat is clear, with depths of 14 to 20 fathoms; Murong point kept bearing W. by S. $\frac{3}{4}$ S. will lead through in mid-channel, and at about one mile northward of Slemar island.

In working through, the following clearing marks may prove useful:—The east extreme of Pulo Leat bearing North clears the dangers extending from the west side of Slemar island, and southward of Pulo Leat; Kwil island E.S.E. leads southward of the latter; Middle point W.N.W. leads south of Middle Pass shoals; and the north extreme of Kwil island W.S.W. leads northward of Sunken rock.

The Channel between Bakau Island and Slemar Island is narrowed to the breadth of $1\frac{1}{2}$ miles by the shoals extending southward of Kwil island. It is not easy to see what advantage is to be gained by using this channel, but if it be desirable a vessel may proceed through in safety, with Klemar island bearing N.E. by E., and when the west extreme of Klambau island bears S.S.E., which leads eastward of the

shoals south of Kwil island, a course may be shaped to the northward avoiding Sunken rock.

The Channel between Vansittart Shoals and Bakau Island is $2\frac{1}{4}$ miles wide, and may be used by bringing Slemar island to bear N.N.W., which will lead through in mid-channel. As the north-eastern patch of Vansittart shoals is approached, take care that Slemar island is not brought to the northward of N. by W.

STOLZE CHANNEL.

Stolze channel is rather wider, less encumbered with dangers, and furnishes objects more convenient for guiding vessels safely through it, than Macclesfield channel. The southern entrance is bounded on the west by Shoalwater island and the reefs southward of it described in pages 331-2, and on the east by Pulo Selio, Carnbee rocks, and other shoals. These latter shoals are much against this channel in making it from the southward, for Carnbee rocks—the most southern of the dangers—lie 20 miles distant from the land, so that in thick or hazy weather, when a vessel might be uncertain of her position, she would not be able to make Billiton island with nearly the same safety that she would be able to make Pulo Lepar or the south coast of Banka. These shoals would appear to form the only drawback to the adoption of this channel, and in fine weather even this would almost disappear, for the hills on Billiton are high, and may be seen at a distance of 30 or 35 miles, and Shoalwater island and light, on the western side, are visible about 20 miles.

DANGERS IN SOUTHERN APPROACH.—East Side.—Carnbee Rocks, in lat. $3^{\circ} 34\frac{1}{2}'$ S., long. $107^{\circ} 41'$ E., are of coral formation, and about 2 cables in extent; these rocks are covered at high water, but a portion dries 5 feet at low water, with depths of 12 to 15 fathoms, one cable distant.

These rocks are difficult to distinguish at high water, when the sea is smooth, from a distance of more than one cable.

A rocky patch with less than 3 fathoms lies one mile N. by E. $\frac{1}{2}$ E. from Carnbee rocks.

Anvang bank, at about $10\frac{1}{2}$ miles northward of Carnbee rocks, consists of large black rocks, some of which dry at low-water, with depths of 5 to 13 fathoms close to. From the western extreme of the bank, Gunong Bolo, on the south point of Pulo Selio, bears N.W. by N. distant $10\frac{1}{2}$ miles.

Naga reef, a shallow patch, lies S. $\frac{3}{4}$ E., distant $2\frac{1}{2}$ miles from Anvang bank.

Cooper shoals, lying $2\frac{1}{2}$ miles northward from Anvang bank, have a depth of 2 feet, and from 7 to 10 fathoms close-to, with Gunong Bolo bearing N.W. by N., distant 8 miles.

Three-foot shoal, lying $4\frac{1}{2}$ miles north-westward from Cooper shoals, with Gunong Bolo bearing N. $\frac{1}{2}$ W. distant $4\frac{1}{4}$ miles, is a patch having 3 feet water, and 10 to 13 fathoms around.

Patches with depths of 3 to 5 fathoms, lie between Cooper and Three-foot shoals.

Masar (Kennedy) and Otan Islands.—Kennedy is a small island, lying $6\frac{1}{2}$ miles N.E. by E. of Anvang bank. A small islet lies three-quarters of a mile north-west of it. Otan is rather smaller than Kennedy island, and lies about $1\frac{3}{4}$ miles E.S.E. from it.

Other islands and dangers lie to the southward of Billiton, (*see* page 375) but they are to the eastward of the track of vessels bound through Gaspar strait.

THE WEST COAST OF BILLITON, forming the eastern limit of Gaspar strait, is fronted by numerous islands, separated by narrow, and for the most part, unnavigable passages. Pulo Selio, with the dangers westward of it; the Lima island group, and Pulo Mendanao the largest of the islands, form the eastern limit of Stolze channel.

Hills on the Coast.—At the south-west extreme of Billiton are the Gunong Beginda (Haycocks), two remarkable hills, 496 feet high, which, when coming from the southward, appear as islands. At 5 miles north-eastward of the Haycocks is Beluru or Blantu hill, 1,166 feet high, and to the eastward of Blantu are Luda, Pyramid and South peak, all of which serve to determine a vessel's position when approaching the strait from the southward.

At 7 miles northward of Blantu are Kilang, 1,198 feet, and Kubing 1,090 feet high; at 10 or 11 miles northward of Blantu is Agong, 1,242 feet high, and 7 miles northward of Agong is Liang, 1,096 feet high. The whole of the hills just mentioned are visible from the southward and south-westward. At 3 miles south-eastward from Tanjong Bienga, a high bluff forming the north-western extremity of Billiton, is Gunong Tobalo, the highest part of which is 540 feet high.

ISLETS and DANGERS.—Pulo Selio, is $3\frac{1}{2}$ miles in length, with a conspicuous hill, 242 feet high, upon its south extreme, named Gunong Bolo; it is surrounded by a reef, which, on the south-east side extends $3\frac{1}{2}$ miles, with Pulo Saribu standing about midway on it. Pulo Saribu is separated from the south-western point of Billiton by a channel nearly 2 miles in width, but its south entrance is blocked by a reef lying southward of Pulo Saribu, 4 miles in length.

White rock 28 feet high, stands on the western edge of a rocky patch, lying 3 miles westward of the south point of Pulo Selio; rocks which dry at low water extend one mile south-eastward from White rock, and between this shoal and Pulo Selio is a channel about one mile wide, having depths of 5 to 7 fathoms.

Tiga Shoal, about one-third of a mile in extent, having $1\frac{1}{2}$ feet water, and 10 to 16 fathoms close-to, lies N.W. $\frac{3}{4}$ W., distant $1\frac{3}{4}$ miles from White rock.

Njela (Kurier) Bank, of sand, about one mile in diameter, dries at low water at 3 miles N. by W. of White rock.

Anchorage.—Westward of Pulo Selio vessels may anchor to fill up water. Gunong Bolo, bearing between E. by S. $\frac{3}{4}$ S. and S.E. by E., leads between Tiga shoal and Njela bank. The anchorage nearest to the watering place is in 6 or 7 fathoms, bottom of sand and shells, with White rock bearing S.W. $\frac{1}{2}$ S., and the south extreme of Pulo Selio S.E.; no vessel should venture farther in.

Water.—Fresh water is to be found in the northern part of the bay on the west side of Pulo Selio. Also a little to the northward of Tambelan point on the south-west coast of Billiton, there is a rivulet of good water, easily approached by boats.

Inshore passage.—Beacons.—At 3 miles northward of Njela bank, a beacon is placed on Tela shoal, which lies off the south end of the bank extending 7 miles southward from Mendulok island, and forming the east side of the channel leading eastward of Lima islands and Pulo Mendanao; this beacon is the southernmost of those marking the channel. A shoal patch lies midway between this beacon and Ross island of the Lima group.

A white buoy lies on the west edge of the shallow bank, at about one mile north-west of Pulo Mendulok; two black beacons mark the eastern edge of the bank abreast it, extending southward of Pulo Gala. These beacons are about one mile apart, and distant $1\frac{1}{2}$ miles from the white buoy. Buoys marking the north end of this channel, are mentioned at pages 351–2.

The inshore channel, marked by these beacons and buoys, has plenty of water and appears to present no difficulty if the buoyage can be depended on.

In working to the southward during the S.E. monsoon, this channel appears to offer a quick passage, as the water is smooth, and the wind is said to blow directly off shore, which would be a leading wind.

LIMA ISLANDS are a number of small islands surrounded by reefs, between which are narrow passages having depths of 10 to 20 fathoms water. The southernmost of these islands, named Ross (Bamijo), is

42 feet high. The others are named Benolo, 94 feet high; Kasenga, 58 feet; Bago, 146 feet; Betong, 170 feet; and Ringet, 158 feet high. Ross island may be approached from the southward and westward as near as one mile; but a patch, named Tuan, dry at low water, lies three-quarters of a mile S.E. by E. $\frac{1}{4}$ E. from it. A reef with 5 feet water, lies N. $\frac{3}{4}$ E., distant $1\frac{3}{4}$ miles from Kasenga island. Eastward of a line joining this reef, and Ayer Lantju lighthouse, are many isolated reefs, the neighbourhood of which is better avoided.

Clearing mark.—Ayer Lantju lighthouse bearing N. $\frac{1}{4}$ E. leads westward of the Lima islands, and the shoals northward of them.

GRESIK (Table) ISLAND, forms the western limit of the narrowest part of Stolze channel, the reef extending from Kasenga forming the eastern limit. From its isolated position this island serves as an excellent mark to guide vessels in steering for the narrow part of Stolze channel when approaching it from either direction. It is surrounded by a reef to the distance of 3 cables, and a detached shoal, of 14 feet, lies half a mile south-eastward of it.

A patch of $2\frac{1}{2}$ -fathoms [lies nearly in mid-channel between Gresik island and Ayer island, which makes that passage dangerous.

Ayer and Klemar islands are described on page 343.

PULO MENDANAO, or Long island, lying $8\frac{1}{2}$ miles north-eastward of Klemar island, is much the largest of the numerous islands which front the west coast of Billiton. It is about 8 miles in length, and the same in breadth, so that Long island does not correctly designate its shape, but it is probable that Pulo Gala to the southward, and Pulo Batu Dinding to the northward, were formerly supposed to be a part of it, and from this cause it may have obtained its name. The island is for the most part low, but has some hills 600 to 700 feet high. Its western extreme, named Ayer Lantju (West point), projects considerably from the main body of the island; there is a small hill near its extremity, and a village with a pier lies on the south side of it.

LIGHT.—From an iron lighthouse 80 feet high, painted white, situated on Ayer Lantju (West point), the west extreme of Pulo Mendanao is exhibited at an elevation of 204 feet above high water, a *fixed* white light, visible in clear weather from a distance of 21 miles.

Pulo Ayam (Peling) is an islet lying $2\frac{1}{2}$ miles south-eastward of Ayer Lantju, at about one mile off shore.

Hoog island, or Pulo Kumbong, is a small islet, 100 feet high, and in the form of a sugar-loaf, lying nearly $1\frac{1}{2}$ miles northward of Ayer Lantju; a reef surrounds this islet.

Pulo Gala (Low) Island lies off the south-east coast of *Mendanao*, from which it is separated by *Nado* passage, nearly three-quarters of a mile broad. *Nado* passage is completely barred by rocks.

Pulo Batu Dinding lies off the north coast of *Mendanao*, from which it is separated by *Nassi* channel. On the western side of the island there is a bay, but it is quite filled up with coral shoals. Half-a-mile eastward, from the north-eastern extreme of the island, is a small round islet, named *Krak* or *Monjet*.

Nassi channel is navigable for small vessels only, owing to its being barred at either end; on the bar the depths are 2 fathoms; within the bar, from 5 to 9 fathoms.

Langgir or Rotterdam island, half a mile in length, lies three-quarters of a mile westward of the north-west point of *Batu Dinding*; at 4 cables west of it is a small and low islet. A bank of sand and rocks surround both island and islet, between which and the reef extending from *Batu Dinding* is a narrow channel with 6 to 9 fathoms water.

Sikindang, Sebongkok, and Hoorn are small islands lying in the channel between the east coast of *Mendanao*, and *Billiton*. *Hoorn* island is connected with *Mendanao* by a reef.

Caution.—The whole coast between *Mendanao* island and *Tanjong Bienga*, the north-west point of *Billiton*, is fronted by dangers, and vessels should use extreme caution in approaching it; the outlying dangers only will be described.

Karang Salat, or Perlak shoal, is a rocky shoal nearly awash, situated 2 miles north of *Hoorn* island. Sunken patches lie about 3 cables north-west and south-east of it. From this shoal the two north points of *Batu Dinding* are in line, bearing *W. ½ S.*, and the eastern extreme of *Hoorn* island *S.S.E.*

Pulo Kalmanbang is a small island lying $6\frac{1}{2}$ miles *E. ¾ N.* from the north-east point of *Batu Dinding*. It is surrounded by a reef, which on the east side extends nearly one mile.

Jumangin shoal is a small coral shoal situated 6 cables westward of *Kalmanbang*, on the west side of which a white buoy is moored in 6 fathoms, with the east point of *Hoorn* island bearing *S. by W.*; south extreme of *Pulo Kalmanbang* *E. by N.*

Pinang shoal lies about one mile off the south and south-east sides of *Pulo Kalmanbang*. Its outer edge lies south of the west end of that islet, with a detached reef at 4 cables west of the extreme.

Tukul shoal is partly dry at low water, and lies north-westward of *Kalmanbang* island, distant about one mile.

A white buoy is moored in about 10 fathoms, off the north-west side of Tukul shoal, with the east extreme of Pulo Kalmanbang bearing S.E. $\frac{1}{2}$ S., distant about $1\frac{3}{4}$ miles.

Jumangin and Tukul shoal buoys mark the east side of the north entrance of the Inshore passage, between Mendanao and Billeton islands. See page 349.

TIERUTIUP BAY and RIVER.—This bay lies northward of Pulo Kalmanbang and Tukul shoal, between the latter and Karang Bakka. Tierutiup river falls into the eastern part of the bay, but reefs extend off its entrance to a distance of 5 miles.

Settlement.—The fort lies on the north bank of the river, at one mile within the entrance, with the town of Pandam close northward of it.

Water.—The water, which is brought from a little way up the Tierutiup river, is very good; it may be procured also on the right bank of the river, near the entrance, but it is not so good.

Beacons.—The entrance of this river is marked by beacons; poles surmounted by balls on the port hand, and poles surmounted by triangles on the starboard hand, when entering. Outside the beacons, a black buoy lies on the north side of the channel, with the beacon on Kalmoa island bearing S.E. by E. $\frac{1}{2}$ E. distant $2\frac{1}{4}$ miles; a white beacon buoy lies 4 cables south-west of the black buoy, and marks the southern side of the entrance to the river.

The small island of Kalmoa, 150 feet high, lies on the south side of the Channel between the reefs, and one mile from the entrance point of the river. On the north side of the island stands a white pyramidal beacon, visible from a distance of 12 miles.

A white beacon buoy is moored close to the north-west side of a small coral reef, with three fathoms water, near the middle of Tierutiup bay, with Kalmoa island bearing E.S.E., distant $3\frac{3}{4}$ miles.

Between this buoy and the buoy marking Tukul shoal, there is a small patch with less than 6 feet water, situated nearly midway.

A bank of coral, half a cable in extent, with a least depth of 2 fathoms, lies with Kalmoa islet bearing E. $\frac{1}{2}$ S., and mount Betaling on Pulo Mendanao S.S.W. $\frac{1}{3}$ W.

Karang Bakka, on the north side of the bay, is about 2 cables in extent, with a depth of one fathom water, and 6 fathoms close-to. Tanjong Kubu, on Billeton, bears E. by S., and Kalmoa island S.E. from the bank.

Anchorage.—The best anchorage appears to be just outside the buoys marking the entrance channel, with Kalmoa island bearing about E.S.E., and the west extreme of Kalmanbang island S.W. by S., in depths of 6 or 7 fathoms.

Tierutiup bay affords no safe anchorage in the north-west monsoon, and even during the north-east monsoon there are occasional heavy gales from the north-west. It is advisable to moor, as variable currents in the anchorage are liable to cause a foul anchor.

Directions.—To enter this bay, having passed the west point of Mendanao at a distance of 2 miles, steer North or N. by E. till Rotterdam island bears S.S.E., then steer E.N.E. till Kalmao island bears S.E. by E. $\frac{1}{2}$ E.; thence direct for that island until the west extreme of Kalmanbang bears S.W. by S., and anchor in about 7 fathoms.

When near the north-west point of Batu Dinding island, in the S.E. monsoon period, the wind will sometimes shift to the eastward; in which case, if bound to this bay it is better to anchor and wait for the sea breeze from the southward or south-westward, as the current runs to the north-west with an easterly wind.

TANJONG BIENGA is a high bluff point, forming the north-western extreme of Billiton; from this point the coast trends north-eastward.

Argo shoal, about one mile in extent, with one foot water over the middle of it, lies 4 miles northward from Karang Bakka; from its centre, Tanjong Bienga bears N.E. $\frac{3}{4}$ E.; and Tanjong Kubu, on which are some high trees, S.S.E. $\frac{1}{2}$ E.

Several patches lie near Argo shoal.

ELEVEN ISLANDS are a cluster of small islands lying off the north-western extreme of Billiton. The names of some of them are Lutong (Sailors Hat), Bambu, Sampit, and Burong; the latter is the largest of the group, and lies 3 miles north-eastward of Tanjong Bienga, at one mile off shore.

Langwas (North-west) Island is the westernmost of the Eleven islands, and lies $2\frac{1}{2}$ miles off shore.

For the description of the coast eastward of the Eleven islands, see pages 374-5.

LIGHT.—From a lighthouse 215 feet high, painted white, on Langwas island, is exhibited at an elevation of 200 feet above high water, an *intermittent* white light. The light is fixed for *sixty seconds*, eclipsed *twenty-five seconds*, flash for *ten seconds*, eclipsed *twenty-five seconds*; the whole occupying *two minutes*. It is visible seaward between the bearings of North and W. $\frac{1}{2}$ S. (except where obscured by islands) from a distance of 20 miles.

Alwina shoal (originally reported by the ship *Alwina* in 1858), is a patch of 3 fathoms or less, with 15 to 16 fathoms close-to, and lies with Langwas lighthouse bearing S.S.W., distant $1\frac{1}{2}$ miles.

A patch of $4\frac{3}{4}$ fathoms lies three-quarters of a mile E. by S. from Alwina shoal.

Depths.—Approaching Stolze channel from the southward, depths of from 12 to 15 fathoms will be found within one cable south-westward and westward of Carnbee rocks. Naga reef, Anvang bank, Cooper shoals, and Three-foot shoal appear to lie just within the edge of the 10 fathoms bank extending off Billiton island.

Towards the shoals on the western side of the entrance to Stolze channel the depths are much less than those on the eastern side, and they decrease more regularly, the 10-fathoms line extending some 5 or 6 miles to the eastward of them, so that they may be approached by proper attention to the lead. Near the Shoal-water group, the 10-fathoms line extends a little more than half a mile to the eastward of the shoals, and consequently those dangers must be approached with greater caution.

Depths of 9 to 10 fathoms will be found on the bank extending about 3 miles eastward and south-eastward of Vansittart shoals.

Between White rock and Gresik island, in Stolze channel, the depths are greater on the eastern side, and shoaler on the western side, than in the fairway.

A bank, with 8 to 11 fathoms, extends 2 miles S.S.E. from Ayer island.

The bottom through the entire length of Stolze channel appears to be composed principally of sand and broken shells, with here and there broken coral. North-westward of Billiton the bottom is mostly soft black mud, with sand, broken coral, and shells in places.

DIRECTIONS.—Stolze Channel from the Southward.

—As soon as Blantu, the highest hill on the south-west coast of Billiton, can be recognized, it should be brought to bear about N. by E. $\frac{1}{4}$ E., and with it just in sight on that bearing, if the weather be clear, a vessel will be about 33 or 35 miles distant from it, in the fairway of Stolze channel, with Carnbee rocks about 15 miles to the north-eastward, and may shape a course N. by W. $\frac{3}{4}$ W. As the vessel proceeds to the northward Luda hill will come in sight, and shortly afterwards Pyramid and South peak, all of which will be seen to the eastward of Blantu. Soon the Haycocks will be visible, at first a little to the left of Blantu, and by the time they are in line with it, Gunong Bolo, on the south extreme of Pulo Selio, will be well in sight, bearing about N.N.E., and distant 15 miles. Shoal-water island lighthouse will also be in sight, bearing about N.W. by W.

From this position a course N. by W. $\frac{3}{4}$ W. will lead up to Gresik island, passing 7 or 8 miles westward of White rock, and 3 to 4 miles westward of Ross island. When abreast of White rock, Ayer island will be seen nearly ahead, and Klambau on the port bow; soon the Lima

islands will be seen on the starboard bow, and as they are approached—if the N. by W. $\frac{3}{4}$ W. course has been preserved—Gresik island will be seen right ahead.

Gresik island should be approached on a N. by W. $\frac{3}{4}$ W. bearing until Ayer Lantju lighthouse bears N. by E., which will lead between Gresik island and the reefs extending northward of the Lima islands. When the north side of Ayer island opens northward of Gresik, steer N.N.W. $\frac{1}{4}$ W. for Gaspar island, which will lead between Hewitt and Akbar shoals. To pass eastward of Akbar shoal, when Klemar island bears S. by W. $\frac{3}{4}$ W., steer N. by E. $\frac{3}{4}$ E., which will lead 4 miles westward of the dangers extending from Langgir island, and into the China sea eastward of Akbar shoal and Canning rock. Akbar shoal will be cleared by keeping Ayer Lantju lighthouse, half a point on either side of the bearing S.S.E. $\frac{1}{4}$ E.

Working through from the Southward.—Standing to the Eastward, towards Carnbee rocks, Blantu hill must not be brought northward of N. by E.; and to clear Naga rock, Anvang bank, and Cooper shoals, Gunong Bolo must not be brought westward of N. by W. Near Three-foot shoals, Gunong Bolo must be kept eastward of N. by E.

The dangers southward of Pulo Selio should not be approached under a depth of 15 fathoms, or White rock brought to the westward of N. by W.; and when Gunong Bolo bears eastward of N.E. $\frac{1}{2}$ E., White rock must be kept to the eastward of North, to avoid the edge of the bank which lies south-eastward from it. White rock should not be approached nearer than one mile, nor to a less depth than 14 fathoms; when northward of White rock it must not be brought anything southward of E.S.E. until the north point of Pulo Selio bears E. by N. $\frac{1}{2}$ N., to clear Tiga rock. Njela bank should not be approached under a depth of 10 fathoms, or White rock brought southward of S.E. by S.

Gunong Bolo kept eastward of S.E. by E. will lead clear of Njela bank, and south-westward of the foul ground between it and the Lima islands. Kasenga bearing North clears the dangers extending from the west side of Ross island; and Ayer Lantju lighthouse bearing eastward of North, will lead clear of the rocks which extend northward from Kasenga, and will also clear all dangers northward of the Lima islands. When Gresik island bears West a vessel will be northward of the reef extending from Kasenga and may stand eastward until the lighthouse bears N. $\frac{1}{2}$ W.

Abreast of Pulo Ayam, Ayer Lantju lighthouse must not be brought to the westward of North. To clear the reef surrounding Hoog island, the lighthouse should not be brought to the southward of S.S.E. until Langgir island bears N.E.; Hoog island, in line with the lighthouse, leads clear of the dangers westward of Langgir island.

The dangerous coast of Billiton, between Mendanao and Langwas lighthouse, should not be approached under 6 miles, unless bound to Tierutiup bay.

Standing to the Westward, Shoal-water island, if not brought to the eastward of North, will clear all the shoals southward of it, and the lead will also give good warning when standing towards them, as they lie some 4 or 5 miles within the edge of the 10-fathoms line. Shoal-water and Hancock islands must be approached with caution, as the lead does not give much warning when nearing their ledges; they should on no account be approached within a distance of $2\frac{1}{2}$ miles. Hancock island bearing South leads eastward of Bliss shoal, between which and Ayer island a vessel may stand to the westward until the summit of that island bears N.N.E., which will lead eastward of Vansittart shoals.

Klambau island bearing W. $\frac{1}{2}$ S. leads southward of the dangers extending from Ayer and Gresik islands. The east side of Gresik island may be approached to one mile, but the east side of Klemar island has a rock lying one mile off; and to clear this rock Gresik island must not be brought eastward of S.S.E. The summit of Ayer island, in line with the east extreme of Klemar island bearing S. by E., leads $1\frac{1}{2}$ miles eastward of Hewitt shoal.

Directions.—Stolze Channel from the Northward.—

Having passed eastward of Gaspar island, bring it to bear N.N.W. $\frac{1}{4}$ W., with that bearing on astern, a course S.S.E. $\frac{1}{4}$ E. will lead into the fairway of Stolze channel, midway between Ayer Lantju and Hewitt shoal, and about 2 miles eastward of Gresik island. When Ayer Lantju bears N. by E. an opposite course may be steered to pass between Gresik island and the dangers extending northward from Kasenga.

When Gresik island bears N. by W. $\frac{3}{4}$ W., all danger near the Lima islands will be cleared, and if kept upon that bearing it will lead mid-channel between White rock and Shoal-water island, having passed which the most convenient course may be shaped to the southward, giving a good berth to the shoals.

Entering Stolze channel to the eastward of Akbar shoal, between it and Langwas lighthouse, steer to the south-west,—giving Tierutiup bay a berth of not less than 8 miles—and when Ayer Lantju lighthouse or Klemar island can be made out, bring the latter to bear S.S.W., and steer for it on that bearing, which will lead well to the westward of the dangers near Langgir island. When Ayer Lantju lighthouse bears East, steer S.S.E. $\frac{1}{4}$ E., until it bears N. by E., which kept astern, leads midway between Gresik island and Kasenga island reef; when proceed as before.

Working through from the Northward.—Standing to the Eastward the shores of Tierutiup bay should not be approached

nearer than 6 miles. Ayer Lantju lighthouse bearing S. $\frac{1}{2}$ E. will clear the rocks, extending westward of Langgir island; and bearing S.S.E. will clear the reef surrounding Hoog island.

Between Ayer Lantju and Pulo Ayam the lighthouse should be kept eastward of North; after passing Pulo Ayam the lighthouse may be brought as far to the westward as N. $\frac{3}{4}$ W., until Gresik island bears West, southward of which the lighthouse must be again kept bearing eastward of North, to clear Lima island and reefs. Ross island N.N.W. $\frac{1}{4}$ W., or Gunong Bolo bearing S.E. by E., leads clear of Njela bank.

To avoid Tiga shoal do not bring White rock southward of E.S.E. after the north point of Pulo Selio bears northward of E. by N. $\frac{1}{2}$ N. White rock should be passed about a mile off, and afterwards not brought westward of North, to avoid the edge of the bank lying south-eastward from it. Gunong Bolo bearing N. by E. leads westward of Three-feet shoal; and bearing N.N.W. leads westward of Cooper shoals, Anvang bank, and Naga reef. To avoid Carnbee rocks, Blantu hill must not be brought northward of N. by E.

Standing to the Westward, when abreast of Hewitt shoal, do not shut in the summit of Ayer island with the east point of Klemar island; abreast Klemar island, Gresik island must not be brought eastward of S.S.E. to avoid the rock off it. Gresik island should not be approached within one mile, and when Klambau island bears W. $\frac{1}{2}$ S., a vessel will be southward of the dangers extending from Ayer island; after which she may stand to the westward until the summit of Ayer island bears N.N.E.

Hancock island bearing South leads eastward of Bliss shoal, but Hancock and Shoal-water islands must on no account be approached nearer than $2\frac{1}{2}$ miles, the lead giving very little warning in this locality. When southward of the dangers surrounding Shoal-water island, that island kept bearing westward of North will lead eastward of all the dangers southward of it; the lead, also, will give warning, as the 10-fathoms edge of the bank is 4 or 5 miles to the eastward of them.

NORTH-EAST COAST OF BANKA.

The mariner cannot be too cautious in approaching this dangerous coast, and must use precaution not to get entangled among the outlying dangers when running for Gaspar strait in thick weather.*

HILLS and MOUNTAINS.—Of the many hills on the north coast of Banka the principal are, the Saddles, 912 feet high, situated about

* See Admiralty charts:—Gaspar strait, No. 2,137; scale, $m=0.4$ of an inch; and Banka strait, No. 2,597; scale, $m=0.25$ of an inch.

10 miles westward of Berikat point; the Padang mountains, the summit of which is elevated 2,630 feet at 10 miles westward of the Saddles; and the double-peaked mountain, Guong Maras (Crown peak), 2,800 feet high at about 20 miles from the north coast of the island.

THE COAST from Berikat point trends 24 miles in a westerly direction to Langka point, $2\frac{3}{4}$ miles westward of which is Koba village. Timor island lies about $2\frac{1}{2}$ miles off shore, at $5\frac{1}{2}$ miles eastward of Langka point. Eastward of Timor island the shore may be approached to depths of 6 or 7 fathoms, but westward of the island reefs extend from 2 to 3 miles off shore. About 16 miles N.W. by W. $\frac{1}{4}$ W. from Langka point is the large village of Kerow, whence the coast trends in a northerly direction to Sungai Marawang, near which stands the towns of Rusa and Punkal Pinang. Dangerous reefs extend from 15 to 20 miles off this part of the coast.

Koba road lies 2 miles westward of Langka point; the anchorage is in $4\frac{1}{2}$ fathoms, with the mouth of the river bearing S. $\frac{1}{2}$ W., distant about $3\frac{1}{2}$ miles. Nearer the shore is Gantreng reef and other patches, westward of which the 3-fathom edge of the bank fronting the shore extends 3 miles off.

ISLETS AND REEFS.—**Tetawa bank.**—Fronting the coast between the village of Kerow and Marawang river is a chain of banks from one to 5 miles broad, known under the general appellation of Tetawa bank, upon which are several scattered islands. Many patches on these banks dry at low water.*

Barat (Kinsbergen) Reef, with $5\frac{1}{2}$ feet water, lies nearly 2 miles North of Langka point; from the reef the flagstaff at Koba village bears S.W. $\frac{1}{4}$ W.

Pulo Buar (Colowy), the south-eastern of the islets, lies 11 miles northward of Langka point. The islet is surrounded by a reef, which in places extends to the distance of one mile. Many rocky patches lie westward of the islet.

Horse Rocks, nearly dry at low water, lie to the eastward of Tetawa bank, with Pulo Buar bearing W. $\frac{1}{2}$ N., distant $3\frac{1}{2}$ miles. A patch of $1\frac{1}{2}$ fathoms lies $2\frac{1}{4}$ miles north-eastward of Horse rocks, with Pulo Buar bearing W. $\frac{3}{4}$ S., distant $4\frac{1}{2}$ miles.

Mentawa reef lies 2 miles N.E. by N. from Pulo Buar, and is more extensive than Horse rocks.

Goat shoal lies $3\frac{1}{2}$ miles N.N.E. of Mentawa; 9 feet water is reported on this shoal.

Pulo Passir, Pulo Johora, and Pulo Tetawa are small islets on Tetawa bank, situated respectively at 4, 6 and 8 miles westward of Pulo Buar.

* See Admiralty chart :—Banka strait No. 2,597; scale, $m = 0.25$ of an inch.

Pulo Panjang, the largest island, lies on the northern part of the bank, about 7 miles S.E. by E. $\frac{1}{2}$ E. from the entrance of Marawang river.

Pulo Bojur lies about one mile eastward of Pulo Panjang; both islands are surrounded by extensive reefs.

Inshore channel.—George Rocks.—Between Tetawa island and the Banka shore is a passage with from 3 to 5 fathoms water, much used by small vessels in communicating between Koba and Marawang river; but George rocks, two rocky patches 6 cables apart, lie in the middle of it; from the eastern rock, Pulo Panjang bears N. by W. $\frac{3}{4}$ W., and Tanjong Limpoajang W. by S. $\frac{1}{4}$ S.

OFF LYING REEFS.—Fathool Barie Shoal.—Is the southernmost of several patches which are steep-to, lying from 15 to 22 miles off shore; it has a depth of 6 feet water, and lies with Pulo Panjang bearing W.S.W., and Pulo Buar S. by E. $\frac{3}{4}$ E. Diederika shoal, with a depth of $1\frac{3}{4}$ fathoms, lies 2 miles N.N.E. of it.

Hydrograaf Rock is the northernmost of this group, and lies $10\frac{1}{2}$ miles from the Fathool Barie; it is 33 yards in extent, steep-to, and has a least depth of $1\frac{3}{4}$ fathoms with 9 to 13 fathoms around. It lies with Riah hill bearing W. $\frac{1}{2}$ N., distant 15 miles.

Palmer reefs, two patches of 7 and 9 feet, and one mile apart, lie respectively S.W. $\frac{1}{2}$ S., $3\frac{1}{4}$ miles, and S.W. $\frac{3}{4}$ W. distant $3\frac{1}{2}$ miles from Hydrograaf rock.

Hydrograaf Reef, having a depth of one foot, is the easternmost of this group; it is 2 cables in extent, steep-to, and lies 9 miles S.E. by E. from Hydrograaf rock.

A reef 3 cables in extent, with a depth of $4\frac{1}{2}$ fathoms, lies nearly 5 miles E. by S. from Hydrograaf reef.

Noordziek Shoal about 3 cables in extent, steep-to, and a least depth of $1\frac{3}{4}$ fathoms with 10 to 14 fathoms around, lies about 2 miles south-west of Hydrograaf reef.

A patch of 2 fathoms lies 2 miles south of Noordziek shoal.

Between Fathool Barie and Hydrograaf rocks, and the shore, are the following shoals:—Roberts rock with a depth of 2 fathoms; General Elliot rock, and Sullivan rock, which dry; Black rock reef, with 3 feet water, and numerous others, with from 5 to 7 fathoms water between them; their positions will be seen by consulting the chart.

TANJONG RIAH situated 11 miles northward of Sungi Marawang is a cliffy point distinguished by two hills; extensive reefs project off its south-east and south sides, which makes it necessary to give it a berth of about 8 miles.

Tate rocks, 14 feet high lie $5\frac{1}{2}$ miles south-eastward of Tanjong Riah. Panjang island kept westward of South, leads eastward of Sullivan rocks and the dangers inshore of it.

MARAWANG ROAD.—Marawang or Pankal Pinang, the chief town of one of the tin districts, is situated a few miles up Sungai Marawang, the entrance to which lies about 11 miles southward of Tanjong Riah; caution is necessary when approaching it, on account of the surrounding dangers.

Water.—Good water can be obtained at Pankal Pinang.

Directions.—Vessels bound from Macclesfield channel to the ports of Pankal Pinang, or Rusah, having rounded Berikat point at the distance of 2 or 3 miles, shape course about N.W., passing between Sittard shoal and Horse rocks; when Pulo Buar bears S.W. by S., and Pulo Panjang West, the course to be pursued will be best seen by consulting the chart.

When approaching from the northward, bring Pulo Panjang to bear S. $\frac{1}{2}$ W., keeping it on that bearing until Sharp peak, the north-western peak of the Lappa hills, bears S.W. $\frac{1}{4}$ W.; then steer direct for it till Pulo Tetawa is just open westward of Pulo Panjang, bearing S.E. by S., when anchor in $4\frac{1}{2}$ fathoms, with the mouth of the river bearing West.

LIAT BAY, formed between Tanjong Riah and Tanjong Lyang, affords good anchorage with shelter from southerly and westerly winds, about three-quarters of a mile off shore; but in the easterly monsoon the swell is very heavy.

The Town of Liat stands a short distance up the river of the same name, and is a chief town of one of the tin districts.

Water.—Fresh water is difficult to procure here, on account of the rocks in the mouth of the river, which can only be passed at high water; even then there is at times a heavy surf on them, which makes the entrance dangerous for boats. Wood and spars of any dimensions may easily be obtained on the south side of the bay, within half a mile of the shore.

Liat reef, about 6 cables in extent, with its centre awash at low water, lies E. by S. $\frac{1}{2}$ S. $3\frac{1}{2}$ miles from Tanjong Lyang; close to the rocks there is a depth of 6 or 7 fathoms.

Circe reef of $2\frac{1}{2}$ fathoms, and 6 or 7 fathoms around, lies $2\frac{1}{2}$ miles south-eastward of Liat rocks, with Riat hill bearing S.S.W. $\frac{3}{4}$ W. distant $4\frac{1}{2}$ miles. A shallow patch lies about three-quarters of a mile north-westward of Circe reef, in the direction of Liat rocks.

Anchorage.—The usual anchorage is in $4\frac{1}{4}$ fathoms, stiff clay, with the mouth of the river W. by N.; and Tanjong Lyang N.W. by N.; southward of the river is a fine sandy beach.

Tides.—It is high water, full and change, in Liat bay at 5 hours springs rise 9 feet.

Directions.—Approaching Liat bay from the northward, a depth of about 7 fathoms will be found at 2 miles from Tanjong Lyang, decreasing towards the anchorage.

Coming from the eastward, bring Tanjong Riah to bear S.W. by W., and steer towards it till Tanjong Lyang bears N.W. $\frac{1}{2}$ W., then steer N.W. by W. towards the anchorage.

THE COAST from Tanjong Lyang trends northward for 12 miles to Tanjong Toan, a clifty point with a hill, and the islet of Pongul close to. The coast to the southward forms a shallow bay, in which, at 5 miles from Tanjong Toan, is the small island Pulo Simbang, connected to the shore by a reef.

There are no known dangers immediately off this coast beyond the distance of 2 miles. Iwan reef, 14 miles eastward of Pulo Simbang is described with the outlying dangers, page 362.

The coast from Tanjong Toan trends about north-westward for 10 $\frac{1}{2}$ miles to Tanjong Grasak, the northernmost point of Banka, where it turns sharply to the westward. See page 329.

DANGERS NORTHWARD AND NORTH-WESTWARD OF GASPAR STRAIT.*

CANNING ROCK, lies directly in the route of vessels proceeding towards Gaspar strait.

This rock is about half a cable in extent with a least depth of 3 fathoms, and 17 to 20 fathoms close to. It lies with the summit of Gaspar island bearing W. by S. distant 10 $\frac{3}{4}$ miles. Vessels from the northward should approach Gaspar island bearing S.W. or more to the westward, until within 5 miles of it, in order to give this danger a wide berth.

* **DOUBTFUL REEFS.**—**Sowerby Shoal**, was reported by Captain J. Sowerby of the ship *Montmorency*, (see *Mercantile Magazine*, 1862), as being 3 miles in extent, with an apparent depth of 2 fathoms. The middle peak of Tebalo was said to bear S. 32° W. and Gaspar island, S. 66° W. This placed the shoal in lat. 2° 15' S., long 107° 28' E.; which position was unsuccessfully searched for by H.N.M. surveying vessel *Hydrograaf* in 1876. Captain Sowerby deduced the position by observations as lat. 2° 15' S. long. 107° 36' E. (this is probably a mistake of 10 miles in the longitude). As this position has not been examined, the shoal is allowed to remain on the chart.

Pare Joie, a sunken rock reported to lie with Gaspar island bearing South distant 5 $\frac{1}{2}$ miles, and a rock reported to lie with Belvedere rock bearing S.S.E. distant 3 $\frac{1}{4}$ miles, have been unsuccessfully searched for by the *Hydrograaf*; their existence is doubtful. A similar doubtful rock is charted 2 miles westward of Pare Joie.

The following have been unsuccessfully searched for by the *Hydrograaf* and removed from the charts:—Columbia shoal, lat. 2° 21' S., long. 106° 46 $\frac{1}{2}$ ' E.; Atwick rock, lat. 1° 48 $\frac{1}{2}$ ' S., long. 107° 31' E.; Pratt rock, lat. 1° 31 $\frac{1}{2}$ ' S., long. 107° 23' E.; Catherine reef, lat. 1° 30' S., long. 107° 1 $\frac{1}{2}$ ' E.; and Scheweningen shoal, lat. 1° 19 $\frac{1}{2}$ ' S., long. 106° 40' E.

WARREN HASTINGS REEFS extend about $2\frac{1}{2}$ miles in a north-east and south-west direction, with depths of 2 to 9 feet. Between and around them there is a depth of 16 fathoms. The centre of these reefs lie with Gaspar island bearing S.E. by E. distant $8\frac{1}{2}$ miles.

BELVEDERE ROCK, 10 feet above water and about 40 feet long, is situated on the southern part of a reef of about one mile in extent, some parts of which are dry at low water; with a heavy swell the sea breaks on them, and by day they may be avoided by keeping a good look out.

Tree Reef, awash at low water, lies S. by W. $\frac{3}{4}$ W. distant $1\frac{3}{4}$ miles from Belvedere rock.

Tijong Reef, the southern of the dangers formerly known as Belvedere shoals, lies S.S.W. $\frac{1}{2}$ W., distant 4 miles from Belvedere rock. Several patches lie within $1\frac{1}{2}$ miles between a north and west bearing from Tijong reef.

SITTARD SHOAL (Vansittart shoal of Horsburgh) lies with the peak of Gaspar island bearing S.E. by E., distant 24 miles. It is 4 cables in extent, with a least depth of $1\frac{1}{2}$ fathoms, and 12 to 18 fathoms close around.

MAGDALENA REEF consists of two rocky pinnacles, half a cable apart, with a least depth of $2\frac{1}{2}$ fathoms, and 14 to 19 fathoms between and around. The summit of Gaspar island bears S. by E., distant $23\frac{1}{2}$ miles from the reef.

Reef.—Captain F. G. Crantz, of the *Dido*, reports having in 1882 passed half a cable to leeward of a small reef, upon the south side of which breakers were visible. Position given lat. $1^{\circ} 55' S.$, long. $107^{\circ} 14' E.$, or N.E. by E. $\frac{1}{2}$ E. about 15 miles from Magdalena reef.

Soembing (Lanrick or Newland) Shoal.—This danger reported by H.N.M. surveying vessel *Soembing*, is about one cable in extent and steep-to, with a least depth of $1\frac{1}{2}$ fathoms and 18 to 20 fathoms around. It lies with Gaspar island bearing S. by E. $\frac{1}{4}$ E., distant 33 miles, or about 4 miles westward of the reported position of Lanrick or Newland shoal, which has been expunged from the charts.

SEVERN SHOAL, is 2 cables in extent, steep-to, with a least depth of $1\frac{3}{4}$ fathoms, and 17 to 18 fathoms around. It lies in the track of vessels from Toty island towards Gaspar strait, in lat. $1^{\circ} 37\frac{1}{4}' S.$, long. $106^{\circ} 31\frac{1}{2}' E.$

Recent surveys point to the Severn shoal as being identical with Actæon rock on which H.M.S. *Actæon* struck in 1857.

Iwan Reef, 2 cables in extent, has a least depth of $1\frac{3}{4}$ fathoms with 14 fathoms close around. It lies W. by S. $\frac{1}{4}$ S. distant 13 miles from Severn shoal, and the same distant from the coast of Banka.

CELESTIAL REEFS, are the south-easternmost of a group of reefs extending 16 miles in an east and west direction. Celestial reefs consist of three patches occupying a space half a mile in extent; the least water is $1\frac{3}{4}$ fathoms, situated in lat. $1^{\circ} 12\frac{1}{4}'$ S., long. $106^{\circ} 46\frac{3}{4}'$ E.

Between and around these reefs, which are steep-to, the depths are from 18 to 22 fathoms.

Deva Reefs, consist of four shallow heads, about one mile in extent, and steep-to, lying about 2 miles northward of Celestial reefs.

Wild Pigeon Shoal, lying about 5 miles westward of Celestial reefs, consists of two shoal patches half a cable apart, and each half a cable in extent; the least depth is one fathom, with 16 to 19 fathoms around.

Hawkins Reef, $1\frac{1}{2}$ cables in extent and steep-to, has a least depth of $4\frac{1}{2}$ fathoms, with 16 to 19 fathoms around. It lies 7 miles north-westward of Celestial reefs. A patch of $1\frac{3}{4}$ fathoms lies 2 miles south-eastward of Hawkins reef, about midway between Wild Pigeon and Vega shoals.

Vega Shoal consists of two shoal patches one cable in extent and steep-to, with depths of 3 and 4 fathoms.

Ingram Reef, is 3 cables in extent, steep-to, has a least depth of 4 feet, with 17 fathoms around, and lies 3 miles westward of Vega shoal. Ingram reef is the north-western reef of this group, and $13\frac{1}{2}$ miles distant from Celestial reefs. A patch of $4\frac{3}{4}$ fathoms lies 4 miles westward of Ingram reef, and 7 fathoms has been found nearly 2 miles northward of Ingram reef.

Caution.—This neighbourhood must be navigated with great caution, and the whole group should be given a wide berth.

Emerald Isle Shoal, on which the American ship *Emerald Isle*, drawing 22 feet, touched, lies approximately in lat. $0^{\circ} 59'$ S., long. $107^{\circ} 2\frac{1}{2}'$ E.

Soundings were tried for immediately after passing over the shoal, but bottom was not reached although discoloured water was distinctly visible where the ship had touched.

DIRECTIONS.—From Gaspar Strait to the Northward.—Most vessels bound to the northward from Gaspar strait prefer passing eastward of Gaspar island, which is the safer route; but some, especially when bound to Singapore by Rhio strait, prefer the less safe but more direct route through the shoals westward of that island.

To proceed Eastward of Gaspar Island with a fair wind a vessel should, as before directed in pages 339, 344, or 355, steer about N. by E. if she passed through Macclesfield channel, or about N. $\frac{1}{2}$ W. or N. by W. $\frac{1}{4}$ W. if she passed through either Stolze or Clements channels,

to pass about 3 miles eastward of Gaspar island, and 6 or 7 miles westward of Canning rock. Having passed Gaspar island, steer to the northward until it bears S. $\frac{3}{4}$ W., upon which bearing it should be kept as long as it can be seen.

This track leads about 4 miles westward of the shoal reported to lie 15 miles north-eastward of Magdalena reef; caution must be exercised when in the locality until its existence is disproved.

If the wind should prevent a direct course from being steered, Gaspar island should not be brought westward of N.N.W. until the vessel is northward of Akbar shoal; and, after Gaspar island is passed, it must be kept westward of S. $\frac{1}{2}$ W. in order to avoid the reefs northward of it.

To proceed Westward of Gaspar Island.—From a position about one mile westward of Glassa rock, steer North until the peak of Gaspar island bears S.E.; when a N.W. course will lead between Warren Hastings reefs and Tijong shoal; but great caution must be observed in the localities of these dangers. When Berikat point bears S. by W., a vessel will be westward of Warren Hastings reefs and Tijong shoal, and a N. by W. or N.N.W. course, according to the set of the tide, will lead westward of Magdalena reef and Soembing shoal, and eastward of Severn shoal, whence course must be shaped to avoid the Celestial reef group.

If circumstances prevent a straight course from being steered, when northward of Gaspar island, keep its summit between the bearings of S.E. by S. and S.E. $\frac{1}{2}$ E., which will keep the vessel clear of Warren Hastings and Tijong reefs.

Berikat point bearing S. by W., leads westward of Warren Hastings reefs and Tijong shoals, and Gaspar island bearing S.E. leads 5 miles eastward of Sittard shoal; but when westward of Warren Hastings reefs and Tijong shoals it will be wise to edge away to the northward—always carefully guarding against tide and currents,—taking care not to bring Gaspar peak to the southward of S.S.E., to avoid Magdalena reef and Soembing shoal.

If proceeding between Berikat Point and Boompjes Island, the point may be passed at the distance of 2 or 3 miles, and the island at one mile; then proceed to the N.N.W., taking care not to bring Boompjes island to the southward of S.E. by S., to avoid the south-west extreme of Warren Hastings reefs. Berikat point bearing S. by W. leads westward of those reefs; and bearing S. $\frac{1}{2}$ E. leads eastward of Sittard shoal.

The passage near the Banka coast is so beset with dangers, and others may exist of which we at present know nothing, that we would strongly advise vessels to give this exceedingly dangerous coast a wide berth,

especially as nothing is to be gained by approaching it. At page 360 directions are given to proceed along this coast to Tanjong Rajah.

Approaching Gaspar Strait from the Northward.—In consequence of the northern entrance of Gaspar strait being so near the Equator, the winds, even in the strength of the monsoons, are very uncertain, producing a corresponding uncertainty in the direction and force of the tides and currents. A sailing vessel approaching the strait from the northward will, therefore, have to be principally guided by the winds and currents which she may herself fall in with rather than by relying upon experiencing those which are here mentioned as most likely to be met with at certain seasons.*

In the early part of the north-westerly monsoon, that is, from the middle of November to the middle or end of December, northerly and north-westerly winds are said to prevail, but Horsburgh mentions an instance of vessels meeting with strong West and W.S.W. winds in December. As the monsoon gathers strength, and becomes more regular, the wind draws to the eastward of North, and late in the monsoon easterly and south-easterly winds are often met with between Banka and Billiton.

Horsburgh remarks, that, vessels intending to pass through Gaspar straits will, probably, find the southerly current usually found running in the south-west part of the China sea during the northern monsoon, set to the south-eastward as the distance is increased to the southward of the line, and it also appears from other sources, that it is most necessary to be prepared to meet a south-easterly current about the entrance of this strait, particularly if the wind be westward of North; but a vessel can be only guided by a correct knowledge of her position, and by the winds and currents she may herself experience, in forming a judgment as to the best means of avoiding the many outlying dangers at the northern entrance of Gaspar strait.

In thick weather it will always be an anxious time for the navigator whilst approaching Gaspar strait, for unless good sights can be obtained he can never be certain of his exact position, and we would again strongly advise him under such circumstances to steer for Banka strait, where the soundings on the edge of the bank extending from the Sumatra coast will enable him to proceed with safety, although he may be quite unable to distinguish the land.

Vessels returning from Singapore or China early in the northern monsoon, when the wind is generally North or N.W., and intending to go through Gaspar strait, usually pass between Toty and Docan islands, off

* See the full description of winds and currents in Carimata strait, which probably do not differ much from those in Gaspar, page 368.

the north coast of Banka; a little later in the monsoon the wind is more easterly, and it is then better to pass from 10 to 20 miles eastward of Toty.

Having passed Toty island, steer about S.E. by E., so as to get on the meridian of Gaspar island before reaching the parallel of $1^{\circ} 50' S$. Gaspar island is visible in clear weather at a distance of 30 miles. When seen, bring it to bear S. $\frac{3}{4}$ W., and steer for it on that bearing, passing eastward of it; thence steer to the south-westward for the entrance of the Macclesfield channel, the one usually taken.

The above directions apply only to sailing vessels returning from China early in the northerly monsoon. In general, and especially returning late in the monsoon from China, when south-east and easterly winds are often met with between Banka and Billiton, it will be better to pass from 10 to 12 miles westward of St. Barbe island, and endeavour as soon as possible to get on the meridian of Gaspar island. When that island is seen, bring it on a S. $\frac{3}{4}$ W. bearing and proceed as before.

Returning from China late in the monsoon S.S.W. winds are often met in the southern part of the China sea, and oblige vessels to pass between the islands near the west coast of Borneo. If this should happen in May or June, it would be tedious work getting to the southward; in such a case steer for the north-west extreme of Billiton and pass through Stolze channel.

CHAPTER VIII.
CARIMATA STRAIT.

VARIATION, 2° 20' East, in 1886.

GENERAL DESCRIPTION.—Carimata strait, the easternmost of the channels leading from the Java sea into the China sea, lies between Billiton island and the west coast of Borneo, and is 115 miles in breadth. The Montaren islands and reefs extend for about 40 miles eastward of Billiton, and the Carimata and other groups extend for about 50 miles south-west of Maya island, lying close to the Borneo coast, thus reducing the main strait to a breadth of about 45 miles, and in the fairway of which are the Ontario and Flying Fish reefs.*

Carimata strait is the customary route from Bali strait or East Java for vessels bound to the Straits Settlements or China; it is also often used by vessels from Malacca strait, proceeding to China in the N.E. Monsoon period, by the Eastern passages. Although much broader than either Banka or Gaspar straits it is not so much frequented as either of those channels by vessels proceeding to and from China by way of Sunda strait; but it is, however, not unfrequently used by vessels returning from China, which from the effects of winds or currents find it difficult to get to the westward.

The great breadth of Carimata strait, compared with the others, is of great advantage to vessels working, but this is partly counterbalanced by the several shoals which lie in or near the fairway and out of sight of land, as well as irregular currents, necessitating a dependence being placed on the reckoning. Notwithstanding, Carimata strait is a very serviceable fairway, and since the publication of the chart of that strait, resulting from the surveys of H.M. surveying vessels, and those of his Netherlands Majesty, the mariner may take it with more confidence, but a careful look out should be kept for any possible uncharted dangers. †

* See Admiralty chart:—Eastern archipelago, No. 941a; China sea, No. 2660 a, and Carimata strait, No. 2,163; scale, $m=0.5$ of an inch.

† **Reported reefs.**—The following reefs reported in Carimata strait, having been unsuccessfully searched for by H.M. surveying vessels, and by those of the Netherlands Government, have been removed from the charts:—Heroine, lat. 3° 37' S., long. 107° 49' E. Willem, lat. 3° 52½' S., long. 109° 42¾' E. Hector, lat. 3° 46' S., long. 110° 8' E.

Besides the Main channel, limited to the north-eastward by the Carimata islands, and to the south-westward by the Montaran islands and Billiton, there are several other channels between the numerous islands lying eastward and north-eastward of Carimata, and between it and the Borneo coast; the eastern of these known as Greig and Inner channels, have a regular tide, and convenient depths for anchoring, and are therefore much frequented by vessels working through the strait; it being quite impossible to work through the Main channel against a strong monsoon, and a continuous rapid current setting to leeward.

The little coast traffic in the strait is almost confined to the steamers of the Billiton tin mining company.

WINDS AND WEATHER.—South-east Monsoon.—

As a rule, the settled weather of the south-east monsoon can be counted on about the end of May; the wind then blows strongly between S.E. and S.S.E. until the beginning of October, accompanied by a dry but misty atmosphere. Although it is clear overhead, the horizon very seldom clears during this season, and the land is difficult to distinguish; about mid-day is the clearest period. The reflected light thrown upon the water from this white mist is locally named "Tongara putih" or white south-easter.*

Change of the Monsoons.—In the beginning of October the character of the weather changes, light S.E. and southerly winds are felt up to mid-day, and are succeeded by land breezes from across the marshes of the west coast of Borneo, and are found a considerable distance from the shore. Thunder storms, much rain and violent squalls from the westward, alternating with successive days of calm fair weather, usher in the north-

Euphrosyne, lat. $3^{\circ} 25\frac{1}{2}'$ S., long. $109^{\circ} 41'$ E. Oliviera, lat. $3^{\circ} 10'$ S., long. $109^{\circ} 47'$ E. Waller, $3\frac{1}{2}$ miles west of Ontario reef. Rival, lat. $1^{\circ} 47'$ S., long. $108^{\circ} 15\frac{1}{2}'$ E. Condor, $2^{\circ} 22'$ S., long. $108^{\circ} 37'$ E. Goan, 6 miles S. by E. from Blackrock. Amur, 2 miles north-west of Vogelnest island. Omni, one mile W. by N. $\frac{1}{2}$ N. from Steil island. Spirit of the North, $1\frac{1}{2}$ miles N.W. of North Papan Island. Rodgers 5 miles west of Pelapi (Melapies) islands. Linge, $5\frac{1}{2}$ miles S. $\frac{1}{2}$ E. from Masien Tiga islands. Columbus, lat. $0^{\circ} 51'$ S., long. $108^{\circ} 16'$ E. Crescent, lat. $1^{\circ} 10'$ S., long. $108^{\circ} 38'$ E. Wellesley, lat. $1^{\circ} 18'$ S., long. $108^{\circ} 34\frac{1}{2}'$ E. Hoogly, lat. $1^{\circ} 35'$ S., long. $108^{\circ} 12'$ E. and a shoal E.N.E. distant 7 miles from Pigeon island (Pulo Kanis).

With regard to some of these reported shoals, Lieut. Hoskyn, commanding H.M. surveying vessel *Flying Fish*, remarks, that on three different occasions whilst at work in the neighbourhood of the Greig and Gwalia shoals, large floating masses of vegetable matter and other débris were fallen in with. One of these was so large that it could be seen from the bridge at a distance of seven or eight miles, and so dense that at a moderate distance it might readily have been mistaken in daylight for a rock. Another bore a striking resemblance to a small sand-bank with a bush on it, and was visible from 5 to 6 miles.

* See Admiralty Wind and Current charts, for Pacific, Atlantic, and Indian oceans.

west monsoon. Numerous waterspouts may be seen at the change of the monsoons, and also during the north-west monsoon period. From February, unsettled weather precedes the change of the monsoon, and squalls occur from the north-westward.

North-west Monsoon.—November, the first month of the north-west monsoon, is considered the most rainy month of the year, and the violent gales from the north-west generally commence with a blueish leaden appearance on the horizon, and a high sea gets up in the northern part of the strait.

December is the most boisterous month, January is generally a dry month with constant northerly wind, but in February it again becomes unsettled, with squalls from the north-west.

The peculiar haze which accompanies the south-east monsoon is sometimes seen during the north-west monsoon, and when seen, some days of continuous north wind may almost certainly be reckoned on.

CURRENTS.—The currents in Carimata strait depend greatly on the strength of the wind. During the strength of either monsoon, the current, when accelerated by the tidal stream runs from 2 to 3 knots per hour with the wind; when the monsoon is light and the tidal stream is against the wind there is little or no current, and the tidal stream at times overcomes it.

TIDES.—In the fairway between Montarau and Carimata island, and in the southern part of the strait, the flood runs to the north-westward and the ebb to south-eastward; southward of Borneo and Billiton, the flood runs to the westward and the ebb to the eastward; northward of Billiton the flood runs from W.N.W. to West, and the ebb from East to South-east. At Serutu island, Carimata group, the flood runs West and the ebb East. On the west coast of Borneo, from Sambar point, the flood runs from North to N. by W., as far as Sukudana, where it meets the flood stream from the China sea running southward past Pontianak, through Greig and Inner channels. This fact should be borne in mind when working against the monsoon through these channels.

There appears to be but one high water in the 24 hours; as a general rule, during the north-west monsoon it is high water about 9h. in the morning, and during the south-east monsoon about the same hour at night, so that ebb tide may be looked for in the north-west monsoon, and flood tide in the south-east monsoon, during the day. The rise at springs is about 6 feet, neaps 3 feet; increased during westerly monsoon by about 2 feet.

SOUTH, EAST, AND NORTH COASTS OF BILLITON WITH THE ADJACENT ISLANDS AND DANGERS.

The whole of these coasts are fronted by many islets and dangers, and as those adjacent to the coast are out of the ordinary track of navigation,

vessels are advised to give them a wide berth. The latter, with the coast will first be described, followed by the Schaarvogel islands and the reefs bordering the main straits.

BILLITON ISLAND, about 43 miles in diameter, forms the western side of Carimata strait. The island is unusually flat, and wooded, with several scattered mountains, but no ranges of them. The north coast is higher and more rocky than the east and south-east sides. The island is but thinly populated, and few inhabitants will be seen except in the mining districts. Fishermen will be met with along the coast, and at the Montaran islands, but they with their families live in boats, and move about to different localities. They are quite harmless, and it is stated will assist shipwrecked mariners. The population of Billiton island is about 32,000, including 8,000 Chinese miners. Supplies cannot be procured on the eastern shores.

Landmarks.—The hills eastward of Krawang point, the south-west extreme of Billiton island, attain an elevation of 1,166 feet, but will not often be seen by vessels passing southward of White island; Rotan island, of the Schaarvogel group is visible about 18 miles in clear weather, and Maleidong island near the coast, north-westward of Rotan, has a remarkable hill visible about 20 miles; these are useful marks for vessels northward of Scharvogel islands, or that are rather far to the westward. Burung Mandi, 1,417 feet in height, near the east point of Billiton, has two peaks, and is a conspicuous mark. On the north coast is Kelapa Kampit and Sekaju hills 17 miles apart, with a lower hill between them.

Sekaju 557 feet high, has a crater-like top, with a bare patch of red stones on its eastern side. Kampit is 715 feet high, conical, and easily recognised. Tajem Bini and Tajem Laki, the highest peaks of Billiton situated 14 miles from the north shore of the island, are two very sharp peaks, each about 1,670 feet in height and conspicuous marks in clear weather.

SOUTH COAST.—From Krawang point, the south-west extreme of Billiton, the coast trends eastward for about 14 miles to Tanjung Lingka, the west point of Balok bay, whence it trends sharply to the northward. This coast should not be approached within 4 or 5 miles, on account of off-lying shoals and islets. At about 2 miles within Lingka point, is Billiton hill, 410 feet in height, and about 12 miles north-eastward is Mengarden, 774 feet high, with Tiung peak eastward of it, forming useful marks in clear weather.

BALOK BAY, between Lingka and Kalumpang points, is about 11 miles wide, and to Balok river at its head is about 8 miles deep. The bay is much encumbered with shoals, but the most dangerous of those bordering the channel to the settlement are marked by beacons, which appear to afford easy navigation.

Dindang, the settlement lies on the eastern side of the bay, near the head, off which at one mile distant there is anchorage in $3\frac{1}{2}$ to 4 fathoms, mud.

From Dindang there are roads to the principal towns in Billiton.

Umpang islets and rocks occupy a space $4\frac{1}{2}$ miles in length in the middle of the approach to Batok bay. Between these islets and the dangers extending 2 miles westward of Kalumpang point, the channel is about 3 miles wide with depths of 4 to 6 fathoms. Rocks above water extend also about $1\frac{1}{2}$ miles south-eastward of Kalumpang point.

The channel westward of Umpang islets, is 2 miles wide.

Beacons.—A beacon with ball, marks the north-east extreme of Umpang islet reefs, and a similar beacon marks the west extreme of the reef at 2 miles northward of it. Two beacons with cross pieces, mark the middle ground westward of the latter, thence to the settlement, beacons with triangles mark the east side, and beacons with balls the west side of the channel. These must not be depended on.

Directions.—Approaching Balok bay it is advisable to make Keta-pang island, which is visible from about 16 miles, thence shape course to pass eastward of Umpang islands beacon, then altering course as necessary between the beacons.

Coast.—Anchorage.—From Balok bay the coast trends eastward for 6 miles to Batu Itam point, north-eastward of which is a bay about 4 miles deep, with Rasah, Ayer, Liendang, Tepi, and other islands lying on the east side of it. The head of the bay is mostly foul, but there is a narrow passage between the fringing reef, with a depth of $3\frac{1}{2}$ fathoms, and 4 fathoms inside. The shores of the bay are foul to the distance of half a mile. This bay affords anchorage in westerly monsoon, in 4 to 6 fathoms mud, about $1\frac{1}{2}$ miles southward of Sembulu islet; access from the southward is easy, keeping towards the western shore to avoid the shoals lying about 2 miles south-eastward of Tepi island.

EAST COAST.—**Tapok point** lies 2 miles northward of Rusah island, and is the eastern point of the bay just mentioned. Sekapar island lies 2 miles eastward of it, beyond which, at about the same distance, are two small reefs. From Topok point the coast trends northward for 16 miles to Samak point, and the coast between is foul in places to the distance of 6 miles.

Merai islands and reefs lie midway between Tapok point and the Schaarvogel islands. The large island is about one mile in extent, with islets and reefs extending 2 miles eastward of it, and 6 miles to the north-eastward; a small shallow patch also lies about 2 miles S.S.W. of Merai island. Between that island and Tepi island, is a group of islets and reefs 2 miles in extent, with a beacon (liable to be washed away) on the southern shoal of the group.

SELANDUK ISLAND, about $2\frac{1}{2}$ miles in length, lies nearly 5 miles northward of Tapok point, and $1\frac{1}{2}$ miles off shore, the passage between being only available for boats.

Selanduk may be recognized by a remarkable solitary tree standing on the hill over the east point of the island.

Meleidong island lies 2 miles eastward of Selanduk, and has several shoal patches from one to $1\frac{1}{2}$ miles southward of it. There is a channel with 5 to 6 fathoms water between Meleidong, and the Ajam islets lying eastward of Selanduk, which is used by the mining company's steamers calling at Lingang river, $3\frac{1}{2}$ miles westward of Selanduk.

Meleidong is a conspicuous and useful mark for avoiding the dangers northward of Schaarvogel islands. It has a remarkable hill on its north extreme, which is visible from a distance of 20 miles in clear weather. Selumar hill, 550 feet high, 4 miles westward of Medong point, should also be a useful mark.

Anchorage.—There is anchorage at about $2\frac{1}{2}$ miles off Lingang river in 3 fathoms water; in approaching it, the north extremes of Meleidong and Selanduk should be passed within half a mile, to avoid the shoal lying $1\frac{1}{2}$ miles north-eastward of these islands, northward of which the ground is very foul. The Billiton tin mining company have beacons on the shoals between Meleidong and Selanduk, but they are not to be depended on.

SAMAK POINT, situated 9 miles northward of Selanduk island, and the point just northward of it, forms the eastern extreme of Billiton island. A hill stands on Samak point, and the town of Mangar, situated about 4 miles up the river of that name, lies about $1\frac{1}{2}$ miles north-west of the hill.

Reefs.—From Samak point, reefs in the form of a crescent, extend about 12 miles in a south-east direction, and within 3 miles of West Protet reef. The chart must be consulted for further information on these dangers, the neighbourhood of which should be avoided by strangers.

Bakau Lemau, situated $6\frac{1}{2}$ miles eastward of Mangar river, is a flat wooded island, with a single high tree rising above the others near the centre. A coral reef extends one mile in a south-east direction, and is dry at low water, the other sides are steep to, but have outlying rocks off them.

Siadung island, a low thickly wooded islet, one mile N.E. $\frac{1}{2}$ E. from Bakau Lemau, is surrounded by reefs to the distance of a mile.

Madau or Honig reef, about half a mile in extent, upon which is a sand-bank having some brushwood on the centre, lies with Burung Mandi point bearing W. $\frac{1}{2}$ N. distant $5\frac{3}{4}$ miles. A shallow patch lies N.W. $\frac{1}{2}$ N. nearly 2 miles from it.

NORTH COAST.—The north coast of Billiton is generally high, and offers many high peaks for ascertaining a vessel's position in fine weather. Tajem Bini and Tajem Laki, about 14 miles from the north-coast of Billiton are each 1,670 feet in height, and the summits of the island. Fishing villages will be found at the mouths of the small rivers, but they are of little importance, and afford no supplies.

Mandi point and hill.—From Mangar river the coast trends northward for about 5 miles to Mandi point, over which is Menang hill; at 2 miles westward of it is Burung Mandi, a table topped hill with two summits, and 1,417 feet in height. From Mandi point the coast takes a north-west direction for about 17 miles to Buding bay and river. Between Samak and Mandi points the coast is dangerous to approach within 3 or 4 miles, but north-westward of Mandi, guarding against some isolated shoal patches, it is safe to approach within $1\frac{1}{2}$ miles.

Klappa Rampit, 705 feet high, is situated about 7 miles westward of Pering river.

Reefs.—A patch of 4 feet, with 6 to 8 fathoms around, lies 2 miles off shore, with Burung Mandi bearing S.W.

A small sand-bank, dry at low water, lies $2\frac{1}{2}$ miles off shore, with Burung Mandi bearing S. $\frac{1}{2}$ W. A sunken rock lies three-quarters of a mile westward of it.

Several shallow patches lie from one to $1\frac{1}{2}$ miles north-eastward from Kluang point, east point of Pasyran river; also at $1\frac{1}{2}$ miles off shore, about 2 miles north-westward of Pering point.

Pigeon island (Pulo Kanis) is a small island lying nearly 4 miles north-eastward of Pasyran and Pering rivers. A reef extends half a mile south-east, and nearly one mile north-west of it, and a patch of one fathom lies about one mile S. by E. of the islet.

Buding bay lies on the north coast of Billiton, at about 10 miles west from Pulo Kanis, and is 2 miles in breadth, between the points of entrance. From Buding point, on the eastern side, a reef extends three-quarters of a mile into the bay, and with the reef extending from the western shore reduces the portion which has depths of $3\frac{1}{2}$ to 4 fathoms to the breadth of half a mile, from which position the bay gradually shoals to $1\frac{1}{2}$ feet at the entrance to Buding river, distant about $2\frac{1}{2}$ miles.

Reefs extend nearly 2 miles off the coast eastward of Buding point, and about $2\frac{1}{2}$ miles north-eastward of Kerupit the west point of entrance, between which there are depths of 6 to 7 fathoms, leading to the anchorage. At 6 miles N.E. $\frac{1}{2}$ E. from Buding point lies a reef with one fathom water, and steep-to; and at $3\frac{3}{4}$ miles N. $\frac{3}{4}$ W. from the same point is a coral patch, with $2\frac{3}{4}$ fathoms, also steep-to.

West channel.—Beacons.—Between Kerupit point and the off-lying shoals, is a channel, marked by beacons, surmounted by triangles on starboard hand and balls on port hand. The entrance is between the barrier reefs at about half a mile eastward of Keran island.

Anchorage.—There is anchorage in Buding bay in $3\frac{1}{2}$ fathoms, mud, with Buding point bearing E.N.E., distant about one mile, and the east side of Keran island touching Kerupit point.

Town.—Buding town is situated 4 miles up the river, and is the principal town of the district from which tin is exported.

Directions.—Approaching Buding bay from the north-eastward, bring Buding point to bear S.W. by S., and steer for it, until the sand-bank on the reefs, 2 miles north-east of Kerupit point bears N.W., then alter course to W. by S. $\frac{1}{2}$ S., until the west point of Buding river bears about S. $\frac{3}{4}$ E., when steer for it until the east extreme of Keran island touches Kerupit point, then anchor in about $3\frac{1}{2}$ fathoms.

From the westward, coasting steamers with local knowledge pass inside the reefs by a channel situated half a mile eastward of Keran island where in mid-channel there are depths of 7 fathoms, thence passing half a mile off Kerupit point between the beacons, two on each side, thence south to the anchorage.

Keran island lies 3 miles westward of Buding river, and one mile off shore, and has several tall straggling trees. It is encircled by a reef, which extends 4 cables eastward, and nearly one mile westward.

Mulut island, situated 4 miles westward of Keran, and one mile off shore, appears from the offing as a small rounded hill, with two remarkable trees on the summit. The island is connected by a reef with Bulu island, 3 miles to the westward, and nearly to Keran island reef eastward.

A Reef with one fathom water and steep-to, lies $4\frac{1}{2}$ miles North from Mulut island; Juro Dajong rock, with a depth of 5 feet, lies N.N.E., distant $1\frac{3}{4}$ miles, and a similar reef lies N.N.W. $\frac{1}{2}$ W. distant $2\frac{1}{4}$ miles, from the same island.

Siantu point, 6 miles westward of Mulut island, may be recognised by a conical hill, and also a small-conical shaped wooded islet off the point; the ground is foul for about one mile seaward of the point, and a patch of 3 fathoms lies $2\frac{1}{2}$ miles N.N.E. $\frac{1}{2}$ E. of the point.

The islets Babi and Bulu, eastward of Siantu point, are merely rocky shoals, covered with vegetation.

Sekaju hill, 558 feet high, with a crater like top, lies 4 miles southward of Siantu point; a useful mark on this coast.

Coast.—From Siantu point the coast takes a westerly direction for about 10 miles to the north-west extreme of Billiton, abreast of which are the Eleven islands, thence the coast trends southward into Gaspar strait,

see page 353. The whole of this coast is fronted with islets and reefs to the distance of $2\frac{1}{2}$ miles, and it is advisable to give it a berth of 5 miles.*

Batu Malan Saluting is an isolated patch of 2 fathoms, lying $3\frac{1}{2}$ miles off shore, with Siantu point bearing S.E. by E. $\frac{1}{2}$ E. about 4 miles. A similar reef lies W. $\frac{1}{2}$ S. about 4 miles from Malan Saluting, and about midway between it and Alwina shoal.

Sujuk, the chief town of the district of the same name, is situated at the mouth of a river about 4 miles westward of Siantu point, and midway between it and Pingi point and hill to the westward.

ISLANDS AND DANGERS ON WEST SIDE OF MAIN STRAIT, AND IN THE FAIRWAYS.

A description of that portion of the dangers southward of Billiton, which lie contiguous to Gaspar strait, is given at page 348. The following islands and dangers lie nearer Carimata strait, and are important to vessels approaching it from the southward.

KEBATU, or Shoe Island, situated about 31 miles S. by E. from Kalumpang, the south point of Billiton island, is 600 yards long by 300 broad, conical in shape, thickly wooded, and 344 feet high. The island is steep-to, with a fringing reef extending from a half to one cable. This island, situated on the western side of the south entrance to Carimata strait, and being visible in clear weather from a distance of 23 miles, forms an excellent object to make for when entering the strait from the south-westward.

White island, 57 feet high, wedge shaped and of a white colour, having a few stunted trees on the top, lies one mile south-west from Kebatu island. A shoal with 6 feet water, and 8 fathoms close to, lies 2 cables north-east from White island, with 10 fathoms between it and the island.

Zephyr rock, nearly dry at low water, and on which the sea generally breaks, is steep-to, and lies 6 cables N.N.W. from White island.

Karang Kawat, or Grace Reefs, on which the sea breaks heavily in moderate weather, consist of two coral patches, the centres of which lie N.N.E. $\frac{3}{4}$ E. distant 4 and 6 miles respectively from Kebatu island.

These reefs are each about 3 cables in extent, with from 12 to 16 fathoms at less than a cable distant all round. The northern reef dries 4 feet, and the southern is awash at low water.

* The British ship *Empress of China* was reported to have struck on a reef in lat. $2^{\circ} 24' S.$, long. $107^{\circ} 49' E.$ or about 7 miles north of Siantu point.—*Shipping Gazette*, 5th July 1877.

Between Kebatu island and Grace reef there is a clear channel $3\frac{3}{4}$ miles wide, with depths of 14 fathoms, mud.

Ketapang island, lying about $8\frac{1}{2}$ miles S. $\frac{1}{2}$ W. from Kalumpang, the south point of Billiton, is a low, swampy, but wooded island about a third of a mile in diameter, and surrounded by a reef, which on the eastern side extends to the distance of 2 cables, with depths of 8 and 9 fathoms around it.

The tops of the trees are visible from a distance of about 16 miles, and form a good landmark for Balok bay.

SCHAARVOGEL ISLANDS, lying from 12 to 20 miles south-eastward of Tapok point, are low, thickly wooded, (the tops of the trees being about 100 feet high), and surrounded by reefs and sand banks, many of which are steep-to, the lead giving no indication when approaching them.

Rotan, the northern island is the largest, and has a remarkably tall tree near its centre, visible from a distance of 18 miles; reefs extend about 3 miles north-east and south-west of the island. There is a passage through the group, both east and west of Penerus island, situated 3 miles S.S.E. of Rotan, and also westward of Rotan island. Pengapiet, the south-eastern island, is divided into two by a channel dry at low water.

The three eastern islands are named Langke, Lung, and Ayer Masin, Langke being the southernmost. Patches of coral extend about 4 miles north-eastward, and 3 miles south-westward of the group, and there are many detached patches north-eastward and eastward of the Schaarvogel islands.

Sand banks extend several miles N.N.E. and S.S.W. of Schaarvogel islands or parallel to the Billiton coast, with depths of 8 or 9 fathoms of water, with several isolated and dangerous coral reefs on them. Between these banks are channels with depths of 15 to 20 fathoms, mud, or sand and mud. Tide rips may generally be observed over this irregular bottom, and with fresh breezes some of the shoals will be seen to break. It is advisable to pass well to the eastward of the patches now to be described.

East Protet reef, having one fathom water, and 12 fathoms around, nearly always breaks. It is 3 cables long, one cable wide, and lies with the high tree on Rotan island bearing S.S.W. $\frac{3}{4}$ W., distant $14\frac{1}{4}$ miles; strong rippings have been observed about 2 miles north-eastward of the shoal.

West Protet reef with $1\frac{3}{4}$ fathoms water, lies W. by N. $\frac{1}{2}$ N., distant $2\frac{1}{2}$ miles from East Protet.

Shallow patches also lie S.S.E. $\frac{3}{4}$ E., distant $2\frac{3}{4}$ miles; S.W. nearly 3 miles; South $6\frac{1}{2}$ miles; S. by W. $\frac{1}{2}$ W. $6\frac{1}{2}$ miles, and a patch of $3\frac{1}{4}$ fathoms South $8\frac{1}{2}$ miles from East Protet; the latter patch also lies with the tree on Rotan island bearing S.W. by W. $\frac{3}{4}$ W., distant about $8\frac{1}{2}$ miles.

OSTERLY REEFS, consist of five shoal coral patches, all of which are steep-to.

North Osterly is a small patch nearly dry at low water, and lies with the high tree on Rotan island bearing W. $\frac{3}{4}$ N. distant 15 miles, and Burung Mandi east peak N.W. $\frac{3}{4}$ N.

East Osterly, dries at low water, and lies S. by E. distant $3\frac{1}{2}$ miles from North Osterly.

South Osterly reef, lies S.W. $\frac{3}{4}$ W., distant $1\frac{3}{4}$ miles from the east reef. It is 2 cables in extent, with a dead coral islet about 40 feet long, and about 3 feet above high water.

A patch of $3\frac{3}{4}$ fathoms lies W. $\frac{3}{4}$ S. distant $2\frac{1}{2}$ miles, and a patch of one fathom lies nearly West, distant $4\frac{1}{4}$ miles from Osterly north reef.

Breakers may generally be seen over Osterly reefs.

Tides.—Near the Osterly reefs the flood runs north-westward, and the ebb about south-south-eastward. In November and December, no flood stream was observed. The rise of tide at springs is about 5 feet.

Bower shoal, discovered by the *Nassau*, 1876, is a coral patch three-quarters of a cable in extent, having 8 feet water, and steep-to, lying $6\frac{1}{2}$ miles southward of South Osterly reef, with the high tree on Rotan island bearing N.W. $\frac{1}{2}$ W., distant $19\frac{1}{2}$ miles. It stands near the middle of a narrow sandbank of $8\frac{1}{2}$ to $9\frac{1}{2}$ fathoms, extending 12 miles in a north and south direction. South Osterly reef stands on the north extreme of this bank.

DISCOVERY West bank (Ayer Masin), lying nearly 14 miles south-eastward of Bower shoal, in lat. $3^{\circ} 39' S.$, long. $108^{\circ} 46' E.$ is composed of coral, 7 cables long, and 2 cables broad, having a small portion barely covered at high-water springs. There are depths of 5 to 17 fathoms around the bank at a distance of one cable.

Discovery reef lies N.E. by E. distant $5\frac{1}{2}$ miles from Discovery West bank, and is 2 cables in diameter, having several coral heads barely covered at high water, and 14 to 22 fathoms at the distance of one cable.

Discovery East bank (Gusong Mampango), lying E. by N. nearly 26 miles from West bank, is $4\frac{1}{2}$ cables long, $1\frac{1}{2}$ cables broad, and having in its centre a decayed white coral ridge 5 feet above high water; there are depths of 16 to 17 fathoms, sand, around this bank, at a distance of one cable.

Discovery East bank is visible from aloft on a clear day at a distance of 7 to 8 miles. Birds make their nests here, and may generally be seen hovering about the bank.

LAVENDER BANK (Karang Juruk), lying N.W. $\frac{1}{4}$ W., distant 15 miles from Discovery East bank, with Rotan island bearing W. by N. $\frac{1}{4}$ N., is 9 cables long, 2 cables broad, and composed of coral, with several large

black boulders awash at half tide; around this bank there are depths of 15 to 20 fathoms, sand and shells, at the distance of one cable.

During a south-easterly breeze the sea on Lavender bank has been observed to break from aloft at a distance of 6 miles.

CIRENCESTER BANK (Karang Batuan), lying N. $\frac{1}{2}$ W., distant 9 miles from Lavender bank, is half a mile long, and one cable broad.

A black rock nearly the centre of the bank, which dries for about 50 yards, is barely covered at high water. The depths around the bank are from 29 to 34 fathoms.

Cirencester Shoal lies with Merajah island, Montaran group, bearing N.W. $\frac{3}{4}$ N., distant 22 miles, and the same distance northward of Cirencester bank. It is half a cable in extent, with a least depth of 2 fathoms, and 13 to 17 fathoms close around. The water about the bank is not discoloured, but tide rips may usually be seen.

A patch of $4\frac{3}{4}$ fathoms lies $1\frac{1}{2}$ miles S.S.W. of Cirencester shoal.

Doubtful reef.—A reef awash, on which the German vessel *Stephan* grounded in 1884, is reported to lie in about lat. $3^{\circ} 7''$ S., long. $109^{\circ} 17'$ E., or with Cirencester bank bearing S.W. by W. $\frac{1}{2}$ W. distant 20 miles. As no observations were taken to determine the position of the vessel when aground, the position of Stephan reef, and even its separate existence from dangers already known, must be considered doubtful.

MONTARAN or MOMPARANG ISLANDS consist of a group of islets, sand-banks, and coral reefs, extending 40 miles in an easterly direction from the north-east coast of Billiton. They are all uninhabited, but are frequented by the fishermen from the neighbouring coast of Billiton. With the exception of Nangka the islands are low, and are all covered with vegetation.

Between the islands are many dangerous coral reefs, steep-to, and the whole group must be considered unsafe navigation for any but small craft.

Tides.—It is high water, full and change, about 9h. 40m. in the morning during north-west monsoon, and the same hour in the evening during the south-east monsoon, rise from $4\frac{1}{2}$ to 6 feet. See page 369.

WEST GROUP.—The west Montaran group consists of eight islands, and several rocks above water.

Nangka (Tokokema) island, the most prominent of the Montaran islands, is $1\frac{1}{4}$ miles long and three-quarters of a mile broad; it rises in two densely wooded peaks, which at a distance appear like two separate islands. The southern peak is 549 feet high, and the northern peak 415 feet high.

This island is surrounded by a coral reef, which, on the north side extends half a mile off. A sunken rock lies three-quarters of a mile N.E. of the island.

Sembilan, situated about three-quarters of a mile westward of Nangka, is a sandy islet covered with trees and surrounded by a reef, leaving a narrow passage between the islands.

Foul ground exists for one mile westward of Sembilan, and a small coral reef, with 6 feet water and steep-to, lies S. $\frac{1}{2}$ W., distant $1\frac{1}{2}$ miles from the island.

Three islands lie close together southward of Nangka island. Sekumpul the northernmost, is distant about 2 miles, and Gampal (Telagapat), the southernmost and largest, about $3\frac{1}{2}$ miles from the south end of Nangka island. These islands are low, consisting merely of mangroves, and other trees (from 90 to 100 feet high,) growing on coral reefs. At 2 miles west of the south point of Gampal is a reef with less than 6 feet water.

High bank, situated about $2\frac{1}{2}$ miles east of Gampal, is nearly 2 miles long; on its south end is a patch of dead coral 3 feet high.

Napier (Maranai) island is densely wooded, three-quarters of a mile long, 90 feet high, and surrounded by coral reefs, which on the north and north-west sides extend about three-quarters of a mile, and on the east and south-east sides nearly 2 miles.

A reef of 3 fathoms lies with Napier island bearing N.E. by E. $\frac{1}{4}$ E. distant 2 miles.

Baru island situated on a reef about one mile east of Napier island, is small and sandy, with a few trees.

South (Sadung) island, about $2\frac{1}{2}$ miles south of Napier, island is a low sand-bank surrounded by a coral reef and covered with trees. The passage between it and Napier island is blocked by reefs which occasionally break.

Bakau island, about 4 miles westward of Sadung, is a low island with a large bush in its centre. A small sandy islet with some trees lies a short distance from its north-east point. A reef extends $1\frac{1}{2}$ miles E.S.E. from the island, and also half a mile north-west.

Paperak island, situated about $1\frac{1}{2}$ miles south-eastward from Bakau, is small and densely wooded. A reef about one mile in extent, with 2 to 3 feet water, lies one mile west of the island, and several coral patches exist between the island and Burung Mandi point.

Lenore reef, situated N.W. $\frac{3}{4}$ N. distant $3\frac{1}{2}$ miles from Napier island, is a small coral reef with $1\frac{1}{2}$ fathoms water, and steep-to.

A coral patch of 3 fathoms and 19 to 22 fathoms around, reported lying one mile N. by W. of Lenore reef, apparently has no existence.

A reef, with $3\frac{3}{4}$ fathoms, lies $2\frac{1}{2}$ miles E.N.E. of Lenore reef.

West Lenore (Hydrograaf) reef is $3\frac{1}{2}$ cables long, by $2\frac{1}{4}$ cables wide, and lies S.W. $\frac{3}{4}$ W., distant $8\frac{1}{2}$ miles from the south hill of Pulo Nangka; it has 2 fathoms water, and from 15 to 21 fathoms close around.*

Corcyra reef, about half a mile in diameter, with $1\frac{1}{2}$ fathoms water, lies with the south peak of Nangka island, bearing E. by N. distant 4 miles.†

Hydrograaf reef, extending one mile in a north-west and south-east direction and about 4 cables wide, has a least depth of one fathom, from which mount Tajem Laki bears S.W. $\frac{1}{2}$ W., and the south peak of Nangka island East. The reef is steep-to, with depths of 15 to 20 fathoms within one cable.

Gusong Serlang, one mile in length and 3 cables wide, has a bank of brown sand above high water on its north-west part, from which Pigeon island bears W. by S. $\frac{3}{4}$ S. distant $6\frac{1}{2}$ miles. Depths of 12 to 16 fathoms were found close around this reef.

Nearly midway between Gusong Serlang and Bakau island, are two detached coral patches, having one fathom water.

MIDDLE GROUP.—**Merajah island**, the largest of the Montaran Middle group, is low, flat, and covered with mangroves. The fringing coral reef extends in places to the distance of half a mile.

Big tree (Bulian) island is 150 feet high, the highest of the Middle group, thickly wooded and surrounded by a coral reef which extends half a mile north-west and south-east from the island.

Tempuling is a small islet situated one mile west of Big tree island.

Channer (Berisi) island half a mile west of Merajah, is similar to Tempuling, having reefs extending 3 cables from its north and south points.

Warren reef is a small bank of dead coral 5 feet high. Shallow patches lie about three-quarters of a mile north and south of Warren reef, and a similar patch 2 miles W. by S. of it.

Gubbins reef is a large reef, having near the middle a bank of dead coral 3 feet high. This reef is nearly connected with the Middle group by two other reefs. At $1\frac{1}{2}$ miles eastward of Gubbins reef is another large reef, with detached heads off it.

* *Filadelfia* reef reported by the Austrian barque *Filadelfia*, as a narrow reef, $1\frac{3}{4}$ miles long N.N.W. and S.S.E., having one foot water, 9 fathoms close to the eastern edge, and in lat. $2^{\circ} 37' S.$, long. $108^{\circ} 25' E.$, is considered to be identical with one or other of the charted reefs.

† Maa-sen-waal shoal, mentioned in former edition, seems to be identical with Corcyra reef.

Luctor reefs.—A patch dry at low water, lies about 2 miles W. by S. $\frac{1}{2}$ S. of Gubbins reef, with a patch of $3\frac{3}{4}$ fathoms, on which the *Luctor* struck, at $1\frac{1}{4}$ miles N.W. $\frac{1}{4}$ N. from it.

East (Pesemut) island is the easternmost of the Montaran islands. It is about half a mile in extent, of coral formation, thickly wooded, and surrounded by a sandy beach. The trees in the centre form a sharp pointed summit 112 feet high, making the island conspicuous and easily recognised when seen from a distance. Isolated coral patches extend one mile off the south-east part of the island.

Small (Tuan) island, 66 feet high, situated $1\frac{3}{4}$ miles south-westward from East island, is about one-third of a mile long, surrounded by a reef, and covered with a few stunted trees.

Justina reef half a mile in length, has a sand-bank above high water, one cable in extent, on its south end, with East island bearing W.N.W. distant $1\frac{1}{2}$ miles.

Whittingham reef, lying 2 miles N.E. by E. $\frac{1}{2}$ E. from Pesemut island, is small with $2\frac{1}{2}$ fathoms water. In the centre of the triangle formed by this reef, East island and Justina reef, is a small patch of $1\frac{1}{2}$ fathoms.

Catherine or Evans reef, about 2 cables in extent, has a least a depth of one fathom, with Pesemut island bearing W. $\frac{3}{4}$ N., distant $4\frac{1}{2}$ miles. Patches of 4 and 6 fathoms lie about half a mile north-eastward of it. This danger is steep-to with depths of 8 to 15 fathoms around, and is rarely indicated by breakers or discoloured water.

CAUTION.—Vessels using Carimata strait are advised to pass to the eastward of Catherine or Evans reef, as there is no passage between the Montaran islands that can be recommended.

REEFS.—**Condor reefs.**—Two small coral patches $2\frac{1}{4}$ cables apart, north-east and south-west, the southern patch having $2\frac{1}{2}$ fathoms, lie with East island bearing E.S.E., and Nangka south peak bearing S.W. by W. distant 10 miles. The edges of the reef are steep-to, and no breakers were observed.

Flying Fish bank, with a least depth of 3 fathoms, lies with Nangka island peak bearing S. by W. $\frac{1}{8}$ W., distant 18 miles. Within a distance of half a mile are several patches of 8 and 10 fathoms, beyond this distance the depth is over 20 fathoms.

Ontario reef, composed of dead coral, is about $2\frac{1}{2}$ cables long, and at half tide a patch of sharp spiral rocks about 20 yards in diameter uncovers. It lies with Carimata peak bearing N.N.E. $\frac{3}{4}$ E., distant $28\frac{1}{4}$ miles, and nearly in mid-channel between the Carimata and Moutaran islands.

A patch of 5 fathoms lies half a mile north of the reef with irregular bottom to the distance of a mile, beyond which the depths are from 15 to 22 fathoms all around.

Soundings are no guide in approaching Ontario reef, and the sea does not always break, it is therefore advisable to give the reef a wide berth.

Florence Adelaide reef, composed of coral and stones, with $1\frac{3}{4}$ fathoms at low water, extends 3 cables in a north-east and south-west direction, with a breadth of 2 cables. At the distance of half a cable eastward there is a sand patch with 6 fathoms; and farther eastward at the distance of 2 miles, depths of 13 and 15 fathoms, over sand, were obtained, with 20 fathoms, mud bottom, close-to; on the north and south sides it is steep-to, with 17 to 20 fathoms, sand and mud, at the distance of one mile. No indication of the reef was observed at 2 cables distant. Position, lat. $2^{\circ} 4' S.$, long. $108^{\circ} 5' E.$

THE CARIMATA ISLANDS lie on the eastern side of the main fairway, and extend for a distance of about 50 miles south-westward from Maja island, Borneo coast.

Carimata, the largest island, is about 11 miles in extent east and west, 7 miles north and south, and near its centre is a peak rising to an elevation of 3,378 feet high, which in clear weather can be seen from a distance of 55 or 60 miles, but as a general rule it is obscured by clouds. The peak is in lat. $1^{\circ} 36' 18'' S.$, long. $108^{\circ} 54' 29'' E.$ On the south-west end of the island are some hot springs.

Reefs extend off the east and south coasts of Carimata from 5 to 7 miles in places, but the north side is comparatively clear.

Besi island stands about $4\frac{1}{2}$ miles off shore, on the south side of the reef extending eastward of Carimata island. It has a tower shaped rock on its flat summit. Isolated and dangerous reefs extend a further distance of 4 miles eastward and north-eastward of Besi island, the neighbourhood of which should be avoided.

At $6\frac{1}{2}$ miles S.S.E. from the south point of Carimata island is a gravel bank, having 4 fathoms water. About midway between the outer edge of Gravel bank, and the west point of Carimata, are some rocks with less than 6 feet water. Two islets lie off the bay on the west side of the island, with patches of reef between them; the eastern islet is 280 feet in height.

Anchorage.—During the south-east monsoon, there is good anchorage in 12 to 14 fathoms, mud, off the north side of the island, westward of the north point. Vessels should not stand nearer to the shore than to bring the south point of Pyramid or Buan island in line with the north point of Carimata island.

During the westerly monsoon there is anchorage in 6 fathoms off the south side, eastward of the Gravel bank, at about $2\frac{1}{2}$ miles from the shore; also at about one mile southward of Besi island in 7 fathoms, mud.

There is a small village, in a creek upon the south shore of the island S.E. by E. from the peak of Carimata, inhabited by about 200 fishermen, and a few Chinese.

Surong Gading Island lies 3 miles westward of the north-west point of Carimata; it is rocky and 790 feet high. A reef extends nearly half a mile southward of the island.

Vessels should not use the channels between any of the islands lying between Surong Gading and Carimata island, as there are many reefs among them, and the currents are strong.

Bliang is a round conical island, 1,293 feet high, lying between Gading and Carimata; it can be seen for 30 miles or more, and forms a good mark, as it nearly always remains clear when the higher hills are obscured.

Serutu island, about 7 miles long east and west, $1\frac{1}{2}$ miles broad, 1,575 feet high, and visible 28 or 30 miles off, forms the north-eastern limit of the broad main channel of Carimata strait. On the western point of the island is a hummock, which has been mistaken for a small island, and named the Quoin from its appearance. About 2 miles off the west end of the island the depths are 20 to 24 fathoms.

Anchorage.—Water.—There is good anchorage off the north side during the south-east monsoon, in about 11 fathoms. At a sandy beach on the south side of Serutu, and near the east point, there is a good watering place, but high tide is required for a large boat to get over a reef, near to which there is anchorage in 7 fathoms, mud. It is said, also, that fresh water can be obtained at the west end of the island (at the foot of a hill of moderate height) off which a vessel may anchor in 10 fathoms.

Genting, Mintano, and Gresik, are three islands, east and west of each other, situated E.S.E. distant $13\frac{1}{2}$ miles from Carimata peak. These islands are thickly wooded, Mintano, the centre one being the largest. A dry sand bank extends $1\frac{3}{4}$ cables northward from Gresik, but there is no other danger, depths of 8 and 9 fathoms being found around and between the several islands.

Tongue islands.—Bakong, the northern island of the group is a small wooded hummock with a surrounding reef having three islands upon it. About $1\frac{1}{2}$ miles N.W. of Bakong lies a reef extending 2 miles north and south, having 6 feet water.

Other detached corals reefs lie between this group and Carimata, rendering the channel between, named Osterly channel, dangerous to navigate.

Liesing island is low and flat, with a reef extending nearly 4 cables south-eastward, upon which are three small islets.

Boom island is a round-shaped woody islet, steep to all round.

Steil island, the easternmost of the group, has a reef extending 3 cables north-west of it; between Steil and Boom islands there are depths from 16 to 20 fathoms.

A small reef with 4 fathoms water, and about one mile in extent, lies one mile northward from Steil island.

Osterly channel, the passage between the reefs extending eastward of Carimata island and Lising, is intricate, being obstructed by many shallow patches, between which the currents run with strength. Vessels should not use this channel, but pass eastward of Steil island.

Buan or Pyramid island, the remarkable conical peak of which is 1,017 feet high, lies $7\frac{1}{2}$ miles north-eastward of Carimata island. A reef extends $4\frac{1}{2}$ cables eastward from the island.

Ular and Pulo Nibong lie respectively W.N.W. distant $1\frac{1}{2}$ miles, and E. by S. three-quarters of a mile from Buan island, with channels between them having depths of 8 to 12 fathoms; both these islands are rocky and have a few trees upon them.

A reef, which occasionally breaks, lies nearly 2 miles E. by S. from Nibong island, with apparently foul ground between.

Jamsetjee or Seno shoal, composed of coarse sand and stones, has 5 fathoms least water, and lies with Buan island peak bearing E.S.E., and Bliang peak S.S.W.

Leman islands, are a group of rocky islands lying 15 miles north of Carimata island. Pako, the easternmost island is the largest and 164 feet high, with a reef extending to the northward about 6 cables. The western island, Leman Budi, has a rounded appearance, and is covered with verdure.

The channel between Budi and the eastern islands of the group is one mile wide, with a depth of 14 fathoms; but the channels between the other islands are narrow and obstructed by reefs.

SHOALS.—**Gwalia shoal** is the southernmost of a group of coral shoals extending about 14 miles in a north and south direction, and situated north-westward of the Leman islands. It is a round coral patch about 2 cables in diameter, with less than 6 feet on it at low water, from which Budi, the western Leman island, bears S.E. by E. $\frac{1}{2}$ E. about $21\frac{1}{2}$ miles, and Carimata peak S.E. $\frac{3}{4}$ S. The depths around the shoal are from 7 to 10 fathoms. The wreck of the *Gwalia* lies on its southern edge.

Erickson shoal, about 2 cables in extent, with a least depth of $4\frac{1}{2}$ fathoms, lies about 3 miles north-west of Gwalia shoal, with depths of 7 to 11 fathoms at one cable distant.

Twilight reef, upon which the American ship *Twilight* struck, lies N.E. by N. nearly 5 miles from Gwalia shoal.

China shoal lies about 6 miles N. $\frac{3}{4}$ W. from Erickson shoal ; it is about 5 cables long, and 3 cables broad, and the depth of water varies from less than 6 feet to 4 fathoms.

South Greig shoal is a small patch of coral with 5 fathoms water, lying 2 miles north of China shoal.

Middle Greig shoal, with 2 fathoms water, is about 2 cables in length, and steep-to on the south and west sides, there being 10 to 14 fathoms close to its outer edge ; on the north and east sides the soundings are more gradual.

North Greig shoal, the northernmost of this group, is a small patch with 4 fathoms water, and 11 to 13 fathoms at the distance of one cable. It is situated 2 miles N.N.E. of Middle Greig, and $13\frac{1}{2}$ miles N. by W. from Gwalia, the southern shoal of the group. Position, lat. $0^{\circ} 52\frac{1}{2}'$ S., long. $108^{\circ} 32\frac{1}{2}'$ E.

Caution.—The shoals, embraced between the Gwalia and North Greig shoals, rise from a depth of 10 to 13 fathoms. They are rarely visible either from the deck or mast head from the green nature of the surrounding bottom, and from the abruptness with which they rise the lead will seldom give sufficient warning to enable a danger to be avoided. Vessels are therefore recommended to give this neighbourhood a wide berth. On the western side of the reefs this may always be secured by keeping in not less than 16 fathoms water.

VOGELNEST (Birds Nest) ISLANDS, so named from being the resort of the birds which build the edible nests, are a group of five islands lying 20 miles E.S.E. of Carimata island ; between the eastern island and the others there is a channel 2 miles wide having from 9 to 13 fathoms. The western group is surrounded by a reef extending 2 cables from the shore, and reefs extend 2 cables N.N.E. from the eastern extremes of the island, having rocks above water.

Black Rock, or islet, lies $4\frac{1}{2}$ miles S.W. of the Vogelnest group. Two rocks, also above water, lie half a mile south-eastward of Black rock. All these are steep-to, having from 9 to 11 fathoms at a short distance.

Krawang islands are three rocky islets, and a rock lying 2 cables W. by S. from the northern islet. Between the north and two south islets there is a narrow passage of 12 to 15 fathoms water. Between these islets and the Vogelnests, the depths are from 9 to 11 fathoms.

PAPAN ISLANDS consists of a group of six rocky islands thickly wooded, and divided into groups of three by a channel about one mile wide.

Meleidong, the eastern island, is the largest and affords good shelter on its east side during westerly winds, having also a convenient landing-place for boats in a small bay near the south extreme.

Two small islets lie northward of Meleidong, from the western of which a reef extends West one cable, having a rock over which breakers are usually seen.

The three islands of the western group lie in a north and south direction about half a mile apart; from the northern of these a reef extends westward $4\frac{1}{2}$ cables, and from the southern island a reef extends about 3 cables to the southward.

Rob Roy rock.—This small rock with a depth of 15 feet, lies in Papan channel, with the south extreme of Meleidong island bearing S.E. $\frac{1}{2}$ E. distant one mile.

Kate (Auckland) rock, about one mile westward of Rob Roy rock, is $1\frac{1}{2}$ cables in extent, with 7 feet water, and 12 to 14 fathoms, sand and mud, around. Its position is usually indicated by a ripple.

GURONG or PASSAGE ISLANDS are two thickly-wooded rocky islets situated about 10 miles north-westward of Papan islands. They stand on a coral reef which fringes the islands for a short distance, having from 12 to 14 fathoms close to.

A rock about 160 yards in extent with 7 feet water, and 12 to 14 fathoms around, lies with East Gurong bearing W. by N. $\frac{1}{2}$ N. distant half a mile.

Tallack reef, a small coral reef about 160 yards in extent, with 2 fathoms water, and from 18 to 20 fathoms close around, lies with East Gurong island, bearing E. by S. $\frac{3}{4}$ S., distant $5\frac{3}{4}$ miles.

PELAPI (Melapies) ISLANDS, situated 7 miles north-westward of the Gurong islands, consists of four high rocky islands; the south-eastern and highest, attains an elevation of 1,180 feet.

Anchorage.—During the easterly monsoon there is good anchorage in from 8 to 9 fathoms, mud, midway between the two northern islands; there is also a navigable channel between the north-west and south-west islands, but the other channels should not be used. South-east of the group is an extensive mud flat, affording safe anchorage in 7 fathoms, during the westerly monsoon. A reef extends 2 cables from the north-east island towards the anchorage.

Suka island, steep, rocky, and thickly wooded, lies 2 miles southward of the western Pelapi island.

Double island, situated one mile eastward of the north-east Pelapi island is 403 feet high, and appears as two islands when seen from a distance.

Siri island, lying one mile westward of Penebangan island, is 510 feet high, with a safe passage of 15 fathoms water between it and Penebangan.

PENEBANGAN ISLAND, lying north-eastward of the Pelapi islands, rises to a peak 1,722 feet above the sea. This island lies within the edge of the bank of 5 fathoms and less, extending westward from Maja island.

Anchorage and Water.—There is good anchorage at one mile off the north-western side of Penebangan, in $5\frac{1}{2}$ or 6 fathoms, mud, with shelter from southerly winds. Fresh-water bay, at this part of the island, has two runs of good water, the westernmost of which is the largest, where the water is obtained behind a large black rock on the beach; the boats may approach close, or the casks can be landed on the beach, which consists of fine sand. There are four watering places on the west side, all of which are fronted by fine sandy beaches, and easily discerned.

There is good anchorage on the eastern side during the westerly monsoon, but a reef extends from the south point, which should not be approached within half a mile. The island abounds in wild pigs.

Bulat and Burong islands, four in number, lying eastward of Penebangan island are low and thickly wooded.

Meledan or Button island, is a wooded islet, lying on the shore mud bank, with surrounding depths of 4 fathoms; it is a useful mark when navigating the Inner channels.

INNER and GREIG CHANNELS.—The passage eastward of the Papan islands and Penebangan, is known as the Inner channel, and is used by light draught vessels and coasters, when working against the monsoon; the depths are regular, being from $3\frac{1}{2}$ to 4 fathoms, soft bottom, gradually decreasing to the Borneo coast; the shallow water makes it convenient to anchor for tide or at night. See directions, page 396.

Greig Channel is the passage between Penebangan and the Pelapi islands. It is 2 miles in width and free from danger. The route by this channel and among the islands to the south-eastward, although contracted in some parts, has moderate depths with generally good anchorage, and is, with Inner channel, the only route by which vessels may work against the monsoon, whether bound northward or southward.

WEST COAST OF BORNEO; SAMBAR POINT TO PONTIANAK, WITH THE ADJACENT DANGERS.

GENERAL DESCRIPTION.—**Landmarks.**—The west coast of Borneo is very low and almost uninhabitable. It is principally composed of a muddy slimy soil, which at high water is transferred in many parts into a morass. There are a few isolated hills, the principal of which are Mount Kedio, 1,707 feet high, Batu Jurang, and Minto hill, just northward of Pulo Kumpal or Rendezvous island; a mountain near Sukudana, 3,700 feet high, and a conspicuous mark in clear weather; Maja mount,

1,738 feet high, on Maja island; and Radak and Ambawang mountains, northward of Padang Tikar river, around which the coast is very low; forming the delta of Great Kapuas river. The tops of the trees, however, are visible from a distance of 12 to 14 miles.

On account of the swampy nature of the west coast of Borneo it is but thinly inhabited; Sukudana is the principal settlement in the southern part of the strait. The little coast trade carried on is done by Chinamen or Malays connected with the Dutch Settlements.

Coast.—From Sambar point, the low south-west extreme of Borneo, the coast takes a northerly direction for about 45 miles to Minto hill, 328-feet high, with Kendawaugan river lying about midway, thence it continues its northerly direction for about 27 miles to Ketapang river; and 35 miles beyond is Sukudana town and the Simpang river, which lie at the head of a large bay formed between the coast, and Maja island to the westward. Northward of Maja island several other large islands lie close to the coast, between which are Maja and Padang Tikar rivers, and several smaller rivers to the northward of them, in the direction of Pontianak. The whole of the coast between Kumpul island, lying about 25 miles off Sambar point, and Pontianak, may be safely navigated by ordinary attention to the chart.

Caution.—Numerous detached sand ridges, with little water on them, between which the currents run from 2 to 3 miles an hour at times, extend for about 30 miles southward of Sambar point, terminating in Fox shoal. Vessels should pass well to the southward of all these dangers.

SAMBAR POINT or Batu Titi.—This point has a large tree upon it, which is visible 4 miles farther than the neighbouring wooded land, or about 16 miles.

Pulo Mangkap, lying 7 miles south-westward of Sambar point, has a remarkable high tree near its centre, and which can be seen about 14 miles. A rock above water lies 4 miles S.E. of the island, and several others lie north-eastward of it. Vessels from the southward should not attempt to sight this island.

SHOALS off Sambar point.—**Fox shoal,** with a least depth of 2 fathoms, is situated 27 miles South from Pulo Mangkap. The shoal is one mile long in a N.W. and S.E. direction, and is indicated by strong rippings. Positions, lat. $3^{\circ} 30\frac{1}{2}'$ S., long. $110^{\circ} 9'$ E.

Patches of $4\frac{3}{4}$ and 5 fathoms are charted 5 miles south-eastward of Fox shoal.

Aruba shoal, lying S. $\frac{1}{4}$ W., distance 23 miles from Pulo Mangkap, is a narrow bank 4 miles long, with 2 fathoms water, steep-to and generally indicated by rippings.

Clemencia reef, consisting of a ridge of hard sand 4 miles long, situated 20 miles S. by W. from Pulo Mangkap, has about one foot water

on its shoalest part and is steep-to. Breakers are nearly always to be seen on this reef. A patch of $2\frac{3}{4}$ fathoms lies $7\frac{1}{2}$ miles N. $\frac{1}{2}$ E. from Clemencia reef.

Linge shoal, consisting of hard sand, having a depth of $1\frac{1}{2}$ fathoms, lies with Pulo Mangkap bearing N.W. by N., distant $13\frac{1}{2}$ miles; the shoal is steep upon the northern side, but in other directions the water shallows gradually.

Banks.—Between Clemencia shoal and Pulo Mangkap are several sand ridges extending in a north-west and south-east direction and with shoal spots of 2 to 3 fathoms.

Between these ridges are depths of 6 to 12 fathoms mud; as the currents are generally strong with overfalls, and there are no objects by which the position of a vessel may be accurately ascertained, it is advisable, as before mentioned, to pass southward of Fox shoal.

GELAM or Laag Island is about 4 miles in extent, very low, wooded, and the largest of a group lying 10 miles north-westward of Sambar point. Penabung Tikus, a group of islets and sunken rocks, extend about 3 miles westward of Gelam island, being a continuation of the rocky and foul ground lying between Mangkap and Gelam. Beranton islets lie about 2 miles northward.

A reef, with a least depth of $1\frac{1}{2}$ fathoms, lies S.S.W. $\frac{1}{2}$ W., about 6 miles from the west extreme of Gelam.

PULO KUMPAL (Rendezvous island), better known among the natives as Pulo Bauwal, lies about 6 miles northward of Gelam island. It is 6 miles long, by 4 miles broad, thickly wooded and low, with the exception of two small hills rising above the vegetation near the centre of the island.

This island was, in former times, the rendezvous for the China convoys in case of separation.

Reefs extend about one mile from the north and west shores, and several islets and rocks lie upon the reef off the north extreme; upon the eastern side, banks of hard sand lie parallel with the coast, extending a mile from it, and are steep-to. Patches of sand and stones both above and below water are found within 2 miles of the south side of Pulo Kumpal, and foul ground extends to the Beranton islets.

Coreyra bank, of 2 fathoms, lies S. by W. $\frac{1}{2}$ W. about 5 miles from Sulphur point, with a patch of same depth nearly 2 miles within it. A patch of 4 fathoms also lies South $2\frac{1}{2}$ miles from Coreyra.

The hill over Batu Jurong point, open westward of Pulo Kumpal, leads westward of these reefs.

There is a channel of 6 to 8 fathoms between Pulo Kumpal and a mud flat extending from the Borneo coast; the southern part of the channel

shoals to $2\frac{1}{2}$ fathoms taking a S.S.W. direction, and thence between Beranton (Peranton) and Langau islets.

Anchorage.—Sheltered anchorage in both monsoons may be obtained off the east side of Pulo Kumpal, which may be approached by a channel of from 7 to 12 fathoms between Tyampedak and Batu Merah (red rock) the northern islet upon the reef extending from Pulo Kumpal. Rocks above water extend about $4\frac{1}{2}$ cables eastward of Batu Merah.

There is anchorage off the west side, which has a sandy beach, in about 5 fathoms, with Sulphur point (the west extreme of the island), about S. $\frac{1}{2}$ W., and the north extreme E. by N. $\frac{1}{2}$ N., sheltered from easterly winds.*

Water may be obtained on the island by digging above high water mark.

Tyempedak, a low wooded island lying 2 miles northward of Pulo Kumpal and $1\frac{1}{2}$ miles westward of Batu Dyurong, has a rocky coast line except on the south-east side where there is a sandy beach and a small native village. The island should not be closed to a less distance than 6 cables upon the seaward sides, as many detached dangers exist within that distance. There is a channel between Tyempedak and the islands off Batu Jurang.

Batu Jurang (Dyurong) point, is a high rocky point, whence a ridge of hills culminating in a conical peak 689 feet high, extends in a north-easterly direction, and forms the steep slopes of the southern shore of Kendawangan river, the range terminating about 4 miles from the sea. Two islets, the northern and smaller, named Tengating, and the southern, Iras, lies close off the point and are steep-to on their western side.

Between Batu Jurang and Kendawangan river to the northward, four fathoms water will be found at about 4 miles from the coast.

KENDAWANGAN RIVER is navigable for small steam vessels beyond the village of Kendawangan, situated 20 miles from the entrance and 4 miles east of mount Kedio. The village has a population of about 100 Malays. The entrance of the river can be distinguished from seaward at about 5 miles distant, and is obstructed by a bar having 11 feet water at low water. Landing is bad in the westerly monsoon.

Two rocks dry at low water, named Batu Bunja (Crocodile stone) lie about one mile from the south entrance point of the river, and just north of the fairway. From the south rock the east point of river bears E. by S. $\frac{1}{2}$ S.

* There appears to be an eddy tide near the island, as Lieutenant Hoskyn states that the rising tide sets to the southward, whereas in the offing it sets about N.N.W.

The Three Kuting Dyambu (Jambu) islets and many rocks lie off the north point of the river. Two miles westward of them there is anchorage in 4 fathoms, sand.

Directions.—Steer in with the south point of the river entrance bearing East, and when reaching the bar a more northerly course may be made for the middle of the river, where the channel between the banks extending from the entrance points is more distinguishable.

Tide.—Spring tides rise about 5 feet, neaps $2\frac{1}{2}$ feet.

Mount Kedio, or high peak 1,707 feet above the sea, is the summit of a range extending in a south-westerly direction westward of Kendawangan river. Mount Minto stands on Minto point, north-westward of Kedio, and is visible about 20 miles in clear weather.

Gasei point, at 6 miles northward of Kendawangan river, is high and rocky; reefs extend seaward about 3 cables, also in a S.S.E. direction for one mile. Northward of the point the coast is low and wooded as far as Minto point, and intersected with streams of fresh water.

Sawi island is low, 6 cables in extent, and situated 7 miles southward of Minto point, at 5 miles off shore. The tops of the trees are visible from a distance of 12 miles, and islets lie about 2 cables off its east and west points.

Foul ground extends from Sawi island, half way to the shore, rendering the inshore channel unsafe.

A reef (Onrust), dry about 2 feet at low water, and half a mile in extent, lies with Menkudu rocks bearing N. $\frac{3}{4}$ E.; Sawi island S.E. by E. $\frac{1}{2}$ E. distant 6 miles, and Mount Kedio E. $\frac{1}{2}$ S.

Tokong Menkudu or Gilbert rock, is 33 feet high having two trees upon it, and sparsely covered with vegetation. Reefs extend from the rock in all directions, on the south side for nearly half a mile, having from 5 to 9 fathoms close to the edges.

A reef, nearly dry at low water, lies nearly 2 miles N.W. of Minto point.

Pesaguan river.—The entrance to Pesaguan river is situated in a bight of the coast, where the shores are low and densely wooded, 12 miles northward of mount Minto. The river is about half a cable wide, has 3 feet water over the bar at low tide, with from 2 to 3 fathoms water within.

Between Minto point and Ketapang river the ground is foul within the depth of 5 fathoms.

PAWAN RIVER.—This river divides into two arms at a distance of about 12 miles from the coast, the southern arm is named Ketapang and the northern arm Karbau. When approaching this river from the west-

ward, the soundings decrease suddenly from 6 fathoms to one fathom with a hard bottom at 2 miles from the shore, and upon the bar of both arms of the Pawan river there is a depth of 3 feet only, at low water.

A shoal which dries in places extends 2 miles W. by N. from Pajung island situated at the mouth of Karbau river; the channel south of this shoal and island is the better. It is dangerous for small craft to cross this bar during the westerly monsoon, but it is practicable at high water in the south-east monsoon.

A bank of hard sand extends 2 miles off shore abreast Bereh village, about 7 miles south-eastward of Ketapang entrance.

Northward of Pawan river to Tyempedak island the coast is low and swampy, and is fronted by a mud bank shallowing gradually to the shore. Tyempedak, Sampadian, and Kasa Beras, are rocky islets thickly wooded upon their summits, situated upon the mud bank fronting the coast; Tyempedak, the western islet is $3\frac{1}{2}$ miles from the shore. The passage between them is obstructed by rocks.

Juanta island is a rocky and wooded island, having a conical peak visible about 25 miles, useful in the navigation of the locality. Rocks above water lie between it and Katung islet, and also at $1\frac{1}{2}$ miles E. $\frac{3}{4}$ S. of Juanta.

Katung islet lies one mile south-west from Juanta and has a reef lying half a mile north-west of it, upon which breakers are usually seen.

SUKUDANA the principal village on this part of the coast, is situated upon the north shore of a small river artificially barred with stones, at about $1\frac{1}{2}$ miles northward of the Batu islands, which are wooded, and lie about 100 yards off shore. The Dutch Government have a small fort and garrison, but no supplies can be obtained for shipping.

Sukudana lies on the east side of the large and shallow bay formed eastward of Maja island, and into which the Simpang and Kumbang rivers empty themselves. The whole of this bay is shallow, with channels of slightly deeper water leading to those rivers; the 3-fathoms line fringing Maja island at the distance of 3 miles, stretches across the bay to about the same distance southward of Sukudana, but passing within half a mile of the point just southward of Batu islands, thence resuming its distance of 3 miles off shore.

The two high hills ranging from 1,700 to 1,900 feet, lying north and south of Sukudana, are conspicuous objects, and may be seen from a distance of 32 to 36 miles in clear weather.

Anchorage.—Vessels may anchor off Sukudana in 3 fathoms, soft mud, at about $3\frac{1}{2}$ miles W. by S. of the flagstaff, but the ground swell renders the anchorage an indifferent one. There is the same depth of water much

nearer the shore, at about half a mile off the cliffy point, close south-eastward of Batu island, or about 2 miles south of Sukudana, where communication with the shore is easier.

Small craft find shelter from the S.E. monsoon in about 9 feet, mud, just within Salatinama island, and near the south point of Sukudana bay.

Tides.—It is high water, full and change, at about 9h. 30m. in the morning during the north-west monsoon, and the same hour in the evening during the south-east monsoon. Tide rises 6 feet at springs.

Simpang river, lies at the head of the bight formed by Maja island, and the main coast to the south-eastward. Its mouth is obstructed by extensive mud flats; the best channel is near the eastern shore, close to the rocky islet Pelintuan, and has a least depth of four feet at low water.

Kumbang, Mendawa and Kapuas rivers.—The mouth of the Kumbang is 3 miles wide, southward of which there are extensive mud banks with channels between them; the western channel is that usually taken, having 11 feet water at low water, increasing to 6 and 7 fathoms within the river's mouth. The entrance to the above channel bears N.N.W. from Junta island.

Kumbang river joins the Maja river, at the north-east point of Maja island; the united streams under the name of Simpang Lida river continue for 6 miles to the entrance of Mendawa river, and its junction with Padang Tikar. The Mendawa connects with Kapuas river. Vessels from 6 to 9 feet draught can navigate to Pontianak from the Kumbang river by these channels.

MAJA (Mayang) ISLAND fronts the Borneo coast north-eastward of Carimata island, and separates the Maja river from the Kumpang. It is about 27 miles in length, by about 18 in breadth. Mount Maja on its western side is 1,738 feet in height, and Mount Marang or Sanja peak near its south extreme is 196 feet high; the remainder of the island is low. Its south-west extreme is covered with tall Tyemera trees, and fronted by a bank with 3 fathoms and less, to the distance of 3 to 5 miles, increasing off the north-westward side of the island to about 7 miles.

Depths of less than 5 fathoms extend 8 miles south-westward of the island, and within 3 miles of Papan islands.

Maja river.—The mouth of this river forms a deep inlet northward of Maja island. To enter, steer for mount Maja bearing E. $\frac{3}{4}$ N. until Antu island is in line with the western Masien Tiega island, when steer N.E. over the bar on which there is $2\frac{1}{2}$ fathoms at low water, increasing within to 6 and 7 fathoms. The river with these depths is about one mile wide bordered by shelving mud banks; when mount Gadong bears

North, the channel turns to the eastward and contracts to a breadth of half a mile, finally joining the Kumbang.

Antu (Baru), a small rocky island thickly wooded on the summit, lies just within the 3 fathoms line westward of Maja river, and forms a useful mark for vessels bound for that river, being visible in clear weather from a distance of 12 miles.

Masien Tiga islands.—These two thickly wooded islands are situated N.N.W. of Antu island, 4 miles from the coast of Borneo, and are visible 20 miles in clear weather. Nanas and Malang Merakat are small wooded islets lying one mile off shore, eastward of Masien Tiga islets. Vessels of less than 12 feet draught can cross the flat between Antu and Masien Tiga islands, keeping a look-out for trunks of large trees which at times obstruct this passage.

Coast.—From Maja river northward to Padang Tikar the coast is low and fronted with extensive banks of sand and mud, vessels should not approach the coast nearer than 8 miles, or bring Penebangan summit southward of S. by E. $\frac{3}{4}$ E.

PADANG TIKAR RIVER situated about 20 miles northward of Masien Tiga islands is the deepest river on the west coast of Borneo, having a depth of 4 fathoms over the bar at low water over a breadth of 2 miles, and a depth of 3 fathoms over nearly twice that breadth. Vessels of 12 feet draught can reach Pontianak from Padang Tikar, by proceeding southward of Panjang island, and thence by Dyenu (Jenu) and Mendawa rivers to the Great Kapuas, but local knowledge is necessary. Little Kubu river on the north side of entrance to Padang Tikar, admits vessels of about 10 feet draught at high water.

Tides.—The rise and fall of tide at springs at Padang Tikar river is from 3 to 4 feet in the south-east monsoon, and about 6 feet in the north-west monsoon. In the south-east monsoon it is high tide about 8h. 30 p.m.; and in the north-west monsoon about the same time in the morning. Off the coast the flood runs to S.S.E., and the ebb to N.N.W.

Directions.—The high trees on Padang Tikar point may be seen from a distance of about 12 miles. Radak mount, an isolated table top, about 12 miles north-eastward of Padang Tikar point, is visible about 22 miles, and will be seen about the same time as the point. In entering the river, steer for Padang Tikar point, bearing E. $\frac{1}{2}$ S., which will lead over the bar in 4 fathoms water, the shoalest part being 8 miles westward of the point. When Radak mount comes in line with Burung islet, (the south-eastern islet on the north side of river), bearing N.E. by E. $\frac{3}{4}$ E., steer for it until Padang Tikar point bears S.E. by S.; when edge to the eastward to bring Radak mount in line with Terjun hill, (a low rocky hill with two conspicuous trees on its summit on north side of entrance to

Radak river). These objects in line being steered for, lead in the fairway in from 6 to 7 fathoms, between Burung islet and the flat extending westward of Panjang island. When the west point of Little Kubu river bears N.N.W., anchor in about 7 fathoms on the leading mark. Vessels of 10 feet can enter the Kubu under favourable circumstances at high water, by steering for the west point of the bearing of N.N.W.; the depth on the bar at high water being 9 feet in easterly monsoon, 12 feet in westerly monsoon, and 6 feet at low water.

Proceeding up the Padang Tikar, and having the point of that name bearing S.E. by S., steer to the eastward and south-eastward, at about half a mile from the south bank, in depths of 5 to 7 fathoms, as far as the east end of Panjang island.

Coast.—From Padang Tikar river to Little Kapuas river, at about 40 miles to the northward, and on which is the settlement of Pontianak, the coast is low, marshy, and broken into several islands by the shallow streams forming the delta of Great Kapuas river, the principal of which is the Membawang with a depth of 6 feet at low water.

The Ambawang mountains situated about 14 miles northward of Padang Tikar river, rise from this low coast, and may be seen in clear weather from a distance of 36 miles, and are therefore visible from Pontianak road. The shore may be approached by the lead, and to the distance of about 3 or 4 miles. For Pontianak, *see* Vol. II.

Pilots.—The fisherman on both sides of Carimata strait appear to be well acquainted with the shoals in their own neighbourhood, but from their little knowledge of vessels, few are able or to be trusted to take them into the rivers. Away from their own neighbourhood they are of no use, beyond being quick of eye to discern shoals that a vessel may be approaching.

DIRECTIONS.—**Carimata Strait from the Southward.**—Approaching Carimata strait from the southward, a vessel will have to depend principally upon the correctness of her reckoning, for the soundings are so irregular that they will afford but very imperfect guidance, and the land is too distant to be of service in determining her position. If to the westward of longitude $108^{\circ} 20' E.$, a good lookout should be kept to get sight of Kebatu or Shoe island (page 375), which, if seen, will determine the position, and enable her to steer to pass into the strait, either by the main route eastward of Discovery, Lavender, and Cirencester shoals, or by the route westward of those dangers, between them and the Osterly shoals, avoiding Bower shoal.

Should the vessel be to the eastward of $109^{\circ} 30' E.$, and approaching the parallel of $4^{\circ} S.$, the greatest care must be observed to keep to the westward of the dangers which extend about 30 miles southward from Mangkap

island, which island should on no account be sighted until it is known to bear eastward of N.E. Having passed Pulo Kumpal or Rendezvous island, a course should be shaped to pass eastward of Ontario reef, visible at half ebb, between which and Black rocks there are no known dangers; Carimata, Serutu, and the adjacent islands affording good objects for determining the position. Montaran islands will answer a similar purpose if she pass westward.

(Vessels may pass westward of Ontario reef, or between it and Montaran islands, avoiding Flying Fish reef, which lies 13 miles southward of it, Condor reef of $2\frac{1}{2}$ fathoms situated about 7 miles northward of those islands, and Florence Adelaide reef to the north-westward. The passage eastward of Ontario reef is to be preferred.)

Having brought Serutu island to bear East about 5 miles, course may be shaped as requisite, observing that Carimata peak kept eastward of S.E., or Serutu summit S.S.E. $\frac{1}{2}$ E., leads westward of Gwalia reef and the reefs northward of it.

Vessels passing northward through Carimata strait during the months of December, January, and February, (the strength of the north-west monsoon) generally keep near the coast of Borneo to avoid the strong southerly current; and pass into the China sea through Greig channel or Inner channels, *see* below; China sea continued in Vol. II., page 24.

From the Northward, in the north-west monsoon period, the channel eastward of Ontario reef should be taken. Approach Serutu island between the bearings of S.E. and S.E. by E., passing 4 or 5 miles westward of it, observing that the west extreme of the island kept westward of N. $\frac{1}{2}$ W., leads eastward of Ontario reef. Thence the peak of that island may be gradually brought to bear N.W. by N., astern, until lost sight of, which direction being preserved leads well to the eastward of Catherine reef. Vessels may pass westward of Ontario reef, avoiding Flying Fish and Condor reefs lying between it and Montaran islands.

From a position 10 miles eastward of Catherine reef, a S.S.E. course should lead in the fairway, and about 15 miles eastward of Discovery East bank, clear of all dangers.

From the northward, when the south-east monsoon is strong, vessels get smoother water and less current in Greig and Inner channels.

In thick weather, and not certain of the position of the vessel, the best way is to borrow towards the Borneo coast, to get a sight of the land if circumstances admit, and take a new departure from Rendezvous island, avoiding the shoals extending 30 miles southward of Pulo Mangkap.

GREIG AND INNER CHANNELS.—Vessels working through Carimata strait have to take either the Greig, or Inner channel, eastward of Carimata islands, the main strait being impracticable on account of the

strong adverse current. In these channels the sea is smoother and the current not so strong, it being wholly or in part overcome by the flow and ebb of the tide and the indraught into the rivers on the west coast of Borneo; vessels also have the advantage of the change of wind at night and in the morning caused by the land breeze, and which often brings it several points more to the eastward in both monsoons.

These channels have a convenient depth for anchoring, and the bottom is soft mud. Notwithstanding, working through these channels is slow and tedious; as an instance, H.N.M. surveying vessel *Hydrograaf*, when employed there, had a vessel in sight eight days that was working through.

As before remarked, the flood stream comes both from northward and southward on this coast, meeting off Sukudana, the ebb going in the contrary directions.

From the southward.—Being northward of the dangers off Mangkap island and of mount Minto (pages 395–6), the Borneo coast may be approached to 9 or 8 fathoms water, and to 7 or 6 fathoms when nearing the Papan islands. The Black rocks and Vogelnest islands should not be approached nearer than one mile. A vessel may pass on either side of the Papan islands, observing that the water quickly shoals to 5 fathoms, at 3 miles north-eastward of them. The western side is clear. Between Krawang island and the Papan islands the depths are 12 to 13 fathoms, decreasing pretty regularly towards the Borneo coast; and between Papan, and Gurong or Passage islands, there are 11 to 12 fathoms. North-eastward of the Gurong islands the soundings shoal rather suddenly from 8 to 5 fathoms, but gradually under that depth. Greig channel is bold towards either shore with depths from 12 to 16 fathoms in the fairway.

Between Penebangan and Masien Tiga islands, the Borneo coast may be approached to 6 fathoms, but northward of Masien Tiga do not bring it southward of S.E. or stand into less than 8 fathoms until off Padang Tikar river, northward of which the coast may be approached to within 4 miles.

A vessel may stand off to or westward of the Leman islands, observing that those islands (in sight from aloft) kept southward of S.E. by S., leads eastward of Twilight reef, and of the reefs westward of it.

From the northward.—In the south-east monsoon, steam vessels from Pontianak or from that direction, make use of Greig channel, thence passing eastward of Papan islands, and down the Borneo coast distant about 10 miles. From abreast Pulo Kumpal or Mangkap, a good departure may be taken to avoid the shoals southward of it, and a vessel will be well to windward. These remarks coupled with those for going northward, apply also to sailing vessels when southward of Greig channel, a sailing

With the chart now published the navigator will have more confidence, and may probably find it convenient at times to venture amongst some of the islets, but it must be borne in mind that in those channels the current is invariably stronger and more erratic.

CHAPTER IX.

OUTER ROUTE FROM BANKA STRAIT TO SINGAPORE.

VARIATION, 2° 30' East in 1886.

VESSELS bound from Banka strait to Singapore seldom adopt the Outer route to the eastward of the islands of Linga and Bentán, most vessels preferring to proceed by Rhio strait; it however forms part of the main route into the China sea, and is, therefore, of great importance.*

The COAST of SUMATRA from Batakarang point (page 300) trends about N.N.W. for about 67 miles to Tanjong Bon or Jabung. The entire coast is very low, covered with wood, little known, and fronted by a mud-bank that, within a depth of 5 fathoms, extends about 10 miles off shore. It may be approached to 6 or 5 fathoms water, except off Tanjong Bon, close to which there are in some places from 7 to 8 fathoms. Vessels bound to Varella strait should keep about 8 miles off shore until Tanjong Bon bears West.

TUJU or Seven Islands, lie in the north-east approach to Banka strait, and about 20 miles from the north coast of Banka island. They are high and woody, uninhabited, visible about 25 miles, and with several off-lying reefs. Coasters occasionally visit the islands for the purpose of obtaining wood and water; the water, which is bad and scarce, is procured on the west side of Katjangan, where there are a few wells.

Pulo Ju, or Joe, the southernmost of the islands, is very small, but rises to a height of 270 feet. Pulo Sato, the most western of the islands, is also small, 105 feet high, and lies about 4 miles north-west from Pulo Ju. Between these, are Meranti island, 112 feet high, and Lalang; and midway between Sato and Meranti there is a reef, with a depth of 20 feet, and 11 to 14 fathoms around it. The three southern islets have fringing reefs. Pulo Jebia, the largest island of the southern group, is about one mile in extent, 373 feet high, and surrounded by a reef which projects a little more than a mile from its east extreme.

Pulo Katjangan or Tuju, the north-easternmost and largest of the Seven islands, is $3\frac{1}{2}$ miles long by half a mile broad, and rises to several peaks,

* See Admiralty charts:—Banka strait to Singapore, No. 2,757; scale $m = 0.15$ of an inch; and Linga and Sinkep channels, No. 1,789; $m = 0.20$ of an inch.

the highest of which is 526 feet above the level of the sea. It is surrounded by a reef, on which are some rocks above water, especially off its south-east end. About $2\frac{3}{4}$ miles W.N.W. from its north-west extreme, is Pulo Tukonkembang, a small islet, 120 feet high, surrounded by a reef. About one mile W.N.W. from Pulo Tukonkembang, is North-west rock, above water, with a small fringing reef.

DOCAN ISLAND (Menalee), 300 feet high, lies about 24 miles N.E. by E. of the Tuju group; it is about three-quarters of a mile in extent, surrounded by a reef, and a small islet with some rocks project nearly one mile from its north-eastern extreme. The summit of this island makes like a peak when seen from the northward, but appears round from the eastward.

Mary rock.—Three reefs extend in a S. by E. direction from the south point of Docan. Mary rock, the outer one, has a depth of 6 feet and is distant $1\frac{1}{2}$ miles; the middle rock has 10 feet, and the inner one 5 feet, distant about three-quarters of a mile from the point. The depths around them are 12 to 18 fathoms.

The channel between Tuju islands and Pulo Docan has regular depths of 12 to 16 fathoms.

TOTY ISLAND or Pulo Laut, 250 feet high, lies 8 miles N.E. by E. $\frac{1}{2}$ E. from Docan island. It is small, and surrounded by a reef, which on the north-west side projects half a mile. The summit of this island when seen from the northward appears round, but sharp from the eastward.

The passage between Toty and Docan appears to be free from danger, and the depths in it are from 12 to 18 fathoms.

Directions.—When passing between Banka and the Tuju islands, the latter should not be approached to less than 13 fathoms water, nor Banka nearer than 5 miles, for its dangers are all about 3 miles in the offing, and nearly awash. Near the Malan Hyū and Malan Doyang rocks the bottom is rocky, and the depths irregular.

Vessels keeping to the southward of Toty and Docan islands, in order to cross over to Borneo, must take care to avoid Mary rock lying S.S.E. 2 miles from Docan island, and also Vega and other shoals, described at page 363.

Between the north coast of Banka and Tuju, Docan, and Toty islands the general depths are from 14 to 16 fathoms, but more to the eastward they increase to 18 or 20 fathoms.

Currents.—From October to March, during the north-west monsoon, the currents run with force to the south-east, and during the other months to the north-west. It has, however, occurred that vessels going to Banka in June and July have experienced strong southerly currents.

PULO TAYA,* situated about 35 miles north-westward of Tnju islands, is of granite formation, covered with wood, uninhabited, and rises to a double peak 630 feet above the sea; the northern peak is about 60 feet less in elevation than the southern one, and both peaks when in line on a N. by E. and S. by W. bearing, show as a single triangular peak. Two sandy bays are formed in the bight between the hills, and there are two small islets off its north-east side. The whole shore of the island is steep-to, and may be approached to a distance of 3 cables.

Water.—There is a spring of excellent water on the western side of Taya, and a boat at high tide can approach it to within 40 feet, but at low tide rocks extend nearly a cable from the sand. The knowledge of this is important to the mariner, as no similar facility for watering occurs between Banka and Rhio strait. In the fine season boats come here from Linga seeking turtle.

Castor bank is a long ridge of coral and sand, about one mile wide, extending 13 miles in a N.E. by N. direction from Pulo Taya. The general depths on it are 8 to 10 fathoms, but on one part, N.E. 10 miles from Pulo Taya, there is a ridge about one mile in extent, and its eastern side steep-to, with only 5 fathoms. The bank is famous for a red species of fish, called from their colour Ikan Merah.

Pulo Taya bearing S.W. $\frac{1}{2}$ W., will lead one mile eastward of the shoal parts of Castor bank, and bearing S.W. by S. the same distance to the westward. Diang or Eung, the east point of Linga (which, with Gubang point to the westward of it, appears at a distance like two islands), bearing N.N.W., will lead about 4 miles north-eastward of Castor bank.

Alang Kalem or Ilchester Bank is about $2\frac{1}{2}$ miles in length, $1\frac{1}{2}$ miles in breadth within a depth of 3 fathoms, and steep-to, with a least depth of one fathom on two shoal heads, towards the centre. From these Pulo Taya bears S. $\frac{1}{2}$ W., and Pulo Meralie off the east point of Linga, N. by E., distant 9 to 10 miles.

To pass eastward of this danger, Pulo Meralie must not be brought to the eastward of North, nor Pulo Taya to the southward of S. by W.

SINKEP ISLAND, Pulo Punubo, and two islands to the westward, appear from a distance like one large island, being separated only by narrow channels. They lie off the south-western part of Linga, and, together with some adjoining islets and shoal spots, cover a space from 20 to 24 miles. Sinkep, the largest island of the group, is of

* The information relating to Pulo Taya, Castor bank, and Linga island, together with Frederick reef and the whole of the islands and dangers off the east coast of Bintang, has been derived principally from the result of the surveys by Mr. Stanton, Master commanding H.M. surveying vessel *Saracen*, in 1860-61.

irregular shape, and of considerable elevation, having on its eastern side a range of hills with a peak 1,440 feet high near the centre of the range. It is only the east and north-east coasts of Sinkep and the dangers off it which will be noticed here; the other portions of the group belong to the Inner route, by Varella and Durian straits, and are described at page 438.

Dangers.—At $3\frac{3}{4}$ miles E. by S. from the south-east point of Sinkep is the south end of a shoal, which from thence extends N.N.E. for 5 miles with a breadth of $1\frac{1}{2}$ miles. At each end is a patch of about 2 fathoms, with depths of $4\frac{1}{2}$ and 5 fathoms between. Cape Buku (the south point of Sinkep) bearing West, leads one mile southward of this danger; and the eastern point of the island bearing North leads about the same distance eastward.

Rocks and shoal water extend nearly a mile from the east point of Sinkep, and the *Saracen's* soundings show a bank, with less than 5 fathoms, projecting 4 miles in a north-easterly direction from it. As no soundings have been taken near the north-east coast of Sinkep, it should be approached with caution. There are some rocks awash off the east sides of the small islets lying between the north-east point of Sinkep and Punubo.

LINGA ISLAND, lying about midway between Banka and Singapore strait, is about 33 miles in extent, in a W.N.W. and E.S.E. direction, but excepting at the southern part where the town and road are situated the island is very little known and has never been surveyed. Upon its southern part is a remarkable mountain, the peak of which, rising to an elevation of 3,920 feet, is split in two, forming a sort of double peak, which Horsburgh describes as “two peaks rising like spires from the summit of the mountain,” but which is more generally thought to resemble asses ears, visible many miles in all directions.

The east extreme of Linga, named by the natives Tanjong Eung, from its prominent position and pyramidal peak, 750 feet high, is conspicuous, and visible in clear weather 30 miles off. Tanjong Ru may be known by a saddle hill, 630 feet high, near it. These points make like islands when above 13 miles distant.

Islets.—Rocks.—Pulo Meralie is an islet lying three-quarters of a mile south-eastward of the hill on Eung point. Pulo Kaka, a larger islet lying about half a mile off shore in a south direction from the same hill, is surrounded by a reef which extends one mile off its south-west point. Between Eung point and Tanjong Ru the coast forms a deep bight named Tolo bay, on the east side of entrance to which is the small islet Diarom, with some rocks awash around about it. Pulo Singasa, a small islet, lying a little more than one mile to the southward of Tanjong Ru, is surrounded

by a reef, and a rock awash lies a mile off its south end; depths of 4 and 5 fathoms extend about one mile southward and south-westward of it. At $4\frac{1}{4}$ miles W. by S. of Pulo Singa is De Hes rock, with 6 feet water, 12 fathoms around it, and nearly 2 miles off shore. The south extreme of Pulo Kaka open southward of Pulo Singa leads southward of it, and Linga peak N.W. by W. leads westward.

LINGA ROAD.—The bay forming Linga road is exposed to southerly and easterly winds, and large vessels are obliged to lie far out on account of shoal water extending from the mouth of the river, and around Pulo Colombo and its adjoining islets.

Islets.—Reefs.—Pulo Colombo, the largest of these islets, lies nearly 2 miles southward from the entrance of the river. Anlo and Ballang islets are both small, the former lying about a mile S.E., and the latter the same distance E. by S. from Colombo. About 2 miles westward of Colombo is another small islet named Pulo Badas, which is almost connected by reefs to Pulo Mapar, a larger islet about a mile to the northward, with a grove of cocoa-nut trees; a village abreast contains about 300 Malays and Chinese, chiefly fishermen.

The following are the outermost of the dangers extending from the islets:—A shoal with 2 feet water lies with Pulo Badas, distant $1\frac{1}{3}$ miles, and in line with Pulo Mapar. Another shoal extends 2 miles S.S.E. from Pulo Anlo, having $1\frac{1}{2}$ fathoms on its extreme; Ponubo peak, bearing W. $\frac{1}{2}$ N. leads half a mile southward of it, and nearly one mile southward of the 2-foot shoal off Pulo Badas.

Linga.—The town of Linga or Dyak is prettily situated on the banks, and nearly a mile within the entrance of the fresh-water river. The high rugged, fantastic peak of Linga in the background, together with the rakish appearance of the country boats all moored to cocoa-nut trees and areca palms, their rich foilage almost obscuring the houses, give to the whole a picturesque appearance. The river is not more than 100 feet wide, and will only admit small vessels, as its bar dries at low water springs. Both sides near the entrance are densely wooded, and alligators are numerous.

The town (in 1860) numbered about 4,000 Malays and 1,500 Chinese. The former prefer their usual style of houses constructed on poles, but some of the Chinese have substantial buildings of stone. The produce is rattans, pepper, and gambier, which is carried to Singapore and Rhio principally by native craft. Gold is found in small quantities after heavy rains. Tin has not yet been found, but the neighbouring island of Sinkep produces some. The Sultan is nominally under Dutch protection and the resident of Rhio pays him an annual visit.

Water.—The *Saracen* obtained good water, but with difficulty, from a well in the interior of Pulo Mapar. It was at first procured from a well near the village, but the natives, from religious scruples, objected to its use. The shore is bordered by a reef, which makes watering difficult except from half flood to half-ebb.

Anchorage.—H.M.S. *Saracen* anchored in Linga road in 4 fathoms, mud, Pulo Badas bearing N.N.E. about one mile, and Ponubo peak W. $\frac{1}{2}$ S. There appears to be good anchorage eastward of the islets, in about 7 fathoms, and 4 miles off shore, with Linga peak just eastward of Colombo, N.W. $\frac{3}{4}$ W., and the peak of Sinkep S.W. by W.

Tides.—It is high water, full and change, in Linga road at 7 p.m., and the rise is 7 feet. The flood runs to the westward at the rate of 2 miles an hour.

Directions.—A vessel proceeding towards Linga road from Banka strait should pass westward of Pulo Taya, and steer for the high land to the eastward of Linga peak, giving the eastern coast of Sinkep a berth of at least 5 or 6 miles. In working, by not bringing the east point of Sinkep to the eastward of North, will avoid the shoal off the east side of that island; and by not bringing the south-east point of the island to the southward of S.W. until Linga peak bears N.W. by N., will avoid the shoal bank which extends 4 miles in a north-easterly direction from the east point of Sinkep. When standing towards the south coast of Linga care must be taken to avoid De Hes rock, which is steep-to, by keeping the south extreme of Pulo Kaka open of Pulo Singa, or Linga peak northward of N.W. by W.

Bound to Linga road from the north-eastward, round the east point of Linga island at a moderate distance, and then steer to the westward for the anchorage.

The NORTH-EAST COAST of LINGA is formed of numerous hillocks, from 200 to 300 feet high, which give it a uniform appearance; but neither it nor the adjacent islets are safe to approach at night, being as yet but imperfectly surveyed. The soundings obtained by the *Saracen* in this locality were confined to those above a depth of 10 fathoms, as vessels can gain no advantage by keeping close in shore.

ISLETS AND REEFS.—**East Domino or Selengtang**, is an islet about 80 feet high, lying about 8 miles northward of Diang, the east point of Linga. A reef extending about a mile north and south of the islet, and a rock awash is said to exist about $2\frac{1}{2}$ miles south of it. The depths close eastward of the islet are 14 fathoms, increasing to 16 and 17 fathoms at the distance of 3 or 4 miles.

Domino Hill, or Budiang island, is about 2 miles in extent, and a peaked hill near its centre bears W. by S. $\frac{1}{2}$ S. 4 miles from East Domino.

Great Domino or Kongka Island lies about $3\frac{1}{2}$ miles north-west of Domino hill island; it is moderately elevated and appears about 4 miles in length. Off its south-east point are two islets named Maras, and off its north-west point are two others, named Sarus or Blaiding.

Crocodile rock, about 15 feet high, lies N.E. $\frac{3}{4}$ N. 4 miles from a conspicuous conical hill on Great Domino.

Brisbane shoal, on which the English barque *Brisbane* struck in 1876, lies N.W. by W. $\frac{3}{4}$ W. $2\frac{1}{2}$ miles from Crocodile rock; it is composed of coarse sand, about one mile in extent, with 2 fathoms water, 6 to 7 fathoms close around, and depths of 6 to 8 fathoms between it and Crocodile rock.

A coral reef about three-quarters of a mile long, 70 yards broad, and awash at low water, is said to lie about 2 miles W. by S. from Crocodile rock; between this reef and Great Domino island, there is a channel 2 miles wide with 7 to 11 fathoms water.

Kintar Island.—Three other islands with one or two adjacent islets extend from 4 to 8 miles in a north-westerly direction from Great Domino. The large island next northward of Great Domino, named Kintar, has on its southern end a high bluff, and when coming from the northward, before the adjacent islands to the southward are visible, it much resembles the hill on the east end of Linga.*

A rock with 3 feet water lies N.W., distant 2 miles from Pulo Kapas, a small islet surrounded by a reef, and the north-westernmost of the group extending from Kintar.

Fly bank, the position of which is doubtful, is a small patch of 2 fathoms, with 9 to 13 fathoms close-to, said to lie N.N.W. $\frac{3}{4}$ W. $10\frac{1}{2}$ miles from Crocodile rock, with the high bluff of Kintar bearing South, distant $7\frac{3}{4}$ miles, and Pulo Kapas S.W. by W. $\frac{1}{2}$ W. $5\frac{1}{2}$ miles.

Pollux rock, a patch of 2 fathoms, with 10 and 11 fathoms close-to, lies N.W. about 4 miles from Fly bank, with the high bluff of Kintar bearing S. by E. $\frac{1}{2}$ E. 11 miles.

RODONG PEAK.—From 20 to 30 miles northward of Linga island are many small islands. The most conspicuous of them is Pulo Rodong, or Merodong, which has a high conical peak, about 800 feet above the sea, the only hill of this feature in the vicinity. This peak is one of the principal objects which will enable a stranger to make out the entrance to

* Lieutenant C. J. Bullock, R.N.

Rhio strait; it may, however, occasionally be useful to vessels working to or from Singapore by the Outer route.

FREDERICK REEF is the outermost of the reefs lying off the south-east coast of Pulo Bentán. It is nearly 3 cables in diameter with two heads near the centre awash at low water. The depths around are from 20 to 22 fathoms, except at the north-east side, where irregular soundings from 10 to 13 fathoms extend half a mile off. From the centre of the reef, Pulo Ruig or Ragged island bears N.W. $\frac{1}{4}$ N. $23\frac{1}{4}$ miles, and Pulo Borean W. by N. $\frac{3}{4}$ N., 24 miles.

In light winds the reef may be distinguished by the discolouration of the water; in fresh breezes it is difficult to distinguish breakers from the swell, except when the tide is setting against the wind with a comparatively smooth sea. Off Bentán island at the change of the monsoon in April, the flood tide runs for 18 hours, and the ebb 6 hours. In June the tides are reversed, consequently a tide against the wind will only take place a few hours each day.

From the close examination made by Mr. Stanton in H.M.S. *Saracen*, he was led to believe that the other reefs which were said to exist near Frederick reef, are identical with it, and that there are no other dangers in its vicinity.

Clearing marks.—As this dangerous reef lies in the direct track of vessels, the utmost care is necessary to avoid it. A vessel will keep eastward of it by not going into less than 25 fathoms, and to the westward by keeping Gin peak (a conspicuous hill, 337 feet high), Kwas hill (857 feet high on Bentán), and Pulo Borean well in sight, until the latter bears W. by N. which leads well northward of the reef. The high peak of Linga island S.S.W. $\frac{1}{2}$ W., or Pulo Ruig bearing N.W. by N., will also lead westward of it.

Sand bank.—At about 11 miles N.W. by W. $\frac{1}{2}$ W. of Frederick reef, is the termination of a narrow sand bank with depths of 7 to 10 fathoms, and steep to on its eastern side. From this extreme, the bank trends in a south-west and west direction for about 30 miles, where it joins the 13-fathoms bank fronting Pollux rock, and Missana island, entrance to Rodong strait. In the N.E. monsoon much rain and thick weather are experienced, and soundings on this bank afford a good guide to clear these reefs, and will save anchoring in deep water.

EAST COAST of PULO BENTÁN.—Numerous islands and dangers lie off the southern part of the east coast of Bentán, among which no vessel should venture. Vessels making passages between Banka and Singapore straits should pass outside or to the eastward of the whole of these islands and dangers, and it is therefore only necessary here to notice

the outermost of them. The whole coast, of which little is known, and the islands off it are as a rule fringed with coral.

ISLANDS AND REEFS.—**Pulo Gin or Great Island**, is the name given to three islands, which are together about 4 or 5 miles in extent, lying about 6 miles south-eastward of the south-east extreme of Bentán, and separated from each other by narrow channels. Several hills on the islands are from 200 to 300 feet high, and one, named Gin peak, rising about the centre of the south-eastern island, is 337 feet.

Pulo Terobi, the most southern of a cluster of islets, lying to the eastward of Pulo Gin, is 112 feet high, and bears E. by S. $2\frac{1}{2}$ miles from the south-east extreme of that island.

Pulo Borean or Saddle Island, is the northern of these islets, and bears from Pulo Terobi, N. by E. $\frac{1}{2}$ E. 5 miles. Being 308 feet high, and saddle-shaped, it is conspicuous and easily recognised.

Geldria bank is the outermost of a dangerous groups of shoals lying 13 or 14 miles eastward of Pulo Gin, well out in the fairway of vessels proceeding between Banka and Singapore straits, especially such as pass inside Frederick reef. Its north extreme lies E. by N. $\frac{1}{2}$ N. distant 15 miles from Gin peak, whence it extends in a south-west direction about $2\frac{1}{2}$ miles, having 2 to 4 fathoms water, 19 to 20 fathoms close to the eastern side, and 8 to 12 fathoms, irregular depths, near the south-west and west sides.

Raleigh shoal lies W. by S. $\frac{1}{2}$ S. distant 3 miles from the south-west extreme of the Geldria. It has 2 fathoms water over a coral bottom, from which Pulo Borean bears W. by N. 5 miles. Several patches of 4 fathoms lie northward and southward of it.

A shoal patch, of coral and sand, nearly one mile in length and half a mile in breadth, with 2 fathoms water, lies 3 miles south-westward of Raleigh shoal, with the centre of Pulo Borean bearing N.W. $\frac{1}{4}$ N. distant $4\frac{1}{2}$ miles.

The neighbourhood of these patches should be avoided by vessels of heavy draught.

Boat rocks (Kaju Ara), lying about $2\frac{1}{2}$ miles north-west from the north end of Geldria bank are three low rocks, visible about 4 miles. A rocky patch, with 3 fathoms water, lies about midway between Geldria bank and Boat rocks.

Pulo Ruig or Ragged Island, appropriately named from the irregular appearance of the trees on its summit, is the outer and easternmost island off the east coast of Bentán. It is 115 feet high, about the same size as Pulo Borean, and is steep-to at 3 cables off.

A coral bank, with depths of 3 to 5 fathoms, and about one mile in extent, lies S.W. by W. $\frac{1}{2}$ W., $5\frac{1}{4}$ miles from Pulo Ruig. Pulo Borean, or Saddle island, bearing S.S.W., leads eastward of it.

Clearing marks.—Pulo Terobi, bearing West, leads southward of Geldria bank and other shoals; and Boat rocks in line with Pulo Borean, or Pulo Ruig N.N.W. $\frac{1}{2}$ W., leads north-eastward of them.

PULO PANJANG, an irregular-shaped island, from 3 to 4 miles in extent, lies about 8 miles off the east coast of Pulo Bentán. Rocks extend about one mile off its north-east point; and there are others, some above water, off its south-east point, the outer ones of which, named Bare rocks, are 55 feet high.

Anchorage.—On the east side of the island the coral reef,—which as a rule fringes all the islands contiguous to the east coast of Bentán, as well as that coast itself,—is absent, leaving a small sandy bay, where vessels may anchor in 8 or 9 fathoms, about three-quarters of a mile off shore. As the bottom in parts of this bay is foul, care must be taken to keep the two Bare rocks open eastward of Tree islet (58 feet high with a single tree on it), forming the southern extreme of the bay.

Water and Wood may be procured in this bay, and boats can approach close to the beach at all hours of the tide.

Passage rock, 26 feet high, lies about three-quarters of a mile northward of the north-east point of Panjang.

Pulo Suto, with Middle rock, Black rock, and Pulo Blanhap, lying north and north-west of Pulo Panjang, form a sort of chain stretching from outside the dangers off the north coast of that island to the shore of Bentán, and to the southward of which no vessel should attempt to pass.

Pulo Suto, or Volcanic island, 140 feet high, lies N.W. by N., distant 2 miles from the north-east point of Pulo Panjang. It is steep to on the north side, but a reef extends half a mile from its south extreme.

Middle rock is a dangerous pinnacle, awash at low water, and 11 fathoms close to, lying N.N.W. $2\frac{1}{2}$ miles from the north-west point of Pulo Panjang, and nearly 4 miles from Pulo Suto. Black rock bearing W. by N., or Pulo Suto S.E. by E. leads northward of it.

Black rock, 22 feet high, with a smaller rock close to its south side, lies N.W. by W. $\frac{3}{4}$ W., distant $2\frac{3}{4}$ miles from Middle rock. Near the rock the soundings are from 13 to 17 fathoms.

Pulo Blanhap is a small island 90 feet high, lying W. by N., distant 5 miles from Black rock, and nearly 2 miles from Tanjong Blanhap, on the north-east coast of Bentán.

COAST.—Landmarks.—From Tanjong Blanhap to Tanjong Brakit, 8 miles north-westward, the north-east coast of Bentán forms a bay

about 2 miles deep, indented with several small bights or coves. Over the point at about one mile north-west of Tanjong Blanhap is a conspicuous tree, the top of which is 252 feet above the sea; 2 miles W.N.W. of the tree is a hill, 420 feet high. Three-quarters of a mile northward of this hill, close to the coast line on the deepest part of the large bay, is another, named Double Tree hill, 334 feet high.

The shore of this part of Bentán is for the most part fronted by a reef which projects in some places to the distance of half a mile, and just to the northward of the point, upon which stands the conspicuous tree, is an extensive bed of rocks, between which and the point north-westward of it, is Boat cove, apparently a convenient place for landing.

Water.—Several small streams of fresh water discharge themselves near the middle of this bay, but the watering place appears to be about one mile northward of Boat cove.

Soundings.—From Black rock, which is steep-to, to Pulo Kuku (Coco), a small island lying close to the eastern face of Tanjong Brakit, and which may be approached to half a mile, the soundings shoal gradually, and the lead is a good guide. (For coast to the westward *see* page 130.)

Tides.—It is high water, full and change, at Tanjong Brakit, the north-east point of Bentán, at 11h. 0p.m.; at Pulo Suto at 3h. 40m.; at Pulo Panjang at 4 h. 20 m.; at Pulo Borean at 6 h. 0 m.; and at Pulo Terobi at 1 h. 0 m.;* the rise is 9 feet, but on extraordinary occasions it is 12 feet.

During the shifting months of the monsoons the tidal streams are regular, but during their strength the surface current will be always more or less governed by the wind.

The flood tidal wave comes from the northward, and runs nearly parallel to the east coast of Bentán, along its southern side towards Abang strait, and to the northward in Rhio strait, meeting another tide from Singapore strait near the town of Rhio.

The flood sets to the southward along the east coast of Linga, and close to Tanjong Eung, its south-eastern extreme; from thence it runs West to Ponubo strait and obliquely across Linga bay to Varella strait. From Tanjong Eung to Pulo Taya, and onwards to Banka strait, its direction is nearly South; another stream from about 2 miles south of Taya sets towards Varella strait.

The ebb stream sets in the opposite direction, and the meeting of this stream from Banka and Varella strait was observed to take place between Pulo Taya and Tuju islands.

Winds.—During the shifting months of the south-east monsoon sailing vessels are often five and six weeks in making the passage from

* Probably the south-east monsoon period.

Singapore to Banka strait. In the month of September the *Saracen* had the south-east monsoon strong, with much rain; about the equinox there were several heavy squalls. This monsoon is generally supposed to shift about the beginning of October, but during the whole of this month the wind was only 4 hours from the northward, there being a succession of calms, light southerly airs, a close muggy atmosphere surcharged with electricity, and frequent heavy Sumatra squalls or south-westers. On the 9th of November the monsoon shifted with furious gusts.

These squalls at this season generally take place at night, accompanied with heavy rain, thunder, and lightning, and are of short duration.

DIRECTIONS by the Outer Route from Banka Strait to Singapore.—The ordinary route for sailing vessels bound northward from Banka strait is between the Tuju islands and Pulo Taya; they may, however, pass on either side of Pulo Taya, which, being high and bold, is very convenient to make in thick weather or at night.

At night, or in thick weather, the lead will be very useful in detecting the drift caused by cross currents between the Tuju islands and Sumatra, for the depth decreases generally towards Sumatra, and increases towards those islands; but care should be taken in approaching them, as the remarkable irregularities of the currents have brought many vessels into the danger of being entangled among them. Near Sumatra a mud bottom mixed with sand prevails, and near the islands mud only.

The *Castor* bank, lying north-eastward of Pulo Taya, has not less than 5 fathoms water, but a vessel will pass eastward of it by keeping Pulo Taya westward of S.W. $\frac{1}{2}$ W., and will pass westward, between it and Ilchester bank, by keeping Pulo Taya between the bearings of S.S.W. $\frac{1}{2}$ W. and S. by W., until Pulo Meralie bears westward of North. By keeping the east point of Linga (which, with a point to the westward of it, appears at a distance like two islands) bearing N.N.W. will lead from 3 to 4 miles north-eastward of *Castor* bank and *Ilchester* shoal.

Having passed eastward of Pulo Taya, a course may be steered to cross the equator in 20 or 21 fathoms, or in about long. $105^{\circ} 30'$ E. From the equator steer about North until past the *Frederick* and *Geldria* shoals, observing in the night not to come under 23 or 24 fathoms between lat. $0^{\circ} 30'$ and $0^{\circ} 50'$ N. to avoid those dangers; if it be day when Pulo Ruig or Ragged island is seen, keep it westward of N.W., and it will lead eastward of these shoals. When abreast of Pulo Panjang, and in soundings of 24 or 25 fathoms water, a N.W. or N.W. by W. course, according to tide, will lead to the entrance of Singapore strait. (See Chapter II.)

CHAPTER X.

RHIO STRAIT.

 VARIATION 2° 30' East in 1886.

GENERAL DESCRIPTION.—The route from Banka strait to Singapore, eastward of Linga and through Rhio strait, is the one now commonly adopted by vessels proceeding either way between Sunda strait and Singapore, for the reasons stated at page 221, that Rhio strait is safe, sheltered, and easily navigable, the Dutch Government having placed beacons on many of the dangers; whereas the route eastward of Bentán is exposed in both monsoons, and the fairway is encumbered with many rocks and shoals, which render it necessary for vessels to keep at a long distance from the land.*

This route is particularly convenient for sailing vessels leaving Singapore for Europe in the north-east monsoon, and but few now adopt any other. By proceeding through Rhio strait they avoid the delay and inconvenience so frequently experienced during that season in getting to sea by the main channel of Singapore strait, eastward of Horsburgh lighthouse. In the south-west monsoon also, vessels are frequently able to proceed to the southward much quicker by this route than by the outer one.

Rhio strait, the southern limit of which is between Missana and Talang islands, is bounded on the east by Bentán island, and on the west by the chain of islands of which Battam, Rempang, and Galang are the chief; numerous smaller islands and shoals front the main shores on each side of the strait, and very much contract the width of its main navigable channel. The strait is about 50 miles in length, in a north-west and south-east direction, having depths ranging from 6 to 30 fathoms in the fairway.

The southern entrance of the strait is about 15 miles wide, for a distance of 11 or 12 miles; it then contracts to about 9 miles between Pulo Siolon and Great Garras island. About the middle of the strait, and 3 miles

* See Admiralty Charts:—Banka strait to Singapore, No. 2,757, scale $m = 0.15$ of an inch; Singapore strait, No. 2,403, scale $m = 0.66$ of an inch; and Rhio strait, No. 2,413, scale $m = 0.65$ of an inch.

northward of Garras island, is Pankel island, surrounded by a reef extending in some places half a mile off shore, to the westward of which is the principal channel, about 3 miles wide, bounded on the west by the islets and banks off the north-east end of Pulo Galang. The passage eastward of Pankel has several reefs and islets, which render its navigation more difficult; the principal dangers are buoyed or beacons, but they are liable to break adrift.

At Pulo Loban, about 10 miles northward of Pankel, the strait is reduced to about $2\frac{1}{2}$ miles in width, and is further reduced to 2 miles abreast West point, 5 miles north of Pulo Loban; this is the narrowest part of Rhio strait.

Northward of West point, the western extreme of Bentán, the strait rapidly widens to its northern entrance, where it is about 10 miles in breadth.

WEST SIDE OF RHIO STRAIT.

ISLETS AND REEFS.—**Missana Island**, at the southern entrance of the strait, is peculiar in shape, consisting of two narrow ranges of moderately elevated hills, which lying in different directions from an elbow on the north-west part of the island; the longer range extends from the south point of the island 4 miles in a northerly direction, whence the shorter trends 2 miles eastward.

The shore reef extends in places to the distance of half a mile from the north shore of Missana, and an isolated patch of 2 fathoms, lies 6 cables off, making it dangerous to approach that shore nearer than one mile. A cluster of rocks above water lies 2 or 3 cables westward of Observation point, the north-west point of the island, westward and south-westward of which other dangers extend more than half a mile. On the east side of Missana, the shore reef extends off nearly three-quarters of a mile, and embraces the small wooded islet off the east point.

Niamok, a small square shaped island, with a reef projecting one mile in a north-easterly direction from it, lies one mile south-eastward of Missana, and between them are several rocky islets, and reefs which block the channel.

Anchorage.—The bay on the east side of Missana appears to afford good anchorage in from $5\frac{1}{2}$ to 8 fathoms, by not bringing the eastern part of the small islet off Missana to the eastward of N.E. $\frac{1}{2}$ E., and the eastern side of Niamok to the eastward of S. by E. $\frac{3}{4}$ E.; the south point of Missana bearing W. by S. leads clear of Niamok reef.

Rodong peak, on the south-east end of Rodong island is 797 feet high, and lies 4 miles westward of Missana. This peak seen from the

southward presents a conical appearance, and being the only hill of this feature in the vicinity is conspicuous. It is one of the principal objects which will enable a stranger to identify the entrance to Rhio strait, for it can nearly at all times be seen over Missana as the strait is approached. The hill, from the peak, forms a shoulder to the north-westward, and gradually slopes in that direction, so that after Missana is passed the conical shape disappears. Missana and Rodong islands form the south side of Rodong strait.

Binan Island, lying 3 miles north-westward from Missana, is 2 miles long, narrow at both ends, and widening to half a mile near the middle. The island is easily recognised by a conspicuous hill, 269 feet high, at the south-east end. A reef fronts the greater part of Binan, extending from a quarter to half a mile off the north and north-west sides.

Rifleman Shoal, situated about a mile off the centre of Binan, is a patch of hard sand three cables in extent, the least water being 2 fathoms; from this spot Binan hill bears S.W. $\frac{1}{4}$ S., and the north-west extreme of the island W. by N.

Katang Linga Island lies $1\frac{1}{2}$ miles north-west from Binan; it is a bold, bluff looking island, 246 feet high, nearly a mile long and half a mile broad; a shore reef fronts the greater part of it, extending off in some places about 2 cables. A shoal, having about 4 feet water, lies three-quarters of a mile W.S.W. from the north point of Katang Linga, but it is quite out of the way of vessels navigating Rhio strait.

Binan and Katang Linga, from the eastern limit of a number of islands, named the Tetampan group (*see* page 444).

Selanga Islands, three in number, are small, but elevated and conspicuous; they lie to the north-westward of the Tetampan group, the northern one bearing from the north end of Katang Linga W. by S. $\frac{1}{4}$ S., distant $3\frac{1}{2}$ miles. Vessels working, should not stand to the southward of a line joining Katang Linga and North Selanga.

Udik is a small island lying N.W. by W. $\frac{1}{2}$ W., $3\frac{3}{4}$ miles from north Selanga, and E. by N. $\frac{1}{4}$ N. from the north end of Pangallap island. Udik and Selanga islands lie out of the direct track of vessels; but vessels working through should not stand to the southward of a line drawn between north Selanga and Udik, in order to avoid a rock awash which lies W. $\frac{1}{4}$ N., distant 2 miles from the former island.

Pulo Rondo or Dumpo, 129 feet high, lies N.W. $\frac{1}{2}$ W. $8\frac{1}{4}$ miles from Katang Linga, and about $1\frac{1}{2}$ miles south-eastward of the south end of Pulo Galang. It is a remarkable little island, showing very round and bold against the adjacent land, and is one of the most useful objects for recognizing the entrance to the strait when coming from the south-

ward. Haai reef, a patch of 2 fathoms, lies a quarter of a mile to the southward of it; and there is a rock above water about 3 cables distant to the north-westward.

Great bank, is situated within the edge of the 5 fathom line fronting the bight lying between the south-east extreme of Pulong Galang and Selatan island. The bank is $1\frac{1}{2}$ miles long, with a least depth of $2\frac{1}{2}$ fathoms. The anchorage in the bay inside the bank was formerly considered good, but reefs extend both from Galang and Selatan, which render it anything but a safe and convenient place for large vessels seeking anchorage.

East bank lies one-third of a mile S.E. $\frac{1}{2}$ E. of Dempo point, the outer point of the islands eastward of Selatan. It is little more than half a mile in extent, with from 3 to 9 feet water, and 8 to 9 fathoms close-to.

Jassens shoal lying between Pulo Tarong (the island close northward of Selatan) and Great Garras island, is about $3\frac{1}{2}$ miles long, and one mile broad, with 4 to 18 feet water; the south-east extreme of the shoal which is nearly in the line between Dempo point and the east end of Great Garras, terminates in a reef which dries at half tide. There is a channel on each side of Jassens shoal, but the northern one is very narrow at the western end, having a general depth of $3\frac{1}{2}$ fathoms, and is only available for small vessels: the southern channel is nowhere less than three-quarters of a mile wide, with depths of 6 to 13 fathoms. Care is necessary, however, when avoiding Jassens shoal, to give a safe berth to a small reef which lies one-third of a mile off the north-east part of Pulo Tarong, and when the west end of Great Garras bears N.E. borrow on that island shore in order to avoid the bank extending one mile from the east side of Pulo Galang, and upon which are some patches of reef; the northernmost of these patches has a small islet upon it, and lies N.W. about $1\frac{1}{4}$ miles from the west end of Great Garras.

LITTLE GARRAS (Karas) ISLAND marks the entrance of the narrow part of Rhio strait: it is but a quarter of a mile long east and west, formed of two small hills, and fringed by a narrow reef.

Dittlof reef, lies about three-quarters of a mile S. by E. from the eastern extreme of Little Garras, and uncovers. A 3-fathom patch which is steep-to, lies about a quarter of a mile South of it; and between Dittlof and Little Garras island there is a patch of 2 fathoms.

LIGHT.—On the south-east hill of Little Garras stands a lighthouse, painted white, from which is exhibited a *fixed* white light, elevated 118 feet above the sea, and visible between the bearings of S.E. by E. through south and west, to N.E. by N., from a distance of 8 miles.

Great Garras (Karas) Island, situated half a mile westward of Little Garras, is 3 miles long, three-quarters of a mile broad, and has a flat

summit. A reef encircles it extending in places a quarter of a mile off. An isolated patch lies about a third of a mile from the north-west point of the island; from this point and extending nearly half way along the north coast of the island is a bank, of 2 to 3 fathoms, projecting nearly a mile from the shore, and for half a mile farther in the same direction the depths are under 5 fathoms; large vessels should, therefore, keep the whole of Little Garras well open of Great Garras.

Tarong point, the north-east extreme of Galang island, lies $2\frac{1}{2}$ miles north-westward from the west end of Great Garras, and has on its northern side a small bay, in which there is a village. A reef fronts the point to a distance of a quarter of a mile.

MUBUT ISLANDS.—At 6 miles north-west from Little Garras, is the larger and higher of the two Mubut islands, easily distinguished by its prominent position off the deep inlets to the westward. It rises to a round peak, with the greatest declivity on the eastern side; whilst the smaller island, or West Mubut, is considerably lower towards its centre. A dangerous reef extends $1\frac{1}{2}$ miles to the southward of Mubut, which will be avoided by keeping the west extreme of Great Garrat westward of S. by W. A reef also extends nearly $1\frac{1}{2}$ miles northward of both islands; the north and east extremes of Sembolang point in line, bearing N.W. $\frac{1}{2}$ W., is a close mark for clearing the eastern side; and the south end of Pankel, bearing E.S.E., leads northward.

Tiun strait, the opening between Pulo Galang and Pulo Rempang is blocked by a sand-bank having general depths of 6 to 12 feet; there are also some dangerous reefs lying from one-third to three-quarters of a mile northward of Tarong point; between these reefs and the Mubut shoals there is a channel, about 3 cables wide, with 4 to 8 fathoms.

Sembolang point, the eastern extreme of Rempang island, is the next prominent object on the western side the main channel; the hill within the point is 252 feet high. The point is fronted by a reef to the distance of about 2 cables, close to which are 5 to 8 fathoms. A detached reef lies 4 cables off the north shore of Pulo Rempang, and S.S.W. of Tiemara bank; the water in the bight westward of it is shallow.

Tiemara bank, lying about $3\frac{1}{2}$ miles north-westward of Sembolang point, and about $1\frac{1}{2}$ miles eastward of Tiemara island, is one mile in extent, with a least depth of $1\frac{1}{2}$ fathoms. A white buoy is moored on the eastern side of this bank, with the north-east point of Tiemara island bearing N.W. by W. $\frac{1}{4}$ W. and east point of Pulo Loban N. by E. $\frac{3}{4}$ E. To avoid the bank, Sembolang point should not be brought eastward of S.E. by S., and if of heavy draught not to the eastward of S.S.E.

Tiemara Island, the southernmost of the chain of islands which front Salat Bulang between Pulo Battam and Pulo Rempang, is 341 feet

high, about $1\frac{1}{2}$ miles long, three-quarters of a mile broad, and surrounded at a short distance by reef: Tiemara island when first seen appears like a bold point projecting from Rempang. Between it and Tiemara bank the depths are $3\frac{1}{4}$ to 7 fathoms. A shallow mud bank, having patches of sand above high water), nearly fills the large bay south-westward of Tiemara island, and extending outside the shore reef fronting Pulo Abu, approaches the eastern extreme of Pulo Kantyil in a northerly direction; off the east end of Abu some rocks lie just inside the edge of the bank. There is a narrow channel between this bank and the Tiemara islands, but only available for boats.

Tiemara Kechil, lying about a mile northward of Tiemara island, is about a third of a mile in extent, and surrounded by a reef which on the east side projects a quarter of a mile; a ridge with rocky patches connects these islands, and a patch of 3 fathoms lies N.E. 4 cables from the north-east point of Tiemara island.

Pulo Kantyil, Ayer Radya, and Antu Islands.—The eastern extreme of Kantyil, a long and somewhat narrow point, is a quarter of a mile west of Tiemara Kechil; Ayer Radya lies close to the north-westward of Kantyil, and is the northernmost of four islands lying between Tiemara island and Bulang strait. Antu is a small round island with an islet off its north-east point, lying close to the north-east shore of Ayer Radya. A reef surrounds both the island and the islet to the distance of one-third of a mile.

Johannes Shoal.—On the edge of the bank, with $2\frac{1}{2}$ to 3 fathoms which fills up the bay between the eastern extreme of Pulo Kantyil and Antu, lies Johannes shoal, a small 2-fathom patch with 7 fathoms close outside. Sembolang point kept open of Tiemara Kechil leads eastward of Johannes shoal, and of the reef extending from Antu.

Innang Reef is a small reef lying on the north side of the entrance to Salat Bulang, nearly three-quarters of a mile from the south-east side of Pulo Innang, with Pulo Antu bearing S. by W. $\frac{3}{4}$ W. distant $1\frac{1}{4}$ miles. Patches of $4\frac{3}{4}$ and 5 fathoms lie about 3 cables south-west and north-east of the reef. Sau lighthouse, bearing N. by W. leads eastward of Innang reef.

Pulo Innang, situated $1\frac{1}{2}$ miles north of Ayer Radya, is about $2\frac{1}{2}$ miles long, and $1\frac{1}{2}$ miles broad; the southern part of this island forms the northern side of the entrance to Bulang strait.

A reef fronts Pulo Innang to the distance of one-third of a mile, and its outer part, abreast the north-east shore of the island, should not be approached too close; this part was formerly marked by a beacon. Sau lighthouse kept westward of N. by W. $\frac{1}{2}$ W. leads clear of it.

PULO SAU is larger than Innang, and lies to the northward of it, the channel between them being about a cable wide. Inside these two islands are several islets, with channels between leading into Salat Bulang. A detached rocky patch lies S.E., a quarter of a mile from Sau lighthouse, from which a tongue of rocks and sand extend about $1\frac{1}{2}$ miles in a southerly direction, forming the north side of the narrow channel between Sau and Innang.

LIGHT.—A lighthouse painted white stands on the east point of Sau island, from which is exhibited at an elevation of 118 feet, a *fixed* white light, visible in clear weather from a distance of 8 miles.

Pulo Innang Kechil is a small island lying on the north-east part of the reef which surrounds Pulo Sau. A shoal with 2 to $2\frac{1}{2}$ fathoms water extends about half a mile N.W. by N. from Innang Kechil, and another shoal, half a mile in extent, with $2\frac{3}{4}$ fathoms, lies a quarter of a mile further off in the same direction.

Van Gogh islet, surrounded by a reef which extends south-westward nearly half a mile, lies half a mile north of Sau island. About half a mile N.N.W. of this islet is a coral reef with less than 6 feet water, the northern edge of which has 3 fathoms, and lies with the north point of Pulo Sau bearing S. by E. $\frac{1}{2}$ E. distant 2 miles.

Clearing mark.—Sau lighthouse in line with or open of the east point of Innang Kechil leads eastward of all these dangers, and Malang Yarong, (an islet, off the eastern shore,) bearing E. by S., leads northward. The depths decrease rather quickly under a depth of 10 fathoms near the dangers just described, and in the event of a vessel standing towards the southernmost of them getting a cast of 10 fathoms or less, she should tack immediately.

Malang Orang reef.—The north-east coast of Battam, from abreast Pulo Sau to Tanjong Nongsa or Burang, the western point of the north entrance to Rhio strait, is fronted by a reef, extending in some places to the distance of three-quarters of a mile. Malang Orang, an isolated reef, half a mile in extent, with 5 to 8 fathoms close-to, lies with Tanjong Malang Orang bearing W.N.W. distant about 7 cables.

A white buoy marks the eastern edge of this reef.

Pan reef, lying in the northern entrance of Rhio strait, is visible at low water, when it appears as a long ridge of black stones; the reef is 6 cables long, and 2 cables broad, with 5 to 7 fathoms close to.

Beacons.—A large screw pile beacon erected on the north-east end of this reef, lies with Tanjong Malang Orang bearing S.W. by W. $\frac{3}{4}$ W., distant $2\frac{1}{2}$ miles. A black buoy in $4\frac{3}{4}$ fathoms lies off the south-west extreme of the reef, with the beacon bearing N.E. $\frac{1}{2}$ N. distant 7 cables.

Channels.—There is a safe passage on either side of Pan reef; that on the west side between the reef and Battam shore, although not so wide as the eastern or main passage is more convenient for anchoring in case of meeting with light baffling winds and contrary tides; the depths being from 6 to 10 fathoms; native pilots seldom use the eastern channel, where the depths are much greater.

Seamen will find no difficulty in proceeding by either channel, aided by the chart. The depths in the eastern channel are too irregular to admit of any useful description here, but the screw pile beacon on the reef will always point out the position of that danger in time to give it a proper berth, even if the buoy moored off the south end should get adrift.

Pas-op, or Little Pan Reef, lying N.W. by W. $\frac{1}{4}$ W., distant $2\frac{1}{4}$ miles from Pan reef beacon, and $1\frac{1}{4}$ miles off shore, is a small oval-shaped coral patch apparently dry at low water, with depths of $3\frac{1}{2}$ to 7 fathoms close around it.

A white buoy marks the north-west extremity of this reef.

Clearing marks.—Sau lighthouse in line with the east extreme of Innang Kechil, bearing S. $\frac{3}{4}$ E., is a good leading mark for passing between Pan and Little Pan reefs; Tanjong Sau in sight also leads eastward of little Pan reef. Sau lighthouse bearing S. $\frac{1}{2}$ W., or Barbukit hill, (on the Malay peninsula,) bearing N. $\frac{1}{4}$ W., leads eastward of Pan reef; and when Pulo Nongsa is open of Tanjong Nongsa, a vessel will be northward of both the Pan reefs, and in Singapore strait.

EAST SIDE OF RHIO STRAIT.

ISLANDS AND REEFS.—**Pulo Talang, or Long Island**, the south-west point of which forms the south-eastern limit of Rhio strait, is irregularly shaped, nearly 5 miles long, north-east and south-west, and about a mile broad. It may be known by a square hillock on its south-end, 350 feet high, which, with a sharper peak westward of it, forms a saddle; the land from this to the western end of the island is nearly of the same elevation.

A reef fringes the west shore of the island to the distance of about 2 cables, with depths of 6 to 7 fathoms close-to.

Pulo Gin, or Great Island (see page 407) lies 2 miles eastward of the northern part of Talang, and is one of the prominent objects marking the south entrance of Rhio strait.

Hendrik Jan rock, is a dangerous pinnacle, with a depth of 2 fathoms, having 9 and 10 fathoms close-to.* It lies S.E. by S. distant

* Originally stated to be nearly awash, but 12 feet was the least water found by Mr. T. H. Tizard, Master of H.M. surveying vessel *Saracen*, in 1866.

8 cables from the south-eastern point of Talang, with the summit of South-west hill in line with the south-west extreme of Talang. A patch of $4\frac{1}{2}$ fathoms lies about 3 cables W. by N. of it.

Caution.—Several other shoal patches were found in the channel between Talang and Gin; but they all, except the Hendrick Jan, lie out of the ordinary track of vessels, and are dangerous only in the event of this channel being mistaken in thick weather for the entrance of Rhio. Vessels should give these islands a berth of 2 miles in passing, and not bring Pulo Terobi eastward of E. by N., until South-west hill comes well open of Talang.

PULO SIOLON, or Mantang Island, about 8 miles long, in an east and west direction, and $1\frac{1}{2}$ miles broad, lies north-westward of Talang, and is separated from it by a channel about $1\frac{1}{2}$ miles wide. On its south-west end is South-west hill, 267 feet high, which makes from the southward as a double-peaked hill, and from the northward with a peaked top. The west side of the island is foul to the distance of about 2 cables.

At $4\frac{1}{2}$ miles eastward of South-west hill is Siolon hill, with a flat table summit, the highest hill on Siolon. It rises abruptly from the northward to an elevation of 507 feet, and terminates to the southward in a bluff point, close to which is Segai islet, which is lower than the adjacent land. Pulo Siolon has a narrow channel running through it, at $4\frac{1}{4}$ miles eastward of South-west hill.

At a distance of 12 miles to the southward, both Siolon and South-west hills, owing to the land between them being low, appear as islands.*

Thomas shoal.—Between South-west and Siolon hills, is a bay about one mile deep, fronted by a fringe of reef and a shoal bank extending out in places nearly three-quarters of a mile; upon this bank lie two or three detached patches of reef. Thomas shoal, a patch 4 cables in extent, with a depth of 2 fathoms, lies W.S.W. nearly one mile from Segai islet.

Anchorage.—There is good anchorage between Thomas shoal and South-west hill, in 6 to 10 fathoms, with shelter from northerly winds; large vessels should not stand into a less depth than 5 fathoms, as the soundings become irregular and shallow.

Siolon Channels.—There are channels on either side of Siolon leading into the China sea, northward of Pulo Gin; but as they are quite out of the ordinary track of vessels they should not be attempted by any one not locally acquainted. The southern channel, between Siolon and Talang, is about $1\frac{1}{2}$ miles wide, with depths varying from 14 to 24 fathoms in mid-channel, and from 5 to 9 fathoms near the shore on either side. Some

* Mr. W. Stanton Master, R.N.

reefs lie at the eastern end of the channel, which render the passage through it somewhat intricate.

The northern channel, between Siolon and the coast of Bentán, has several islands and reefs lying along and extending in places $2\frac{1}{2}$ miles from the Siolon shore. The western of these reefs and islands are named Alligator and Blading reefs, and vessels should not pass eastward of a line drawn from them to Alligator island. Two reefs lie on the northern side of the channel, the outermost of which, Prins reef, is one mile distant from Tanjong Batu Babia. The entrance to the channel is between the eastern reef and Blading island, and is $1\frac{3}{4}$ miles wide, with depths of 4 to 5 fathoms. Eastward of the two reefs and Tanjong Batu Litjing, the shore of Bentán is free from danger, and vessels may anchor at any convenient distance from it, in 12 to 18 fathoms. At the eastern end of the channel are several islands and reefs, which render it, like the channel southward of Siolon, somewhat intricate.

The tides in Siolon channels run with great strength, and there are numerous overfalls.

ALLIGATOR ISLAND, 100 feet high, three-quarters of a mile long, and a quarter of a mile broad, lies 2 miles W.N.W. from S.W. hill.

A rocky patch, nearly awash, lies 2 cables north-east of Alligator island; and another patch, having $1\frac{1}{4}$ fathoms, lies one-third of a mile eastward of the south point.

Alligator Reef, lies one mile N. by W. of Alligator island, and is a quarter of a mile in extent, with depths of 4 and 5 fathoms close-to.

Blading Island, lying $1\frac{1}{4}$ miles northward of Alligator reef, is small and surrounded by a reef which extends in a southerly direction more than a quarter of a mile.

Eastward of Alligator reef and Blading island are several other reefs and islands, lying off the northern shore of Siolon.

Prins Reef, lying 2 miles N. by W. $\frac{1}{2}$ W. from Blading, is about a third of a mile in extent, and forms with that island the western entrance of the channel between Siolon and the coast of Bentán. It lies on the outer edge of the shoal bank which fronts Tanjong Batu Babia, and the shore of Pulo Dompá, and is the outer of the two reefs before mentioned as lying off the Bentán shore; the other, which is about the same size, bears E.S.E. from it, distant one mile; from the latter a shoal bank with $1\frac{1}{2}$ to 3 fathoms water, extends one mile in an easterly direction.

The Topies are a cluster of small round islets and rocks, on coral ledges, lying from 2 to 3 miles westward of Alligator reef. When approached from the southward these islets as they rise above the horizon present very much the appearance of the topies, or hats, in use among the Malays, hence their name. The northern and eastern islands are the

largest of the group, the former (Topic island) is 134 feet, and the latter 118 feet high.

Reefs.—The small coral reef lying half a mile N.N.W. of Topic island is marked by a beacon. A bank half a mile long, with $2\frac{3}{4}$ fathoms water, lies with its outer edge bearing S.E. by S., distant three-quarters of a mile from the eastern Topic.

A narrow bank with 4 to 5 fathoms water extends about $2\frac{1}{2}$ miles in a southerly direction from Topic island, with from $5\frac{1}{2}$ to 6 fathoms on either side of it.

Rotterdam Reef is a rocky patch of $1\frac{1}{2}$ fathoms, lying W. by S. $\frac{1}{4}$ S. 7 cables from Topic island. A white buoy is moored on the north-west side of the reef.

Dutch Shoal, a quarter of a mile in extent with 3 fathoms least water, and 6 or 7 fathoms close to its western side, lies on the east side of the main channel between the Topics and Pulo Pankel, with Little Garras lighthouse bearing S. $\frac{1}{4}$ W., distant $3\frac{1}{2}$ miles, and the south extreme of Pulo Pankel N.W. $\frac{3}{4}$ W. $1\frac{1}{2}$ miles. A black buoy marks the south extreme of the shoal.

Dutch shoal is situated on the western edge of a bank having from 3 to 5 fathoms water; this bank is $4\frac{1}{2}$ miles long in a north-west and south-east direction, and about $1\frac{1}{2}$ miles broad.

Clearing mark.—A good mark to keep clear of the entire western edge of this bank, is the apex of Pulo Loban just open of the west extreme of Pankel. Between the bank and Pankel the depths are 7 to 8 fathoms.

Rupels Reef is about 2 cables in extent, and marked by a beacon. It lies off the north extreme of Dutch shoal bank, and about one mile eastward of Pulo Pankel, with the north extreme of that island bearing N.W. $\frac{1}{4}$ W. distant $1\frac{1}{2}$ miles.

PULO PANKEL, about 2 miles long north and south, and half a mile broad, lies on the eastern side of the main channel of Rhio strait, abreast of Great Garras and Mubut islands; at a distance it makes as two round hills. It is surrounded by a reef which extends from a quarter to half a mile from the shore. Beyond the reef at the north-west part of the island, a bank with less than 3 fathoms water projects to a distance of three-quarters of a mile. Eastward of this bank, and half a mile northward of the island, lies Pankel reef, a patch of rocks about a quarter of a mile in diameter.

Soré Island and Reefs.—Soré island lying E.N.E. distant $1\frac{1}{2}$ miles from the north end of Pankel, is a small, round island, covered with cocoa-nut trees, and surrounded by a reef, from which a bank with 2 to 5 fathoms water extends about $1\frac{1}{2}$ miles in a S.S.E. direction. From the island the shore reef extends half a mile northward, and at $1\frac{1}{4}$ miles

N.N.W. from the island lies a reef, one third of a mile in diameter; in the channel between are 5 to 8 fathoms. About one mile north-west from this detached reef lies the south-east end of the largest of the Soré reefs; it is a narrow strip of sand and coral about $1\frac{1}{4}$ miles long, nearly surrounded by a small bank with 2 or 3 fathoms water, and 5 to 7 fathoms close-to.

Buoys.—A black buoy marks the eastern edge of a 3-fathom patch, lying with Soré island bearing N.W. distant about 7 cables. A beacon marks the south-east extreme of Soré reefs, with Soré island bearing S.S.E. $\frac{1}{2}$ E. distant $2\frac{1}{4}$ miles; and a white buoy lies off the north-west extreme of the reefs in about 5 fathoms, at $1\frac{1}{2}$ miles N.W. of the beacon.

Pulo Domba, is 4 miles long east and west, and $1\frac{3}{4}$ miles broad, and separated from the west coast of Bentán by a narrow channel only available for boats. Its western extreme, **Tanjong Domba**, lies 2 miles north-eastward of Soré island.

The small islands, **Basing** and **Sekatap** lie off the south shore of Domba; these, as also Domba, are bordered by reefs which extend about 3 cables off. Patches of less than 3 fathoms extend one mile south-eastward of Basing island, eastward of which the water is shoal.

From Basing island, a bank with $1\frac{1}{2}$ to 3 fathoms near its edge, and 9 to 13 fathoms at a short distance, extends in a northerly direction, passing about one-third of a mile westward of Domba, and thence to Pulo Pitjingit.

Buoys.—A white buoy marks the edge of the bank between Basing island and Pulo Domba, with **Tanjong Domba** bearing N.E. $\frac{3}{4}$ E., distant half a mile. A beacon marks the west extreme of the reef off **Tanjong Domba**.

A red buoy lies off the edge of the shore bank northward of Pulo Domba, with the west extreme of Pulo Pitjingit bearing N.E. by E. distant one mile.

The navigable channel between Domba and Soré is about one mile wide, and generally used by vessels bound to Rhio from the southward.

RHIO ISLAND is about $4\frac{1}{2}$ miles in length east and west, and $2\frac{1}{4}$ miles wide, and being separated from the mainland of Bentán by a very narrow channel, appears to form part of it. The town, which stands on the north-west points of the island, was formerly a port of much trade; and although its importance has for many years declined, is still a place of considerable traffic for small vessels. There are two landing piers, and a fort stands on a hill 70 feet high, commanding the town.

A Beacon 162 feet above the sea, stands on the coast at about 2 cables northward of **Tanjong Pinang**, about one mile southward of the town of Rhio.

Pakko reef lying about half a mile off the western shore of Rhio island, is about half a mile in extent, with a rock near its centre. There is a narrow channel between the rocky bank and the western shore of Rhio, having $1\frac{1}{2}$ fathoms water.

Pulo Pitjingit, or Mars Island, lies one mile westward of Rhio town. The island is about one mile long, a third of a mile broad, and surrounded by a reef which projects about 2 cables on all sides.

Pulo Sengarang is nearly twice the size of Rhio island, lying to the northward, and separated from it by a channel about 3 cables broad. The western extreme of this island projects some 3 miles to the north-westward of Rhio, affording shelter to small craft anchored off the town. There is a large Chinese village on the southern part of Sengarang, opposite to the town of Rhio.

Loz, or Lús, is a small island lying close to the west end of Sengarang.

Anchorage.—The usual anchorage off Rhio is in 3 to 4 fathoms, about 2 miles northward of Pulo Dompá, near the red buoy.

The depths decrease gradually to 4 and $3\frac{1}{2}$ fathoms, but shoal suddenly under a depth of 3 fathoms.

Most of the native craft anchor between Pitjingit island and the town, entering by the narrow channel between Pakko reef and the west shore of Rhio, for the entrance from the westward is barred by a flat with 3 to 6 feet water.

Tides.—It is high water, full and change, at Rhio, at 9h. 50m.; springs rise 7 feet, neaps, 5 feet.*

TERKOLEI ISLAND, lying 6 miles westward of the town of Rhio, is low, flat, about half a mile in extent, with a clump of trees on its east end, and surrounded by a reef which in places extends nearly half a mile. It stands near the middle of a shallow bank with from 3 feet to 3 fathoms water, composed of hard sand and mud, and 8 miles long in an E.S.E. and W.N.W. direction, its eastern part extending to within half a mile of the reef surrounding Pitjingit. Its western part extends to within half a mile of Pulo Loban, with several patches of 3 feet.

Buoy.—A black buoy lies in 3 fathoms on the southern edge of the shoal bank, with the east point of Terkolei bearing N.N.W., distant one mile.

Clearing mark.—The south extreme of Pitjingit bearing East clears the south-east tail of the bank, and the summit of Pulo Loban bearing N. W. by W. $\frac{3}{4}$ W. will lead southward of the whole of Terkolei bank.

* Directions for approaching Rhio are given at page 434.

LIGHT.—On the west end of Terkolei stands a white lighthouse, from which is exhibited at an elevation of 31 feet a *fixed* white light visible in clear weather from a distance of 6 to 8 miles.

PULO LOBAN, lying about half a mile off the south-west part of Bentán, is a group of four or five small islands of about 2 miles in extent, separated by channels so narrow that they appear as one island. The two peaks on the large island attain a height of 342 and 268 feet, and with Pulo Loban Kechil the western islet, make from the northward as three peaks.

A reef which is steep-to, surrounds the group, and extends in places to the distance of one-third of a mile. A small detached patch lies 2 cables south of the south-west point of Pulo Loban, and a patch of 2 fathoms lies half a mile westward of the north point of Loban.

Isabella Shoal situated three-quarters of a mile southward of Loban, is 7 cables long, east and west, 2 cables broad, and has from one to 2 fathoms water. A spit with $3\frac{1}{2}$ to 4 fathoms water stretches from its eastern extreme nearly one mile in an E.S.E. direction. The depths at a short distance from the south side of the bank are from 6 to 10 fathoms, but its western edge is steep, there being 11 fathoms close-to.

Buoys.—Black buoys in about 3 fathoms, and about 8 cables apart, mark the east and west extremes of Isabella shoal. The western buoy lies with Pulo Loban east peak bearing N. by W., distant $1\frac{3}{4}$ miles; and Terkolei lighthouse East.

Clearing marks.—Terkolei lighthouse bearing E. $\frac{1}{2}$ N. leads to the southward, and Sau lighthouse in line with or open of the west end of Loban Kechil, leads well clear to the westward of the shoal.

Dessa Islet and Reefs.—Dessa, situated on the southern side of a shoal three-quarters of a mile in extent, is a small islet, conspicuous from having only one tree upon it, bearing N. $\frac{3}{4}$ W. distant 2 miles from the west end of Loban Kechil, and S. by W. $\frac{1}{2}$ W. about half a mile from Tanjong Batu, the nearest point of Bentán. Two patches of reef, together nearly a mile long, lie with their western extreme about 2 cables southward of Dessa, and between these and the 2-fathom patch off Loban there are depths of $4\frac{1}{4}$ to 9 fathoms. A rocky patch lies 3 cables off the north-west side of Dessa, and the same distance off-shore. These dangers are steep-to. Loban Kechil bearing S.S.E., or Bentán West point N. $\frac{1}{4}$ W., leads westward of these reefs.

Pulo Dua, about three-quarters of a mile long, fronts the bay between Batu and West points, and with the exception of a round lump which rises in its centre is lower than the adjacent land; there is a remarkable white rock near its west side. The island is bordered by a reef to the distance of about $1\frac{1}{2}$ cables; two patches lie at that distance, south and south-east of

the south point. The latter is a rock awash, and lies nearly in the middle of the channel between the island and the shore. At 3 cables northward of the reef fringing the north part of Dua, and 2 cables from the Bentán shore, is a 3-fathom patch.

WEST POINT is nearly abreast the lighthouse on Pulo Sau, on the opposite side of the main channel, and distant about 2 miles. The point is moderately elevated land, presenting a round shelving appearance, and from it the coast line trends north-eastward, forming the eastern side of the north entrance of Rhio strait; the point is bold-to on the south and west sides, but on the north a reef commences, which abreast Senggera rocks extends 3 cables off shore.

The **Senggera** are a ledge of flat rocks, lying 2 cables off shore, at $1\frac{1}{2}$ miles northward from West point. The reef fronting the shore extends one cable outside them, and at low water, dry heads of rocks will be seen extending nearly as far as West point.

Malang Yarong is a small islet, covered with trees, lying half a mile northward of Senggera rocks, on the edge of the reef fronting the shore, which here extends 4 cables off.

Pulo Kera, or Skerrie, is a small island about 80 feet high, lying 2 miles north-eastward of Malang Yarong and close off Tanjong Kalumpung.

The reef which fronts the coast from West point passes a quarter of a mile outside Kera, thence to the eastward, fronting the southern coast of the large bight between Kera and Tanjong Subong, to the distance of three-quarters of a mile.

A Bank, with $1\frac{1}{2}$ to 3 fathoms, and one spot having less than one fathom water, fronts the shore reef north of Malang Yarong; the 3-fathom line which marks its edge, trends from that islet in a N.N.E. direction for 2 miles and passes about half a mile outside Pulo Kera, from which it trends with an irregular outline to Tanjong Subong, passing just outside the Pap and a group of rocks eastward of it. This bank between Malang Yarong and Kera is steep-to, and must be avoided.

Netscher Shoal, the outer part of which lies half a mile outside the bank just described, is about half a mile in extent, composed of hard sand and coral, and has a patch of less than one fathom on its north-west edge. From this shoal spot the west extreme of Pulo Kera bears S. by W. $\frac{1}{4}$ W. distant $1\frac{1}{2}$ miles, and the extreme of Tanjong Subong N.E. by E. $\frac{1}{4}$ E., $4\frac{1}{2}$ miles. Close to the western side of this danger are depths of 6 to 10 fathoms.

Crocodile Shoal, a small patch of hard sand with 3 fathoms water, and $4\frac{1}{2}$ to 8 fathoms around it, is the outermost of the dangers on the east side of Rhio strait. It lies N.E. $\frac{1}{2}$ N. distant $2\frac{1}{2}$ miles from Netscher

shoal, and with Tanjong Subong north extreme bearing E. $\frac{3}{4}$ N. distant $2\frac{1}{2}$ miles. About midway between Crocodile and Netscher shoals is a patch of 4 fathoms.

Clearing marks.—Pulo Kera bearing S. by W. $\frac{1}{2}$ W., leads three quarters of a mile westward of the Crocodile, and clear of the 4 fathoms patch; the northern extreme of Tanjong Subong, bearing E. $\frac{1}{2}$ S. leads half a mile to the northward.

Sau lighthouse bearing S.S.W. $\frac{1}{4}$ W., clears the shoal bank northward of Malang Yarong, and also Netscher and Crocodile shoals.

SUBONG BAY, the deep bight 6 miles across, between Pulo Kera and Tanjong Subong, is nearly filled up with reefs which extend $2\frac{1}{2}$ miles from the shore of the south-east part of the bay, where the Sungai Subong Besar enters it; there are also several outlying rocks above water in the bay.

Rocks.—Outer rock, the farthest off shore of the rocks in Subong bay, is about 10 feet high; it lies N.E. by E. $\frac{3}{4}$ E., $1\frac{3}{10}$ miles from Netscher shoal, with Pulo Kera bearing S.W. by S. distant $2\frac{1}{2}$ miles. The Pap, a rock which dries 6 feet, lies three-quarters of a mile southward of it, just inside the 3-fathom line of the shore bank. A single rock, about 6 feet high, lies E. by S. $\frac{1}{4}$ S. half a mile from Outer rock; and at half a mile beyond in the same direction is a small group of rocks above water, close off the reef fronting the shore.

Tanjong Subong is the north-west extreme of Bentán and the north-eastern limit of Rhio strait. A small islet lies off the pitch of the point, and S.W. by W. one third of a mile from this islet is a sunken rock. Some islets also lie close to the coast south-eastward of Tanjong Subong.

Anchorage.—There is safe anchorage in Subong bay, in 4 fathoms sand and mud, at about one mile E.N.E. of Outer rock.

Tides.—It is high water at Tanjong Subong about 1h. 50m. before Rhio, or at 8 hours.

TIDES.—The flood tidal wave in the China sea comes from the northward and, being divided by the island of Bentán, sweeps round its shores and flows into Rhio strait at both ends, the stream from Singapore strait meeting that from the southward in the space between Tiemara island and Rhio. In the northern entrance, on the western side, a portion of the flood tide entering the strait is deflected between Malang Orang and Pan reefs, and runs to the north-westward with the flood to Singapore; or in the reverse direction to the flood stream entering the main passage of Rhio strait; the ebb takes the reverse direction circling southward of Pan reef, where it joins the main stream ebbing north-eastward. This must be guarded against when near Pan reefs.

The main body of the southern stream takes a general westerly direction for Dumbo strait, much of it diverging to the southward through the channels dividing the several groups of islands lying between Missana and Dumbo, and a portion turning off to the north-west, in the direction of Garras: this last is joined by the streams flowing through the Siolon and adjacent channels, which gradually trend away to the north-westward after they enter Rhio strait.

The monsoons and currents of the China sea very much affect the regularity of the tides, which are strong, and at the springs rush with great velocity through the channels among the islands, forming numerous eddies, and stirring up the mud. In the narrow part of the strait, about West point, this is particularly the case, the tide running from 3 to 4 knots, and sometimes even $4\frac{1}{2}$ and 5 knots.*

DIRECTIONS.—From the Southward.†—A vessel intending to proceed through Rhio strait, should, from a position about 12 or 13 miles north-eastward of Tanjong Diang, the eastern extreme of Linga island, steer about N.W. $\frac{1}{2}$ N., which, if care be taken to guard against the effects of the tide (particularly the ebb, which sets strongly to the eastward), will take her to the fairway of the entrance to Rhio strait, and midway between Rodong and Gin peaks, which are visible in clear weather from a considerable distance.

In this track, if the course be duly preserved, the vessel will pass about 8 miles outside Crocodile rock, and 6 or 7 outside Fly bank, and Pollux rock, which should not be approached under a depth of 12 fathoms, and will have soundings of 15 to 13 fathoms, until abreast of Pollux rock, when the depths will increase to 18 and 21 fathoms. These deeper soundings will continue for 7 or 8 miles, when the depths will suddenly decrease to 12 or 10 fathoms, on the sand bank, which trends north-eastward from Missana island. The depths upon this part of the bank appear to be irregular, and it would seem that a vessel might get a cast of 19 or 20 fathoms when crossing it. After she is fairly over the bank the depths will increase to 15 or 14 fathoms, and continue so for 3 or 4 miles, when they will again become irregular, varying from 10 to 18 fathoms, until abreast of Pulo Gin.

(At night or in thick weather, a vessel, from a position about 13 miles north-east of Tanjong Diang, should steer a N.N.W. $\frac{1}{2}$ W. course for about 25 miles, and then N.W. $\frac{1}{2}$ W. for about 30 miles, which, if proper

* H.M.S. *Fly*, in November, found the tide in the northern entrance to Rhio strait, setting to the southward at the rate of 3 miles an hour, at two hours after the time of high water at Singapore (about half ebb in Subong bay), when the north-east stream should have been running.

† Continued from page 410.

allowance has been made for the tide, will keep her about 11 miles eastward of the Fly and Pollux shoals, and place her in the fair-way of the entrance to Rhio strait, with Pulo Gin on the starboard beam.)

Great difficulty has often been experienced by strangers in making out the entrance to Rhio strait, on account of the numerous islands in its vicinity. The high conical peak of Rodong (*see* page 405) should be made out as soon as possible, that being the first conspicuous object on approaching the strait, and if this can be discerned no difficulty will be found in making out the other points as the vessel proceeds.

Pulo Dumpo or Rondo, the small round island on the west side of entrance of the strait, with Table hill on Pulo Galang, South-west hill on Siolon, Talang island, and the extreme land to the eastward (Pulo Gin, with a flat peak near its centre) will, at a distance of 14 miles, readily show the approach to the strait, whilst, at a nearer distance, the Topies, Alligator, and other islands, cannot fail to point out its entrance.

Having brought the south end of Pulo Gin abeam, a N.W. $\frac{1}{2}$ W. course will lead to the entrance of the strait; Little Garras island lighthouse should be passed about one mile distant, to avoid the Rotterdam and Topie reefs to the eastward.

From abreast Little Garras, a N.W. $\frac{1}{2}$ N. course will lead through the fairway of the channel till Pulo Loban is abeam, a distance of 17 miles. With Loban Kechil bearing East, distant one mile, a N. by W. course for 7 miles will take the vessel past Bentán West point, which will then bear about S.E.; a N. by E. or N. by E. $\frac{1}{2}$ E. course will then lead midway between Pan reef and the dangers off the north-west coast of Bentán into Singapore strait.

The mark for passing eastward of Pan reef is Sau lighthouse bearing S. $\frac{1}{2}$ W., or Barbukit hill on the Malay peninsula, N. $\frac{1}{4}$ W. A vessel will be clear of the Pan reefs when Pulo Nongsa opens of Nongsa point, and may then shape course as necessary for Singapore road. If the tide be setting to the westward a sailing vessel should be careful, especially in light or contrary winds, to get well over on the northern side of Singapore strait, otherwise she may be carried to the westward of St. John, unable either to fetch into Singapore road, or, from the great depth of water, to anchor.

The channel westward of Pan reef is used by the pilots in preference to the channel eastward of it (*see* page 418, and tides at 426). Sau lighthouse in line with east extreme of Innang Ketchil S. $\frac{3}{4}$ E. leads through nearly in mid-channel between the reefs. For directions to Singapore, *see* page 144.

Caution.—The beacons and buoys in Rhio strait, as in other places, occasionally break adrift.

Working through Rhio Strait from the Southward.

—It seldom happens that a vessel will have to work along near the islands from Missana to Dumpo; it is generally found advantageous to stand to the northward in case of meeting with a north-westerly wind, but it may occasionally happen that a vessel will derive advantage by standing towards them; in which case, when standing towards the north side of Missana, avoid bringing the apex of Binan northward of W. by N. To clear the Rifleman shoal, lying $1\frac{1}{4}$ miles eastward of Binan, the eastern extreme of Missana must not be brought eastward of S.E. $\frac{1}{2}$ E., or the northern extreme of Katang Linga northward of W. by N. $\frac{1}{2}$ N. This last also clears the $3\frac{1}{2}$ -fathom patch off the north part of Binan. Katang Linga may be approached to the distance of half a mile. The Selanga islands and Udik may be approached to within moderate distance, but vessels should not stand within a line drawn from the north extreme of Katang Linga to the north Selanga, nor within another drawn from the last-named island to Udik.

Standing to the westward, towards the south end of Pulo Galang, a vessel may approach Great bank and East banks, to a depth of 10 fathoms. Pulo Rondo bearing S.W. by S. leads southward of these banks, and is a safe turning mark.

Between Dempo point and Little Garras a vessel may stand into 8 or 7 fathoms, but to avoid Dittlof reef, Tyroem point the eastern point of Galang must not be brought to bear southward of W. $\frac{1}{2}$ S. until Little Garras lighthouse bears westward of N.W. Little Garras should not be approached nearer than a quarter of a mile, nor Great Garras than half a mile, to avoid their reefs.

Between Great Garras and East Mubut island, a vessel may stand into 8 or 7 fathoms; Little Garras well open of Great Garras is a good turning point to avoid the bank off Great Garras; Loban Kechil open of Mubut island clears the bank extending southward of Mubut.

After passing Mubut, its eastern extreme must not be brought eastward of S. by E. $\frac{1}{2}$ E., until the southern extreme of Sembolang point bears W. by N. $\frac{1}{2}$ N., when the vessel will be clear of the bank which extends north-west of Mubut; thence to Sembolang point she may stand into 8 fathoms.

Sembolang point is fronted by a reef, but the pitch of the point may be passed at a quarter of a mile. The bay between that point and Tiemara bank is free from danger, and a vessel may stand in until Loban Kechil bears N. by W.; to avoid Tiemara bank, keep the north extreme of West Mubut just open of Sembolang point.

Tiemara Kechil should not be approached nearer than half a mile, as the fringing reef is steep-to. After passing this island Sembolang should be

kept open of it, to avoid Johannes shoal and the reef extending from Pulo Antu.

To avoid Innang reef, keep Sau lighthouse well open of Pulo Innang; and to clear the reef fringing that island, keep the north-east point of Innang Kechil open of the eastern extreme of Pulo Sau (with the lighthouse upon it); this will lead clear of all danger as far as the eastern extreme of Sau, which should not be approached nearer than half a mile on account of the small reef lying a quarter of a mile south-east of the lighthouse.

After passing Innang Kechil, in standing to the westward, do not shut in the eastern extreme of Pulo Sau behind Inuang Kechil; this will lead clear of Van Goghs' island reefs and of Malang Orang.

Tanjong Sau, kept westward of S.W. $\frac{1}{2}$ W., leads southward of Pan reef; and when passing eastward of that danger, care must be observed not to bring Barbukit hill to the eastward of North, or Sau lighthouse southward of S. $\frac{1}{2}$ W., until Johore hill bears N.N.W. $\frac{1}{2}$ W.; and then not to bring the last-named hill to the northward of N.N.W. $\frac{1}{2}$ W. until Pulo Nongsa is open of Nongsa point.*

In working between the Pan reefs, keep Tanjong Sau well open of Tanjong Malang Orang, or the eastern extreme of Innang Kechil southward of S. by E., in order to avoid the dangerous reef extending about 6 cables from the Battam shore.

Standing to the eastward, towards Pulo Talang, at the southern entrance of Rhio strait, be careful to give the south-eastern shore of that island a berth of 2 miles, and to keep South-west hill, on Siolon island, well open of Talang, to avoid Hendrik Jan rock. The south-west point of Siolon and Alligator island may be approached to half a mile. When nearing the Topies, South-west hill kept well open of the southern point of Alligator island, will lead southward of those dangers and of Rotterdam reef, in about $4\frac{1}{2}$ fathoms of water; the south-western extreme of Pulo Pankel kept northward of N.W. $\frac{1}{2}$ N. leads westward of Rotterdam and Dutch shoals. Topie island kept eastward of E. by S. $\frac{1}{4}$ S. leads southward of Dutch shoal.

To clear the bank of 4 to 5 fathoms, extending $2\frac{1}{2}$ miles southward of the Topies, Siolon hill must be kept open of S.W. hill, until the apex of Pulo Loban is open westward of Pulo Pankel.

The south-west end of Pankel should not be approached nearer than half a mile as the reef is steep-to; the west side may be neared to 7 or 8 fathoms, but off its northern end keep Little Garras lighthouse open of Pulo Pankel, to avoid the shoal water extending N.N.W. from it.

* Barbukit hill may be recognised by the low land adjoining it, whilst Johore hill terminates abruptly to the westward.

Between Pulo Pankel and Isabella shoal, a vessel may stand to the eastward into 8 or 9 fathoms; but should not bring the north-east extreme of Pankel to the southward of S.S.E., or Terkolei lighthouse to the westward of N. by W., to avoid Soré reefs. Terkolei lighthouse bearing E. $\frac{1}{2}$ N. leads southward of Isabella shoal, and Sau lighthouse in line or open of the west end of Loban Kechil leads well to the westward.

Loban Kechil should not be approached nearer than half a mile, and, after passing it, the western extreme should not be brought southward of S. by E. $\frac{3}{4}$ E., until Tanjong Batu bears East, which will avoid the dangers near Dessa island. Tanjong Batu is steep-to; and both it and Pulo Dua may be approached to about 3 cables, except near the extremes of that island. West point of Bentán is bold, but the shore northward of it, and Malang Yarong, must not be approached nearer than a quarter of a mile, and Kera island not nearer than three-quarters of a mile. There are depths of 7 and 8 fathoms close to the edge of the bank which fronts this part of the coast.

After passing Malang Yarong, care must be taken when standing in for the Bentán shore to avoid the shallow bank which extends off between that island and Pulo Kera; this bank has 12 to 13 fathoms water close-to, and will be avoided by keeping Sau lighthouse southward of S.S.W. $\frac{1}{4}$ W., this bearing also clears Netscher and Crocodile shoals. If Sau lighthouse cannot be made out after Pulo Kera bears southward of East, Malang Yarong island—which will be seen well clear of the extreme of the land as Netscher shoal is neared—must not be brought westward of S. by W. $\frac{3}{4}$ W. until Pan reef beacon bears West; a vessel will then be northward of Netscher shoal, and Pulo Kera may be brought S. by W. $\frac{1}{2}$ W. until Tanjong Subong bears E.S.E., when a vessel will be northward of Crocodile shoal, and in Singapore strait.

Through Rhio Strait from Singapore.—Vessels weighing at Singapore at high water, or about the first quarter of the ebb, and taking about 4 hours to reach the entrance of Rhio strait, will probably carry a fair tide through both straits; but no dependence can be placed on it. (*See tides, page 426.*)

The flagstaff on fort Canning, Singapore, bearing West, leads 2 miles southward of Johore shoal; and when Johore hill bears North, a vessel will be eastward of the shoals. Entering Rhio strait, pass between Little Pan reef buoy and the screw pile beacon on Great Pan; or, pass eastward of the Pan reefs, and in doing so, be careful not to bring Johore hill to the northward of N.N.W. $\frac{1}{2}$ W. until Barbukit hill bears N. $\frac{1}{4}$ W.

Thence a South course will lead down the fairway of the strait until the vessel has arrived nearly abreast West point, when S. by E. is the mid-channel course as far as Pulo Loban. From abreast Loban Kechil

a course about S.E. $\frac{1}{2}$ S. making allowance for tide, will lead mid-way between Pankel and Mubut, also between Garras islands and the Topies, and out of the strait.

Working through Rhio Strait from the Northward.

—In working between the Pan reefs, the screw pile beacon on the north, and the buoy at the south end of the Pan reef, will point out the situation of that danger; but when standing towards the Battam shore, in order to avoid the dangerous reef extending three-quarters of a mile from it, care must be taken not to lose sight of Tanjong Sau, nor to bring the eastern extreme of Innang Kechil eastward of S. by E. If proceeding by the eastern or main channel, in rounding the Pan reefs, do not shut Pulo Nongsa in behind Nongsa point, until Johore hill bears N.N.W. $\frac{1}{2}$ W., and then not to bring Johore hill to the northward of that bearing until Barbukit hills bears N. $\frac{1}{4}$ W.

Standing towards the north-west coast of Bentán,—to avoid the Crocodile shoal, Barbukit hill should not be brought westward of N. by W. $\frac{1}{4}$ W.; if Barbukit cannot be seen, Kera island must not be brought westward of S. by W. $\frac{1}{2}$ W.; or tack in 10 or 9 fathoms. When the screw pile beacon on Pan reef bears northward of West, a vessel will be nearing Netscher shoal, and must avoid bringing the small islet of Malang Yarong—which will be seen well clear of the extreme of the land—westward of S. by W. $\frac{3}{4}$ W., or Sau lighthouse westward of S.S.W. $\frac{1}{4}$ W.; this last precaution will also clear the dangerous bank between Kera island and Malang Yarong. The soundings decrease so suddenly about this part of the coast that they must not be relied on to give warning in time to avoid the dangers.

Kera island must not be approached within three-quarters of a mile, but Malang Yarong may be to a quarter of a mile. A reef rounds away from Malang Yarong to West point, having depths of 8 or 7 fathoms close-to, and it must be given a berth from three-quarters to half a mile until abreast West point, which is bold. Pulo Dua must not be neared within a quarter of a mile, on account of the surrounding reef; and all danger between Dua and Loban Kechil will be avoided by keeping the west end of the latter island eastward of S.S.E., or by not bringing West point westward of North.

Standing to the Westward, when near the south side of Pan reef, Tanjong Sau should not be brought southward of S.W. $\frac{1}{2}$ W., which will clear the Pan reef, and also Malang Orang reef, in case the buoys upon these dangers should have disappeared. From Malang Orang buoy to Pulo Sau, keep the east point of Sau open of Innang Kechil, to avoid the dangers which lie north-westward of Sau.

The eastern point of Sau is bold on its northern side, but south-east of it is a small reef, a quarter of a mile distant, which should be given a wide

berth; after passing this small reef, be careful to keep the eastern extreme of Innang Kechil open of the eastern extreme of Sau, to clear the long spit which projects from the latter island, and also to avoid the reef extending from Pulo Innang. Close to this reef are 8 or 7 fathoms, and 14 or 15 fathoms about half a mile off.

The same objects in line will lead eastward of Inuang reef, towards which, if desirable, a vessel may stand a little closer, after which keep the east extreme of Tiemara Kechil southward of S.E. $\frac{1}{4}$ S., or Sembolang point open, to avoid Johannes shoal. Tiemara Kechil is fronted by a reef, and should be given a berth of half a mile. After passing this island, Tiemara bank will be avoided by keeping the north-east extreme of that island to the westward of N.W., or the north extreme of Mubut just open of Sembolang point, until the south-west extreme of Tiemara is northward of W. by N., when a vessel may stand into the bay towards Sembolang point, as convenient, tacking in 8 or 7 fathoms.

Sembolang point may be approached to a quarter of a mile in 10 or 9 fathoms. After passing this point, do not bring its south extreme to the westward of W. by S. until the eastern extreme of East Mubut bears southward of S. by E. $\frac{1}{2}$ E., to avoid a bank which extends N.N.W. of that island. Between East Mubut and Great Garras a vessel may stand into 8 or 7 fathoms, taking care to keep Little Garras well open of the east extreme of Great Garras.

The eastern part of Great Garras may be approached to half a mile, and Little Garras to a quarter of a mile. After passing Little Garras, the lighthouse must not be brought to the westward of N.W. until the east point of Galang bears W. $\frac{1}{2}$ S., which clears Dittlof reef. Jassens shoal, which fills up a great portion of this bay, may then be approached to 7 or 8 fathoms.

Dempo point should not be approached nearer than half a mile, and after passing this point do not bring it northward of N.W. by W. until Pulo Rondo or Dumbo bears S.W. by S., which leads clear of East bank and all other dangers between that island and Dempo point, and is a safe tacking mark.

Between Pulo Rondo and Katang Linga a vessel may stand well over towards Udik and Selanga islands, but must avoid standing southward of a line joining Selanga and the north extreme of Katang Linga. The east side of Katang Linga should not be approached nearer than half a mile, and Rifleman shoal will be avoided by keeping the northern extreme of Katang Linga westward of W. by N. $\frac{1}{2}$ N. (this also clears the $3\frac{1}{2}$ -fathom patch off the north part of Binan), or the eastern extreme of Missana southward of S.E. $\frac{1}{2}$ E.

Having passed Rifleman shoal, if the apex of Binau be not brought to the northward of W. by N. the dangers which extend about three-quarters of a mile from the north side of Missana will be avoided.

Standing to the Eastward, Loban Kechil should not be approached nearer than half a mile, and Sau lighthouse in line with its west extreme will clear the west end of Isabella shoal, the southern part of which will be avoided by not bringing Terkolei lighthouse eastward of E. $\frac{1}{2}$ N. Between Isabella shoal and Pankel, a vessel may stand into 8 or 9 fathoms, but in order to avoid Soré reefs do not bring Terkolei lighthouse to the westward of N. by W. or the north end of Pankel to the southward of S.S.E. Little Garras lighthouse open of the south-west extreme of Pankel will lead clear of the shoal water extending N.N.W. from the north part of that island; its west side may be approached to 8 or 7 fathoms: shoal water extends from the south-west extreme, close to which are 13 fathoms water; it should not be closed nearer than half a mile. The apex of Loban open of the west extreme of Pankel, will lead clear of Dutch shoal, and of the shoal bank of soundings south-eastward of Pankel; this mark will also lead to the westward of the shoal water—4 to 5 fathoms—which extends nearly $2\frac{1}{2}$ miles southward of the Topies, and Siolon hill open of South-west hill will lead to the southward. The shoal bank, just mentioned, is not dangerous to small vessels which may stand nearer to the Topies, but in order to avoid Rotterdam reef, South-west hill must be kept open to the southward of Alligator island.

To the southward of the Topies, Alligator island may be approached to half a mile, and a vessel may stand on well into the channel between Siolon and Talang, but must not bring South-west hill to the westward of W. by N., to avoid Thomas shoal. There are many shoal patches between Talang and Pulo Gin, but they all with the exception of Hendrik Jan rock, lie out of the track of vessels. The south-east side of Talang should be given a berth of at least 2 miles in passing, keeping South-west hill well open of Talang, until Pulo Terobi bears E. by N.

To Rhio from the Southward.—Vessels bound to the anchorage off Rhio, having entered the strait, *see* page 427, should steer for Alligator island, and pass between it and the Topies, keeping within one mile of Alligator island, to avoid the dangers which lie nearly one mile south-eastward of the Topies. Having brought the eastern Topie to bear West, and about a mile distant, a N.W. by N. course will lead to the entrance of the channel between Soré and Basing islands. In this track the soundings about a mile off South-west hill are from 6 to 10 fathoms, and half a mile south of Alligator island and between that island and the Topies, from 8 to 9 fathoms. After having shaped a N.W. by N. course,

as directed, 5 or $4\frac{1}{2}$ fathoms will be found for about half the distance to the entrance of the channel between Soré and Basing islands, when the depth will increase to 8, 10, and 16 fathoms.

The northern Topie bearing S. by E. $\frac{3}{4}$ E. will lead through in mid-channel between the shoals extending from Soré island, and Pulo Domba, marked by buoys; this latter bank is steep-to, while that on the Soré side shoals gradually. Having passed Tanjong Domba, vessels may steer about North for Rhio road, with the whole of Loz island open of the west extreme of Pitjingit. See anchorage at page 423.

Vessels of moderate draft being on the western side of the strait, about one mile eastward of Little Garras, should steer N. by E. or N.N.E. according to circumstances, to pass between Rotterdam reef and Dutch shoal, crossing the bank with $3\frac{1}{4}$ to 4 fathoms water lying between them; thence through the channel between Soré and Domba islands, to the roadstead as before directed.

To Rhio from the Northward.—Having entered Rhio strait, as directed at page 431, and reached a position about one mile to the westward of Loban Kechil, a south-easterly course should be steered, keeping Sau lighthouse just open of Loban Kechil until Terkolei lighthouse bears E. $\frac{1}{2}$ N., when an E. by S. course will lead about midway between Terkolei and Soré reef buoys, to the anchorage in the road.

CHAPTER XI.

VARELLA AND DURIAN STRAITS.

 VARIATION 2° 20' East, in 1886.

GENERAL REMARKS.—Vessels bound from Banka strait to Singapore during the strength of the N.E. monsoon frequently adopt the inner route by the Varella and Durian straits (*see* page 221). During the prevalence of strong northerly winds in the months of December and January, sailing vessels will save much time by doing so,* for here they will have smooth water, good anchorage, and but little tide, whereas on the eastern side of Linga at this season of the year, there is generally a heavy sea, and a southerly current sometimes running at the rate of 3 knots an hour. In Varella strait they will also be greatly assisted by the squalls from the Sumatra coast.

Varella, or Brahalla strait, is situated at the southern part of this route, and Durian strait at its northern part; the intermediate portion has not received a specific denomination. The entire route is about 120 miles in length from Pulo Varella to the Carimon islands, and is bounded on the western side by the coast of Sumatra, False Durian, Sabong, and the contiguous islands; and on the eastern side by Sinkep and other islands off the south and west coasts of Linga, and by Great and Little Durian, and the adjacent islands.†

Sumatras.—The following useful observations upon the Sumatras, or heavy squalls which are common in these straits, are by Captain McKenzie:‡—"On the west side of Sinkep and Linga and through Durian strait, there will be regular tides, and good slants of wind with the Sumatras. It often falls calm before they come, and if the tide be foul a kedge that could be handily weighed would be sufficient to drop, and the canvas then reduced; double reefed topsails will do for the first puff, and nothing is lost by being prepared for a heavy gust.

* Mr. W. Stanton, Master R.N.

† *See* Admiralty Charts:—Banka strait to Singapore, No. 2,757, scale $m = 0.15$ of an inch; Linga and Sinkep channels, No. 1,789, scale $m = 0.20$ of an inch; Singapore strait, No. 2,403, scale $m = 0.66$ of an inch; and Durian, Muro, and Jombol straits, No. 2,402, scale $m = 0.65$ of an inch.

‡ Nautical Magazine, 1847.

TANJONG BON or *Jabung*.—The coast of Sumatra from Batakarang point to Tanjong Bon, has been described at page 399. Tanjong Bon, is the south-eastern limit of the Inner route. Like most other parts of the east coast of Sumatra, it is low land, and has a mud bank extending many miles north-west and south-east of it.*

ISLETS and DANGERS.—**VARELLA** or *Brahella* is a small island 450 feet high, having a hill on its western part which may be seen 20 miles. It lies in the middle of Varella strait, with Tanjong Bon, bearing S. by W. distant 10 miles.

Some islets and rocks lie near Varella, the largest of which, *Anak Varella*, is about one mile north-eastward of it, with from 7 to 9 fathoms water between; at one mile northward from *Anak Varella* lies a rock, with 17 fathoms close to, having a channel 2 miles wide, with 10 to 16 fathoms, between it and *Middle rocks*.

Water.—There is anchorage on the south-west and north sides of Varella, in about 6 fathoms, at 2 cables off shore. A path leads from about the middle of the north side to the centre of the island, where water may be procured.†

Shoal.—Captain G. Kunst, of the Dutch barque *Louisa Kroon Prinses of Sweden*, reports having seen a shoal, with but 12 feet water, from which Varella island bore W.N.W. distant 3 miles.‡

Middle rocks, partly dry at low water, lie 5 miles N.E. $\frac{3}{4}$ N. from Varella, or nearly midway between the latter and the islets which front the south end of *Sinkep* island.

Pollux rock with 4 feet water lies nearly 2 miles north-east of *Middle rocks*, with the nearest of the islets southward of *Sinkep* bearing N. by W. distant $3\frac{1}{2}$ miles.

Varella channels.—The channel southward of Varella island is wider and more free from danger than that northward of it, and is consequently more frequented. The shoal bank projecting about 8 or 9 miles north-westward from Tanjong Bon forms an elbow, which will be avoided by keeping Tanjong Bon southward of S.E. $\frac{1}{2}$ S., until Varella island bears eastward of E.N.E.

The channel to the northward, between Varella and *Sinkep* Lant islands is encumbered with the dangers just mentioned. Between *Pollux*

* See Admiralty charts :—Banka strait to Singapore, No. 2,757; scale $m = 0.15$ of an inch; and Linga and *Sinkep* channels, No. 1,789, scale $m = 0.2$ of an inch.

† It is still necessary for merchant vessels which have occasion to fill up water in out of the way places to be on their guard against surprise. Natives, not ordinarily pirates, frequently become such if a good opportunity present itself.—J. W. Reed, Master, R.N., 1864. See also footnote, page 152.

‡ *Singapore Straits Times*, 10th September 1864.

rock and those islands it appears to be clear, although the chart has but few soundings. Between Varella and cape Buku the south extreme of Sinkep, the channel is 10 miles wide, with depths of 12 to 20 fathoms.

SINKEP, the easternmost of the three islands forming the north side of Varella strait, is about 20 miles in extent, and of irregular shape. Baru bay, about 3 miles deep, lies between its two southern points. On the eastern side of the island is a range of hills, with Sinkep peak 1,440 feet high near the centre of the range. There is a hill over Buku point, and 4 miles to the northward on the west coast of the island, is Sharp peak of moderate elevation. From cape Buku the coast trends in a north-westerly direction for 14 miles to Saboyoro strait, which separates Sinkep from the island next westward of it. Rocks above and below water front the whole south-west coast of Sinkep, to the distance of one mile.

Saboyoro strait is about two miles broad, but its entrance is contracted to half that breadth by reefs projecting from the points of Sinkep and the island westward of it. This strait is imperfectly known.

Rawa is the outer of two islands westward of Sinkep, their south-west coast lines following the same north-west direction as that of Sinkep; the whole distance, from cape Buku to the north-west extreme of Rawa being about 23 miles. The islands are separated by a channel so narrow that they appear as one. Shoal water extends 2 miles into Saboyoro strait from the south point of the eastern island, but gradually lessens in distance from the shore to the north-westward, until at the north-west end of Rawa it projects but half a mile.

Silenseng, or Green Island, 119 feet high, lies 3 miles north-westward of Rawa island, and is separated from it by a safe channel with depths of 10 to 20 fathoms. The island is surrounded by a shoal which on its north side extends three-quarters of a mile.

Bunta, or Wright Island, is small, and lies $1\frac{1}{2}$ miles northward of Silenseng. Rocks extend about a quarter of a mile from it.

Seera, or Reef Island, is small, 160 feet high, and lies W. $\frac{1}{2}$ N. distant $6\frac{1}{2}$ miles from cape Buku. Several islets stand on the reef which surrounds the island, and extending 2 miles north-westward, and one mile south-eastward of it.

Anak Seera are rocky islets lying about 3 miles northward of Seera, on the eastern edge of a reef which extends 2 miles north-westward of them. Between this reef and that extending from Seera island there is a safe channel about one mile wide, with depths of 7 to 12 fathoms.

James rock, a pinnacle, lies in the channel between Seera island and Sinkep, with Cape Buku bearing S.E. $\frac{3}{4}$ E., and Seera island west extreme W.S.W. A patch of $4\frac{1}{2}$ fathoms lies about 2 miles northward of

this pinnacle nearly midway between Anak Seera and Sinkep; vessels navigating eastward of Seera islands must avoid these patches.

Some patches of $4\frac{1}{2}$ and 5 fathoms, lie from 4 to 6 miles northward of Anak Seera.

Speke rock, lies W. by N. $\frac{1}{2}$ N. about 9 miles from Seera island. It is small, and uncovers at two-thirds ebb, showing as a small black rock about the size of a boat, with depths of 8 fathoms close-to. Buku point kept open to the southward of Seera island, leads southward, and Mudiu island bearing N.W. by N. leads to the westward.

There is a safe passage between Speke rock and Seera island, avoiding the 4 fathoms patch lying about midway; and also between Speke rock and Alang-Tiga islands, avoiding Atkin rock. The soundings in this passage are generally from 6 to 8 fathoms, muddy bottom, sometimes sand; but the channel westward of Alang Tiga is preferable, being clear of danger.

Alang-Tiga Islands lying 29 miles north-westward of Varella, are a group of five small islands, and some rocks above water. The three principal islands are high, and may be seen from a distance of 24 or 25 miles, and the others 13 or 14 miles. They may be passed at a prudent distance on their western side; the depths being mostly from 6 to 9 fathoms, mud, in the fair channel. In working, the coast of Sumatra may be approached to 6 fathoms water, and from this depth to 8 or 9 fathoms towards the islands is a fair track, although the soundings are not always regular, 7 fathoms being the general depth directly westward of the islands until near the mainland.

Atkin rock is said to be a small pinnacle which uncovers at two-thirds ebb, and steep-to; when covered, unless the tide is running strong, there is no indication of it.* The marks given for the rock are, the west extreme of Beralas, just shut in by the east extreme of Alang Tiga island, and the south extreme of Mudiu island bearing N.W. by W. $\frac{1}{2}$ W., distant three-quarters of a mile.

JAMBI BAY.—From Tanjong Bon (page 437) the coast of Sumatra trends sharply to the westward, forming Jambi bay and the delta of the Jambi river, the principal entrance of which, named Nior river, is situated about 33 miles from that point. This coast is fronted by a mud ank which in places extends nearly 7 miles off.

Berba island lies off the eastern mouth of the river, 10 miles westward of Tanjong Bon.

Anchorage.—There appears to be good anchorage in 6 to 8 fathoms, 7 or 8 miles northward of Nior river.

* H.M.S. *Rifeman*, in February 1864, searched in vain for this rock.

Nior river is fronted by the mud bank to a distance of about 7 miles. There are two channels into the river; the western is the deeper and has a least depth of 9 feet on the bar; within the river the depth is from 4 to 5 fathoms.

Beacons.—Two beacon buoys are moored at the Nior east entrance, in $3\frac{1}{2}$ fathoms at the outer edge of the flat; the northern buoy is painted white, and the southern black: a Herbert beacon buoy painted black, in 3 fathoms water, marks the entrance to the western channel. Both channels within the beacon buoys are marked by floating beacons; those on the starboard hand on entering have each a ball, and on the port hand a cross.

There are several towns and villages on the banks of this river, the principal of which is Simpang about 20 miles, and Jambi about 50 miles from the entrance.

This part of Sumatra is under the Dutch, who have a station and fort at Muara Kompeh, a town 5 miles above Simpang.

Coal.—A seam of excellent coal was (in 1860) discovered near the Sultan's house at Jambi.

Basso Island.—Basso or Bakau point is the south-east extreme of Basso island, which is 20 miles in length, and the eastern of the several islands lying in the approach to Indragirie river. It bears N.W., distant about 52 miles from Tanjong Bon, the coast line between receding into a large bight, 33 or 34 miles deep, into which debouch several rivers.

The eastern coast of Basso island should not be approached nearer than about 2 miles, as a shoal, steep-to, projects nearly one mile off.

AMPHITRITE BAY is about 16 miles deep, formed between the north-east extreme of Basso island and Tanjong Baru, or Dato, 15 miles to the northward. It is nearly filled by a shoal, which extends several miles from either shore, between which is the deep water portion of the bay, about 3 or 4 miles broad, with depths of about 6 to 8 fathoms.

Indragirie river.—The large river Indragirie discharges itself through several channels into Amphitrite bay, and also into the bay between Tanjong Bon and Basso island.

Caution.—The outer edges of the shoal extending from the points of entrance to Amphitrite bay, are steep-to, having 10 or 11 fathoms within half a mile in some places, shoaling rapidly to 2 fathoms, requiring great caution when approaching this part of the coast at night.

The Coast.—All this part of the coast of Sumatra is flat low land, thickly wooded with trees about 120 feet high.

From the low headland of Dato point, the coast trends northward towards Durian strait, and is fronted by a shoal bank from 2 to 6 miles off shore, which may be approached by the lead, as, from 10 fathoms upon its edge the soundings gradually decrease to 3 fathoms.

Pulo Ponubo is an island 6 miles in length, in an east and west direction, 2 miles in breadth, and having a hill 955 feet high near its centre. It lies between Sinkep and Linga, dividing the passage between those islands into two channels, named Lima and Ponubo straits.

Lima Strait, between Pulo Ponubo and Linga, is narrow, much encumbered with islets and dangers, and does not appear to be a very convenient channel for navigators unacquainted with it. It is said, however, to be safe and quickly passed through with the tide; and that on its western side, just beyond the narrows, there is a small bay on the Linga shore, with good anchorage, wood, and water.*

Horsburgh states that Lima strait is a short route from Linga road to Durian strait, the soundings in it varying from 7 to 14 fathoms, that it may be navigated with care by vessels of moderate size, and furnishes the following directions:—If bound from Linga road to the westward, through Lima strait, steer out to the southward and south-west, till near the north-east part of Sinkep, to give a berth to the islets off Tanjong Bongon, the west point of Linga bay, and the extensive shoal which stretches thence to the road. Having passed about mid-channel between the islets off Tanjong Bongon, and those northward of Ponubo island, steer for Tanjong Labodado, the west point of Linga, and the depths will be 12 and 14 fathoms near the islets and rocks on the south side of the strait, and 9 or 10 fathoms towards the Linga shore; the bottom hard in the eastern part of the strait, and soft to the westward. Having passed Tanjong Labodado, steer about W. by N., in soundings of 11 to 9 and 8 fathoms, soft ground, and passing about 2 miles northward of Pulo Pandan, in 7 to 9 fathoms, steer to the north-westward for Durian strait.

Ponubo Strait, between Sinkep and Ponubo island, is, like Lima strait, very narrow and encumbered with islets and dangers. We have no directions for it; but, judging from the chart, it appears that it may be entered from the eastward between the small islets Serang, Tenga, and Kekker, and a mid-channel course followed through its narrowest part. After passing the narrows, keep within three-quarters of a mile of Ponubo, to avoid two rocky patches, nearly in mid-channel at the western end of the strait. The depths in the narrow part of the channel are 15 to 20 fathoms, but at the western end there are not more than 4 or 5 fathoms between the rocky patches and Ponubo, and only $3\frac{1}{2}$ to 5 fathoms between them and Sinkep, on which side, also, a vessel of moderate draft may probably pass through with safety.

PULO SETJAWA lies close to the north-west extreme of Linga, from which it is separated by Dasie strait, about half a mile broad. The

* Nautical Magazine, 1847.

west coast of this island trends in a north-westerly direction about 14 or 15 miles, the shore being fronted to a short distance by a reef.

Close to the north-west part of Setjawa lie two small islands named Great and Little Blando, the latter, which is the north-western one, having two islets near its west side.

Tiampa Strait.—Tiampa, an irregularly shaped island, 5 miles long, and $1\frac{3}{4}$ miles broad, is separated from the north-western part of Setjawa and the Blando islands by Tiampa strait, 2 miles wide, having depths of 13 to 30 fathoms. In the northern entrance of this strait lies a narrow bank, $2\frac{1}{2}$ miles long, having from one to 2 fathoms water, with 8 to 14 fathoms in the narrow passage between it and Blando islands. The channel between the bank and Tiampa is one mile wide, with depths of 9 to 14 fathoms.

Buaya Island lies 3 miles westward of the north-west point of Tiampa, and in the channel separating them there is a group of islets and rocks. Buaya nearly three miles in extent, is a remarkable island, rising to a peak 888 feet high.

Dian is the south-easternmost and Loban the north-westernmost of a chain of islets fronting the south and south-west sides of Buaya, from which they are separated by a channel with depths of 12 fathoms, but there is a rock near the west side of Buaya.

Leda rock is the outermost of a ridge of rocks which extend about $1\frac{1}{2}$ miles in a N.W. by W. direction from Loban.

TEMIANG GROUP.—This group with the other islands and dangers between Buaya and Potong islands lie far to the eastward of the usual track for vessels bound through Durian strait, but it seems advisable to describe them for the benefit of navigators who may wish to pass through any of the channels leading into or from Rhio strait.* This group is composed of four large and several small islands, lying to the north-westward of Setjawa and Sebangka, and separated from those islands by a narrow channel, which appears to be obstructed by numerous rocks. Temiang island, which limits the group to the north-eastward, is $7\frac{1}{2}$ miles long, 3 miles broad, and irregularly shaped, the north-east side being nearly strait, but at the south-east end there is a deep bay or inlet; there is also an inlet at the north-west end, but not so deep. This island, which is the largest of the group, is mostly composed of high hills, and near the west end on some table land is Mount Buanaja, 800 feet high.

The three other principal islands which lie close to the south-westward of Temiang, are divided from it and from each other by narrow channels, and the group is limited in that direction by Ompok island and several

* See Admiralty chart:—Rhio strait, No. 2,413; scale, $m=0.65$ of an inch.

islets standing on a reef 3 miles in length. Close-off the north-west end of Temiang is Pintu island about one mile long, and 430 feet high, and beyond it is Kebat island, 240 feet high. All the islands are fringed with reefs.

Pompon Island situated S.W. by W., about 2 miles from Kebat ; is rather more than half a mile in diameter, having in the centre a hill 433 feet high. A sunken rock lies W. by N. half a mile distant from the north extreme of the island, and rocks above water stand on a reef, at three-quarters of a mile N.N.E. from Pompon, and N.W. nearly the same distance from the north-west islet of the Babie group.

Pompon Reef, N. $\frac{1}{4}$ E., distant $2\frac{1}{2}$ miles from Pompon island consists of three or four rocks several feet above water, which at a distance appear like boats under sail. A rock awash lies a quarter of a mile to the westward, and between are depths of 5 to 8 fathoms, with 12 to 15 fathoms close to the shoal.

Irene Rock, said to lie W. by N. $\frac{1}{4}$ N., about 7 miles from Pompon island, could not be found by the *Riflemen* in the course of a four hours search, but the examination was insufficient to disprove its existence.

Buaya island bearing S.E. by S., or Potong island North, leads about 4 miles to the westward of the assigned position.

PANGALLAP GROUP.—**Allor** is a small round island, 139 feet high, situated on a reef half a mile across, at 4 miles northward of Kebat, the north-west extreme of the Temiang group.

Pangallap Island, 3 miles long, and half a mile broad, is moderately elevated, the highest hill on the southern part being 246 feet, and that on the northern 267 feet high ; the island is fringed by a reef, which projects in places on the east coast to a distance of a quarter of a mile, but on the west coast the ledge is nearer the shore. Some flat rocks, just above water, lie one cable south-eastward of the south point. The channel between Pangallap and the reef extending from Allor, is 3 cables broad, with depths of 7 to 23 fathoms.

Dedap, about $1\frac{1}{2}$ miles in length, lies to the westward of Pangallap, from which its southern and nearest part is distant three-quarters of a mile. Three small islets stand on the reef extending half a mile south-eastward of the island ; and detached rocks, awash, lie about 6 cables south-eastward of the reef.

The channel eastward of these rocks, and between Dedap and Pangallap, appears to be free from danger with the exception of a rock awash, lying a short distance beyond the edge of the reef fringing Pangallap, and which bears E. by N. $\frac{3}{4}$ N. from the north end of Dedap.

At about half a mile off the north-west extreme of Dedap lie two small islets, encircled by a reef; these islets form the southern limit of Abang strait.

RODONG GROUP lies to the westward of Niamok and Missana, (see page 412) and comprises six islands, separated by narrow unavailable channels. Rodong, the northern island, is 797 feet high, and is one of the principal land-marks for making Rhio strait. The three eastern islands are known as the Desie islands: the two western as the Madang islands.

The channel between Missana and the Rodong group is encumbered with numerous dangers, and should not be used.

DUA ISLANDS, situated about $2\frac{1}{2}$ miles westward of Madang islands, are two low islands, each encircled by a reef extending in some places a quarter of a mile from the shore and divided by a narrow channel having a depth of 4 fathoms. Two reefs, each about half a mile in extent, and separated by a narrow deep-water channel, lie from $1\frac{1}{2}$ to 2 miles north-westward of Dua islands. On the south end of the southern reef is an islet, and at the north end are some rocks above water; on the north-east extreme of the northern reef is Tree rock, 14 feet above high water.

A coral patch, with 3 fathoms water, and 11 to 14 fathoms close around it, lies N.W. by W. $\frac{3}{4}$ W. one mile from Tree rock; the channel between them is safe.

TETAMPAN GROUP, situated north-westward of the Rodong group, occupies a circular space about 4 miles in diameter, and is comprised of several islands, islets, and rocks, separated from each other by narrow intricate channels which are obstructed by numerous reefs and dangers. Tetampan, the south-western island, is 390 feet high, and the most conspicuous of the group; Binan and Katang Linga forms its eastern and northern limits, and the Nopong islands, with the adjacent islets and reefs, its north-western.

TEMIANG STRAIT, leading from the China sea to Durian and other straits adjacent, is about 14 miles long in a west-north-west and east-south-east direction, and 2 miles broad; on its south-side are the northern islands of the Sebangka group, Temiang, Pintu, and Kebat, and to the northward are Niamok, the Rodong group, Dua islands, and Tree rock reefs.

A dangerous pinnacle rock, awash at low water, and difficult to make out, lies in the southern entrance of this strait, about one mile N.E. of Reman islands, a group of small islands off the south-east extreme of Temiang. This danger may be passed on either side, the channel to the southward being three-quarters of a mile wide, but it is preferable to pass to the northward; in doing so, however, care is necessary to avoid the

reef which projects half a mile southward from the east point of Desie, and also a rock awash which lies a quarter of a mile off the south point of the Madang islands.

RODONG STRAIT, between the Rodong and Tetampan groups, is also navigable, but there is a rock-awash lying N.E. by N. distant 6 cables from the north point of Rodong; there are also two patches of reef, one lying a quarter of a mile south-eastward, and the other half a mile south-westward, of the southern island of the Tetampan group. Besides avoiding the first-mentioned danger, vessels when working should not stand to the southward of a line joining the northern extremes of Rodong and Missana islands.

The channel between the Tetampan group and Dua islands is safe, taking care not to stand within three-quarters of a mile of the south-west islands of the group lying between Tetampan and Little Nopong.

PANGALLAP STRAIT is bordered on the east by the Tetampan group and Selanga islands, and on the west by Allor, Pangallap and Udik. A bank about $1\frac{1}{2}$ miles in length, with 6 to 10 fathoms water, lies in the fairway of this strait, having on the northern end a rock awash, from which north Selanga island bears E. $\frac{1}{4}$ S. distant nearly 2 miles; from the rock the bank trends in the direction of Allor island, with a patch of $2\frac{1}{4}$ fathoms, hard sand, near its south end, from which Allor island bears S.S.W. $\frac{3}{4}$ W. distant $1\frac{1}{2}$ miles. Vessels may pass between or on either side of these dangers, but it is better to pass to the eastward of both. Off the east side of Pangallap, a hard mud bank extends nearly one mile, with 5 to 10 fathoms water, and a bank of sand half a mile in extent, with about the same depth of water extends eastward of Udik; elsewhere the soundings are irregular, 13 to 28 fathoms.

Owing to the uneven nature of the bottom, the strong tides, near springs, cause violent whirls and overfalls which are alarming to strangers, but it seems only necessary to avoid the above described dangers to pass safely through the strait, as none besides those could be discovered, though carefully searched for.*

ABANG ISLANDS.—Little Abang island, about one mile in extent, lies 2 miles N.W. by N. from Dedap, with the Nio islands, surrounded by reefs, lying nearly one mile from its eastern side.

Great Abang Island, 4 miles long and $2\frac{1}{2}$ miles broad, is situated north-west of Little Abang, and is separated from it by a channel with 3 to 9 fathoms, which is contracted near the centre to one cable in breadth by an island near Great Abang, and the reefs extending from both islands.

* Staff Commander J. W. Reed, H.M. Surveying vessel *Rifleman*, 1869.

A rock, with 3 feet water, and 4 to 9 fathoms close-to, lies W. $\frac{3}{4}$ S., nearly one mile from the south-west point of Little Abang. Close to the west side of Great Abang is Tortel islet, and W. $\frac{3}{4}$ S. nearly $1\frac{1}{2}$ miles from this islet is Hippomenes rock, awash, with 7 to 13 fathoms around it.

Cameleon Rock is small, about one foot above high water, with 7 to 11 fathoms close to its west side, and some patches of 2 and $2\frac{1}{2}$ fathoms from a quarter to half a mile northward and north-eastward of it. From the rock the apex of Potong bears N.N.W. distant $6\frac{3}{4}$ miles, and the south point of Little Abang E. $\frac{3}{4}$ N. distant about 7 miles.

Potong, if not brought to the westward of North, will lead well clear to the westward of Irene, and Cameleon rocks.

Potong Island, lying 5 miles W.N.W. from Great Abang, has several hills, one of which is 462 feet high. The island is surrounded by numerous islets and rocks, which, off its south-east side, extend three-quarters of a mile. Off the north-east side the depths are irregular and somewhat shoal, $3\frac{1}{4}$ fathoms being found at two-thirds of a mile, and $2\frac{1}{4}$ fathoms at one-third of a mile from the shore. Off its west side isolated and sunken patches extend about one mile south-west from its north-west extreme.

Pulo Anak Potong, composed of two islets nearly one mile in extent, lies about $2\frac{1}{2}$ miles westward of Potong island, with apparently depths of 12 to 18 fathoms in the channel between.

Gull rock or islet, lies one mile west-north-westward of Anak Potong; westward and northward of it are patches of 4 to 5 fathoms.

ABANG STRAIT.—Between Dedap and Little Abang is Abang strait, reduced to the breadth of one mile by two islets which lie half a mile off the north-west end of Dedap, and by the Sapientu islets and rocks, the outer edge of which is three-quarters of a mile from the south-east end of Little Abang. The depths near the islets are 7 fathoms, with 12 in mid-channel, increasing to 20 or 30 fathoms between the north point of Pangallap and the Nio islets. See directions at page 456.

DUMPO STRAIT, about 7 miles in length in a north-west and south-east direction, and 3 miles in breadth, lies between the Abang islands and Pulo Galang. Fringing reefs extend from 2 to 4 cables from the islands bordering the strait.

Dumpo strait affords easy and safe navigation, the fairway being perfectly free from danger, and the following rocks lie so near the islands that they may be easily avoided. Haai reef, a patch of 2 fathoms, lies a quarter of a mile S.S.E. from Pulo Dumpo; a 6-foot rock, E.S.E. half a mile from the south-west point of Galang; a rock above water, E. by S. one third of a mile from the north point of Great Abang; and Penjabung

rock, S.W. $\frac{1}{4}$ S., half a mile from the north point of the island of that name. This last is the most dangerous, and will be avoided if the south-west point of Galang be kept open of the south-west point of Penjabung, or the apex of Tafelberg, a table hill on Galang island, open westward of Semut island. The depths in the strait are irregular, varying from 11 to 24 fathoms. See directions at page 456.

DURIAN STRAIT, between Great and False Durian, is nearly 4 miles wide; the Brothers islets lie in its southern approach, and may be passed on either side. The channel eastward of the Brothers has from 10 to 15 fathoms, and is 4 miles wide; that to the westward has from 8 to 14 fathoms, and is 3 miles wide; both are equally safe.*

Three Brothers.—The South Brother is the largest and highest of the three islands lying at the south entrance of Durian strait. It is about one mile in length, and about one third of a mile in breadth; its summit near the centre of the island is 257 feet high, and may be seen 17 or 18 miles. There is a white cliff or rock on the north-east side, which makes this island remarkable. Rocks extend some distance off the south extreme of the island.

The Middle Brother, 135 feet high, lies about one mile northward of the South Brother. Between the South and Middle Brother there is a safe passage, about two-thirds of a mile wide, with depths from 8 to 13 fathoms.

The North Brother, or Round island, 87 feet high, is smaller and lower than the others. It lies N. by W. distant $2\frac{1}{2}$ miles from the Middle Brother. A straggling reef partly dry at low water, with a rock above water at its southern end, extends three quarters of a mile S.S.E. from North Brother. Between this reef and Middle Brother there is a safe passage $1\frac{1}{2}$ miles wide, with 11 to 17 fathoms water, now frequently used; but vessels passing through should keep within one mile of Middle Brother, to avoid North Brother reef.

Eastern Bank, lying to the eastward of the Brothers, is composed of hard sand, having irregular depths of one to 6 fathoms, with 10 and 12 fathoms close to its western edge. From the North Brother, its south extreme of 5 fathoms, bears East, nearly 5 miles, thence its western edge extends about N.N.W.

Low Mangrove Islands.—Several low mangrove islands extend from about $2\frac{1}{2}$ miles northward of the Sumatra coast, to a distance of 8 or 9 miles in that direction from it. South island, the south-easternmost of the group, is small, 90 feet high, and surrounded by rocks. The north-

* See Admiralty chart of Durian, Moro, and Jambol straits, No. 2,402, scale $m=0.65$ of an inch. For directions, see pages 455-461.

easternmost one, named Long island, which lies about 6 miles westward of the South and Middle Brothers, is $1\frac{1}{2}$ miles long; at one mile north-westward of it is a higher island, named Saddle.

FALSE DURIAN or Pulo Duri, is an irregular shaped island about $2\frac{1}{2}$ miles in extent, and with the adjacent islands, forms the south-western limit of Durian strait. Near its north-west end is a peak 604 feet high, which bears West distant 5 miles from the North Brother.

Three or four small islands lie close to the south-east point of False Durian, the outermost and smallest of which is named Rocky islet. Rocky islands, a group of islets and rocks, lie off the north-west point of False Durian, and a bank with $4\frac{1}{2}$ and 5 fathoms water, one mile in extent, lies from one to 2 miles off in the same direction.

NOTE.—“As the islands hereabout have a similar appearance, strangers when coming from the southward ought to be careful not to mistake one for the other, for some vessels have not been able to discern the proper passage. The conical peak of Great Durian being higher than any of the other land, is first discerned in coming from the southward.”*

Shoal Patches.—Several patches lie on the bank southward of False Durian, one of which, having 2 fathoms water, lies with the northern extreme of Long island bearing W. $\frac{1}{2}$ S., and the peak of False Durian N.N.W. $\frac{1}{4}$ W. Three-quarters of a mile to the southward of this patch is another with $3\frac{1}{2}$ fathoms, and 4 or 5 fathoms at a short distance from its eastern side. Patches of $4\frac{1}{2}$ and 5 fathoms, also lie at 2 and 3 miles southward of the 2-fathoms patch.

At about $1\frac{1}{2}$ miles north-eastward of the 2-fathoms patch is another with 3 fathoms, sand and shells, and 4 and 5 fathoms around, discovered by H.M.S. *Saracen*; it lies three-quarters of a mile South from Rocky islet. Depths of less than 5 fathoms extend one mile or more south-eastward of this patch.

Clearing marks.—Vessels from the southward will avoid all these patches, and the bank off the Sumatra shore, by keeping South Passage island open eastward of Rocky islet, east extreme of False Durian; or by keeping the peak of Great Durian westward of N. $\frac{3}{4}$ W.; and it would seem advisable for large vessels not to stand far to the westward of that line, for from the irregularity of the bottom other and shoaler spots may exist.

Richardson Shoal is about one cable in extent, with $2\frac{3}{4}$ fathoms water, and 7 to 10 fathoms around and between it and the east side of False Durian island. From the rock the peak of False Durian bears

* Horsburgh, Vol. II.

W. by N., distant $2\frac{1}{10}$ miles; and Rocky islet S. $\frac{1}{2}$ E. three-quarters of a mile.

Rocky islet kept westward of S. by W., until the peak of False Durian bears West, leads clear and eastward of the shoal.

GREAT DURIAN or **Pulo Sanglar**, about 4 miles N.N.W. of the North Brother, is $3\frac{3}{4}$ miles in extent, with a peak near its centre 965 feet high.

The Tombs is the name given to some islets and reefs, extending about three-quarters of a mile from the southern part of Great Durian.

A small coral reef lies about half a mile south-westward of the Tombs and about a mile S.E. by S. from the south-west point of Great Durian. Between this reef and the Tombs are depths of 12 fathoms, and from 15 to 27 fathoms at a short distance from both dangers. Great Durian peak bearing North, and False Durian peak bearing S.W. $\frac{1}{2}$ W., will lead about half a mile clear of the western and southern sides of both dangers.

Little Durian, 590 feet high and 2 miles in extent, lies close off the north-west extreme of Great Durian. Some rocks lie close to the south-west shore of Little Durian, and a small islet with a rock outside it lie off the north-west point.

South Passage Island, situated three-quarters of a mile from the south-west coast of Little Durian, is 204 feet high, about half a mile in extent, and surrounded by rocks lying close to the shore.

North Passage Island, 156 feet high, is 2 cables in extent, and lies N.W. by N. $2\frac{1}{4}$ miles from South Passage island.

Princes Island, lies abreast of and $2\frac{3}{4}$ miles distant from North Passage island, on the western side of Durian strait; it is low, of coral formation, covered with trees about 100 feet high, and having a round and conspicuous appearance. On the eastern side there is a coral ledge, nearly awash at low water, and extending 3 cables; a reef apparently extends half a mile S.W. of the island.

The Strait of Sanglar may be considered one of the southern entrances to Durian strait, although it is but partially surveyed, and does not offer any advantages to induce a vessel to proceed through it, but on the contrary is very inferior to either of the other channels. It lies to the northward of Great and Little Durian, and is bounded on the north by the islands of Jang, Moro, and the Monkey group. The strait is about one mile wide, and divided by two islands, which reduces the width of the navigable channel to the northward of those islands to little more than half a mile.

The depths between Eastern bank and Great Durian vary from 14 to 9 fathoms. Large vessels should not, however, go nearer to the east coast of

Great Durian than 2 miles, on account of a bank which projects $1\frac{1}{2}$ miles from that side of the island, with 5 to 3 fathoms water, and possibly less in places.

In the eastern part of the strait of Sanglar the depths are from 18 to 12 fathoms, decreasing to 10, and 7 fathoms at its western end. In the fairway of the western end is a patch of 4 fathoms, from which the north-west extreme of Little Durian bears S. by W. $\frac{1}{4}$ W., distant nearly one mile. The soundings that have been taken in this strait are very few, and as it is quite possible that shoaler parts than those known of may exist, it is not therefore recommended.

MORO ISLAND which forms the eastern side of the middle part of Durian strait, lies about $1\frac{1}{3}$ miles northward of Great Durian; it is $5\frac{1}{2}$ miles long in a north-west and south-east direction, and about one mile broad. On the east side of Moro island, between it and Suji island, is Moro strait.

The west side of Moro is but imperfectly known, and few soundings have been obtained near it. A reef appears to extend about a quarter of a mile from its north-west point, having 10 to 12 fathoms close to.

Monkey Islands, three in number, lie from one to 2 miles westward of the south part of Moro island; the middle island, which is the largest, is about half a mile in diameter.

Rocks.—Two rocks or patches of reef lie half a mile off the west point of the westernmost Monkey island. The west extreme of Little Durian, bearing S.S.E., or North Passage island S.W. by S., leads to the westward. In the channel between these rocks and North Passage island the soundings are 27 and 28 fathoms close to the island and in the fairway, but near the rocks are 18 and 15 fathoms.

Dolphin Island, 153 feet high, situated about one third of a mile off the north-west end of Moro island, is about one mile in extent, and fronted on its western side by a coral reef projecting about two cables from the shore, with irregular depths of 13 to 20 fathoms close to.

A rock lies one third of a mile N.N.W. from the north extreme of Dolphin island.

A reef, 2 cables in extent, steep-to, and dry at low water springs, lies one mile westward of the southern part of Dolphin island. From the centre of this reef, Red island bears N.N.W.; and the south-west point of Dolphin island is in line with the sandy north point of Moro island.

Pulo Bolombo, the southern end of which lies about one mile eastward of the north end of Moro, is high, about 3 miles long, north-west and south-east, and half a mile broad. The north end of Pulo Bolombo is fronted by a reef to a distance of nearly half a mile, having a white rock within its edge, off the north-west point of the island.

The Twins, or Pulo Mentegas, are two small round islands, 152 feet high, lying a little more than one mile north-eastward of Red island, and one mile north-west of Pulo Bolombo.

Dangerous reef.—At three-quarters of a mile N.W. by W. of the north Twin is the outer end of a dangerous coral reef 4 cables in extent, dry at low water spring tides, and having from 10 to 17 fathoms around. North Passage island touching or shut in with Red island, leads westward of it.

Red Island (Pulo Gumeata), lying nearly 2 miles north-west of Dolphin island, is of a triangular shape, about half a mile in extent, and covered with trees. It is 256 feet high, and may be seen 15 miles.

Rocks.—The passage between Red and Dolphin islands ought not to be attempted, for nearly in mid-channel lies a dangerous rock, awash at low water spring tides; the soundings near it being irregular, afford no guide. From the centre of this rock the north-east end of Red island is in line with the south peak of Great Carimon, and the centre of the Twins bears N. $\frac{3}{4}$ E.

A rocky patch, dry at low water, lies rather more than half a mile W. by S. from the west end of Red island, with deep water all round, and between it and the island. From the centre of the patch, the north-west bluff of Red island is in line with the south end of the North Twin; and the peak of False Durian is just within the east extreme of South Passage island.

Rocky Islet.—Nearly half a mile northward of Red island is a rock with a tree on it, surrounded by rocks dry at low water, between which and Red island the depths are 15 and 16 fathoms.

Middleburgh shoal, lying nearly mid-way between Red island and the bank extending from Sabong island, is a reef of coral rocks, 300 yards in extent, dry about one foot at low water spring tides,* with 7 and 9 fathoms close to the rocks, and 17 to 20 fathoms about one cable off. From the centre of the shoal, Passage islands are in line, their east extremes bearing S.E. by S.; and the rocky islet, with a tree on it, off the north end of Red island, is nearly touching the North Twin.

Clearing mark.—The whole of South Passage island open eastward or westward of North Passage island clears Middleburgh shoal. The peak of False Durian touching the east side of North Passage island leads in mid-channel, between it and the shoal half a mile westward of Red island.

Islands between False Durian and Sabong Island.—The western shore of Durian strait, from False Durian to the Carimons, is

* Horsburgh.

formed of numerous low islands, covered with trees, the principal of which is Sabong. This land is generally known as the Sabong shore, for the islands forming it are separated from Sabong and from each other only by very narrow channels, and therefore appear as one continuous island.

Pulo Panjang, a large low flat island, lies northward of Saddle, and westward of False Durian; off its north coast is a small islet named Round island.

Pulo Terreatep, the next island named on the chart, is the largest and easternmost of a group of several islands, and lies 5 miles west-north-westward from False Durian; about a third of a mile for its east side is a patch with 4 fathoms water.

Two miles N.N.W. $\frac{1}{2}$ W. from Terreatep, is what appears to be rather a conspicuous island, for it is delineated upon the chart as having two hills upon it, whereas all the adjacent land, and also Princes island, about a mile to the north-eastward, appears low. This island is distant about one mile from the nearest point of Sabong, a round island lying between them.

The channel between the island just mentioned and Princes island, has not been sounded. No vessel should venture through it, for reefs are known to extend a long distance from Princes island, and other dangers may possibly exist. There are no known dangers off the eastern shores of these islands.

SABONG ISLAND, or Pulo Pappan, is the largest island on the western shore of Durian strait. Its north point reaches to within 3 miles of the southern part of Great Carimon, and off its north-east coast lie the islands of Búrú, Paril, and Pandan. Gunong Pappan stands on the north part of the island and is remarkable as being the only hill on the west side of the channel southward of Carimon island.

Deep-water point, the most eastern point of Sabong, lies nearly 3 miles north-west from Princes island. A reef with some trees upon it, lies S.S.E. nearly one mile from the point; it will be avoided by keeping false Durian peak open eastward of Princes island. From Deep Water point the Sabong coast trends west-north-westward, and lying close off it are four islands, the north-westernmost of which is the largest.

There is a depth of 5 fathoms within a short distance of Deep water point, and 8 to 9 fathoms beyond; in the bight to the northward a shallow bank extends out to a line joining Deep water point and Pulo Búrú.

PULO BÚRÚ is a low island $4\frac{1}{2}$ miles in length, crowned with high trees, and having a few inhabitants, who collect great quantities of mangoes, durians, and other fruits, which flourish here in a wild and luxuriant state. It is the next largest island to Sabong, and its south-east

part bears N.N.W. nearly 5 miles from Deep Water point. Clay island, covered with straggling trees and surrounded by rocks, lies off its south extreme.

Bank.—Clearing mark.—The eastern shore of Pulo Búrú is fronted by a shoal-water bank to a distance of one to $1\frac{1}{2}$ miles, with rocks dry at half tide nearly to the same distance. This bank and its continuation to the southward, will be avoided by keeping Deep Water point southward of S. $\frac{3}{4}$ E.

Pulo Pandan, the southern of two small islands lying about one mile northward of Pulo Búrú, is low, and covered with trees about 100 feet high.

Pulo Paril is a much larger island than Pandan, and lies to the westward of it, close to the northern part of Sabong.

Sand banks.—A small patch of 5 fathoms lies E. $\frac{1}{2}$ S. distant nearly $1\frac{3}{4}$ miles from Pulo Pandan; and two patches of $4\frac{3}{4}$ fathoms lie E. by N. nearly 2 miles, and N.E. $\frac{1}{2}$ N. the same distance from it. These patches seem to be the tail of a bank of mud and sand, lying about two miles off the south-east coast of Great Carimon, and which nearly joins another bank extending south-east from Little Carimon, described with those islands on page 34.

Clearing marks.—Pulo Pandan bearing South, leads eastward of the $2\frac{3}{4}$ fathoms patch on the southern bank; and the peaks of Little Carimon, in line, about N.W. or more westerly, leads eastward of all these banks.*

Philip channel, *see* p. 97, and directions for, at p. 458.

SUJI, JAMBUL, BULANG, and BATTAM, are four islands lying to the north-eastward of Moro and Bolombo islands. The two former are about 10 miles long in a north-west and south-east direction; the two latter are much larger, Bulang being about 15 miles long, in the same direction, and 7 miles broad, and Battam 15 or 16 miles in an east and west direction, and 13 or 14 miles north and south. The northern parts of Bulang and Battam form part of the southern side of Singapore strait.†

Numerous small islands, islets, and rocks lie off the shores of, and in the channels between these islands, the whole of which are known under the general name of the Bulang archipelago, but in the present state of our knowledge no vessel should venture among them, and it is, therefore, only the outermost islands and dangers which concern the ordinary navigator; those will be next described, after the following brief observations on the channels between the large islands.

* *See* Admiralty chart:—Singapore strait, No. 2,403.

† *See* Admiralty chart:—Straits of Durian, &c., No. 2,402; also Nos. 2,403, and 1,355.

Moro strait lies between Great Durian, Moro and Bolombo islands on the west, and Eastern bank and Suji island on the east. There are many islands and rocks in this strait, which has been but imperfectly surveyed; it is however navigable with proper care. The electric telegraph cable between Singapore and Batavia passes through this strait.

Suji strait, between Suji and Jambul, is very imperfectly known, but it is certainly encumbered at both ends with many dangers.

Jambul strait, between Jambul and Bulang, is also encumbered with many dangers, although apparently not to so great an extent as Suji; it is but imperfectly known, and at present, like the rest of the straits, is not available for general navigation.

Batu Hadji strait, between Bulang and Battam, is very narrow, in some places not a quarter of a mile broad. A running survey was made of this strait several years ago by Mr. L. C. Bailey, Master R.N., and it is said to be available for vessels, but we cannot give any directions for it. Some years ago it was urged upon the attention of nautical men at Singapore as being a route by which vessels could be speedily towed from Singapore road to sea in the north-east monsoon; but it will have to be properly surveyed before it can be used for such a purpose.

Pulo Doncan, lying about 5 miles N.N.W. $\frac{1}{2}$ W. from the north extreme of Suji island, is the larger of two low wooded islands, fronting the north entrance of the strait of Jambul, which is formed by a group of beautiful islands, some of which are inhabited. Pulo Doncan is surrounded by reefs, and ought not to be approached nearer than one mile.

TIDES.—Throughout Varella and Durian straits the tides are very irregular, rendering it difficult to ascertain either their direction or velocity. In August and September the rise and fall was found generally to be between 10 and 11 feet, sometimes running from 3 to 4 miles per hour during springs; at other times not more than $2\frac{1}{2}$ knots at the same period. This irregularity appears to be produced by the prevailing winds in the north or south entrance of the straits, forcing the tides through in one direction for 12 or 18 hours at a time, although the rise and fall on the shore was regular. But sometimes the tides run with regularity.

It is high water at Red island, and Deep water point, in the northern part of Durian strait, full and change, at 10h., and the tide rises about 10 feet.

Ripplings.—The ripplings met with in the straits might be alarming to a stranger; they appear to be caused by the uneven bottom, and the resistance the tides meet with from the steep reefs and numerous small islands.

DIRECTIONS.—Banka Strait through Varella and Durian Straits to Singapore.*—From the north entrance of Banka strait, and westward of Frederick Henry rocks, in about 7 fathoms. a N.N.W. course will lead towards Varella or Brahalla island, distant about 78 miles. The bank along the Sumatra coast being shelving, the soundings are usually the best guide, and the rule is to keep in from $5\frac{1}{2}$ to 7 fathoms. In working, the coast may be approached with care to a depth of 5 fathoms, observing that the bank, with from 4 to 5 fathoms water, extends from 10 to 12 miles S.E. by E. from Tanjong Bon.

The tides near the shore are generally strong; in the offing they are irregular, and currents sometimes prevail.

In passing southward of Varella island, keep in 10 or 12 fathoms towards Varella to give a berth to the bank of hard ground projecting from Tanjong Bon; thence in working along the coast to the westward, the bank is steep-to, and may be approached occasionally, with care, to 8 or 7 fathoms.

Standing towards Varella, remember the shoal of 2 fathoms water, reported to lie E.S.E., distant 3 miles from that island (page 437). Being westward of the narrow part of the passage between Tanjong Bon and Varella, which is about 7 miles wide, a N.W. by W. course should be steered towards the Alang Tiga islands, in depths of 9 to 12 fathoms. With a working wind, the Sumatra coast may be approached to 6 or 7 fathoms. When steering towards the Alang Tiga, the southernmost island must not be brought more westerly than N.W. by N. until Seera or Reef island is southward of E. by S. $\frac{1}{2}$ S., to avoid Speke rock.

In this track attention to the tides is indispensable, for they are often irregular, sometimes setting out of the Jambi river to the north-eastward at the rate of $2\frac{1}{2}$ or 3 miles an hour; and the coast bank to the distance of 14 or 15 miles westward of Tanjong Bon, is nearly dry at low spring tides, in some places 4 or 5 miles from the shore.

Between Alang Tiga islands and Basso island the depths vary from 7 or 8 fathoms near Alang Tiga, to 13 and 14 near Basso; deepening to 15 and 18 fathoms 2 miles eastward of Dato point.

Having passed Alang Tiga at about 2 miles, a course about N. by W. should be steered for the southernmost of the Three Brothers, bearing from the Allang Tiga N. by W. $\frac{1}{2}$ W. distant 63 miles; when the peak of Great Durian is seen over the South Brother, bearing N.N.W., it should be steered for, passing on either side of South Brother. In working, be

* Mostly from Horsburgh. See Admiralty charts:—Banka strait to Singapore, No. 2,757; channels between Sumatra and Linga, &c., No. 1,789; and straits of Durian, No. 2,402.

careful not to stand nearer to Basso island or Dato point than 2 miles, and also avoid being tempted to stretch into Amphitrite bay, as the banks are steep-to, and cannot be approached by the lead. At 6 or 7 miles northward of Dato point the depths decrease more regularly towards the bank, which may from thence be approached by the lead into 8 or 7 fathoms towards the low Mangrove islands. In standing to the eastward, do not deepen above 18 or 19 fathoms, particularly as the distance from the Alang Tiga islands is increased, for the ground on that side is foul, and unsuitable for anchorage.

Marks for keeping clear of Irene rocks and other dangers on the eastern side of the channel have been given in page 443, and the navigator is referred to them if he should stand so far over to the eastward, which is, however, out of the fair track.

Passage to Singapore by Abang and Dumpo Straits.

—It should be mentioned here that, in order to avoid the difficulty and delay sometimes experienced in getting from the northern part of Durian strait to Singapore road, many sailing vessels have preferred to pass from the Inner route by Abang strait or Dumpo strait into Rhio strait. It seems probable that the best passages might be made in this way, for the great depth of water in the western part of Singapore strait is often embarrassing in light winds. H.M.S. *Saracen* made a good passage by the Abang strait route, first experiencing all the advantages of the smooth water and less unfavourable tides of the passage inside Linga by Varella strait, and then passing without the least difficulty through Abang strait into Rhio strait. See page 446, and Chapter X.

To enter Durian Strait by the Eastern Channel, a berth of one or 2 miles may be given to the South and Middle Brothers, by passing them in from 10 to 15 fathoms, and on nearing the North Brother, give a prudent berth to the reef that projects to the south-eastward. In standing towards Eastern bank, avoid bringing Great Durian peak westward of N.W. by W.; or if the vessel gets on the edge of the overfalls in making the eastern board, tack immediately, and stand towards the Brothers to 10 or 11 fathoms. When the southern point of Great Durian is approached, the Tombs will be discerned; and Sabong hill bearing about W.N.W., making like two islands, which may be mistaken for the Carimons. Having passed the North Brother, at $1\frac{1}{2}$ or 2 miles distance, steer to the westward, giving a berth of about 2 miles to the southern part of Durian, by keeping North Passage island open of Little Durian, to avoid the sunken rocks south-westward of the Tombs.

To enter Durian Strait by the Western Channel, pass $1\frac{1}{2}$ miles westward of the South Brother, and proceed to the northward in 8 to 12 or 14 fathoms, about mid-channel between the other Brothers and

the eastern part of False Durian, observing that South Passage island kept open of False Durian rocky islet, clears the dangers southward of False Durian.

When standing towards Richardson shoal, keep Rocky islet to the westward of S. by W. until the peak of False Durian bears West.

Having cleared the Brothers by either of the channels, the Passage islands will be seen to the north-westward on the east side of the channel, and should be steered for, passing between them and Princes island to the westward. In mid-channel the depths will be generally from 17 to 26 fathoms. On approaching Passage islands, Red island about 6 miles northward of North Passage islands, will be discerned; and may be known by two islets north-eastward of it, named the Twins.

There is a channel between the Passage islands and Little Durian, but it is not frequented, as it is not so convenient as that to the westward; but in case of necessity a vessel may pass between any of these islands, giving them a berth of half a mile, as off their points there is generally rocky and foul ground.

There is also a narrow passage, with 13 to 15 fathoms water, on either side of Red island, but they are not recommended.

The Channel Westward of Middleburgh Shoal is preferable, being about $2\frac{1}{4}$ miles wide with mostly regular soundings from 16 and 17 fathoms close to the shoal, decreasing gradually towards the Sabong shore over a bottom of soft mud, suitable for anchorage. When clear of North Passage island, haul to the westward for the Sabong shore, then steer about N.N.W. along it, in 7 fathoms, which will lead in the fair track between the shore bank and Middleburgh shoal. When Red island bears East, edge out a little, bringing Deep Water point about S. $\frac{1}{4}$ E. or S. $\frac{1}{2}$ E., and deepen to 10 or 12 fathoms; continuing to keep in these depths, steer to the northward, taking care from abreast of Pulo Pandan to bring Little Carimon peaks westward of N.W., to give a good berth to the bank of sand and mud, which projects 3 miles from the shore of Great Carimon island. Little Carimon may be rounded at any convenient distance, if bound through Malacca strait.

In working, keep the Passage islands open of each other, and do not deepen towards Middleburgh shoal to above $8\frac{1}{2}$ fathoms, as the depth is 9 fathoms very near its western edge; but the Sabong shore may be approached to 5, or $4\frac{1}{2}$ fathoms, in a small vessel.

The Channel Eastward of Middleburgh Shoal, between it and the reef lying W. by S. from Red island, is 2 miles wide. False Durian peak in line with the east side of North Passage island is a good mark, and leads in mid-channel in 16 to 19 fathoms, mud.

In working, and standing towards Middleburgh shoal, do not bring the peak of False Durian open westward of North Passage island more than the breadth of that island; and when standing towards the patch off Red island, tack before False Durian peak touches South Passage island. The tides are very strong between Middleburgh shoal and Red island, the flood setting to the southward, and the ebb to the northward, from 3 to 4 miles an hour at springs.

To pass through Phillip Channel.—If bound to Singapore having passed between Middleburgh shoal and the Sabong shore, and brought Red island to bear East, a course about N.E. by N. may be steered, guarding against tide, to pass through Phillip channel to the westward of Doncan island and between Cap and Round islands, neither of which should be approached nearer than three-quarters of a mile, on account of the reefs which project from them.*

In this route take care that the vessel is not set too near the dangers which lie at the entrances and near the points of Moro, Suji, and Jambal straits, for the tide runs through them with a velocity of 3 or 4 knots an hour at springs. After shaping a course to pass between Cap and Round islands, the dangers off Red island and the Twins will be avoided, by not bringing Pulo Doncan to the northward of N.E. by E.; and Cap island kept on a N.E. or N.E. by N. bearing will lead well to the westward of the dangers extending from Pulo Doncan.

Having passed Cap island, bring it to bear S.S.W. astern, which will lead through in mid-channel between Round island to the westward, and Helen Mar reef to the eastward. The depths in this track are variable, 15 to 35 fathoms.

In working, if standing westward of the south end of Round island, do not go farther in that direction than to bring Raffles lighthouse on with the north-west end of Long island, to avoid the reefs lying south-west of Red island.

Standing towards the north-east sides of Round and Long islands, Cap island should not be brought southward of S. by W. $\frac{1}{4}$ W., or Raffles lighthouse eastward of N. $\frac{3}{4}$ E.; Cap island kept to the southward of S.S.W. $\frac{3}{4}$ W. leads clear of Helen Mar reef, and when the northern peak of Great Carimon is well open northward of Red island, a vessel will be northward of that danger, and may proceed into the fairway of the main channel of Singapore strait. To proceed from thence to Singapore road see page 108.

If preferred, instead of using Phillip channel, a vessel after passing between Middleburgh shoal and the Sabong shore, may steer a North

* See Admiralty chart:—Singapore strait, No. 2,403.

or N. by E. course, and pass into Singapore strait westward of Tree island.

Directions from Singapore Strait through Durian and Varella Straits to Banka Strait.*—Having proceeded as far as Raffles lighthouse, according to the directions given at page 109, and brought it to bear W.N.W., or N.W. by W., distant about $1\frac{1}{4}$ miles, Cap island will be seen bearing about S.S.W., and kept upon this bearing will lead about mid-channel between Helen Mar reef and Round island. In working, Cap island must not be brought westward of S.S.W. $\frac{3}{4}$ W. when near Helen Mar reef, or southward of S. by W. $\frac{1}{4}$ W., when off Round island.

Having passed westward of Cap island, a course about S.W. or S.W. by S. may be steered towards the Sabong shore, but as before noticed, care is necessary to guard against the effects of the tide in this locality.

Cap island kept on a N.E. by N. bearing, will lead well to the westward of the dangers near Doncan island, and after that island is passed, it should not be brought northward of N.E. by E. until a depth of 7 fathoms be obtained near the Sabong shore, to avoid getting too near the dangers lying off the Twins and Red island.

With a commanding breeze, the passage eastward of Middleburgh shoal may be taken by keeping the peak of False Durian in line with the east point of North Passage island, which will lead mid-way between the shoal and the rocky patch: the water deepens towards the Middleburgh shoal, it being steep-to all around. To prevent being set upon it in light winds, caution is requisite, as the tides run here from 3 to 4 miles an hour at times, with strong riplings.

A vessel from the direction of Malacca strait, and being abreast of Little Carimon, with its northern end bearing West about $2\frac{1}{2}$ miles, a S.E. by S. course will carry her clear of the mud-banks fronting the low land of Great Carimon, in depths of 7 to 8 fathoms, until abreast of Pandan island. With a working wind, from Little Carimon the soundings are the best guide in standing towards the mud-banks fronting Great Carimon, which ought not to be approached to a less depth than 6 fathoms, remembering that the peaks of Little Carimon in line bearing about N.W. leads close to the edges of the shoal banks; the depths in the offing are from 14 to 16 fathoms mud.

When the strait between Great Carimon and Sabong is open, the depths become irregular; and here caution is requisite with a working wind, as the tides set strong through this strait to the westward at times. When the north end of Pandan bears West about 3 miles, in about 8 fathoms, a

* Chiefly from Horsburgh, Vol. 2.

S. by E. course, or with Deepwater point bearing about S. $\frac{1}{2}$ E., will lead clear of the mud-bank that fronts Pulo Búrú, and mid-way between it and Middleburgh shoal.

In working, a vessel may stand to the eastward to a moderate distance at discretion, but to the westward she must not approach the shore of Pulo Búrú nearer than $1\frac{1}{2}$ miles, in $5\frac{1}{2}$ to 6 fathoms. When the south end of Pulo Búrú bears northward of West, the soundings will decrease regularly on the edge of the mud-bank which extends southward as far as Deepwater point, and the mud-bank may be borrowed on at discretion. Standing eastward towards Middleburgh shoal, tack when the west end of North Passage island touches the east end of South Passage island. The north end of Red island in line with the north extreme of Pulo Bolombo, will lead northward of Middleburgh shoal, and the north end of Red island in line with the south Twin, will lead southward.

When southward of Middleburgh shoal, a direct course may be steered for the east end of False Durian; the Passage islands may be approached to any convenient distance, but Princes island should be given a berth of one mile. The depths throughout are irregular, decreasing towards the western shore where there is a good anchorage. The bank of hard sand and stones, having $4\frac{1}{2}$ fathoms least water, lying north-westward of False Durian, will be avoided by keeping the north extreme of South Brother open of False Durian.

Standing towards the south end of Great Durian, come no nearer the Tombs than one mile, tacking before the whole of North Passage island is shut in with Little Durian. The best anchorage in this part of the strait will be found about three-quarters of a mile from the eastern shore of False Durian, in 12 to 14 fathoms. With a working wind and a favourable tide, keep near False Durian, where the tides are much stronger than in mid-channel; taking care to bring Rocky islet to the westward of S. by W. before the peak of False Durian bears West, to avoid Richardson shoal.

To pass Westward of the Brothers, between them and False Durian, steer through in mid-channel; but when working and standing to the westward, keep South Passage island open of False Durian until the north extreme of South Brother bears northward of E. by N. $\frac{1}{2}$ N., to avoid the patches southward of False Durian. The Brothers may be approached to a prudent distance.

To pass Eastward of the Brothers, being eastward of the Tombs steer from one to 2 miles northward and eastward of the North Brother, where the water will shoal to 12 or 13 fathoms; then steer about S.S.E., attending to the set of the tide, to pass the Middle and South Brother at the same distance, not borrowing nearer them than 10 or 12 fathoms. With a working wind, and standing towards Eastern bank, avoid bringing

Great Durian peak westward of N.W. by W., or tack when approaching the overfalls near the bank. The depths in this channel will be from 10 or 12 fathoms near the Brothers, to 16 or 18 fathoms near the overfalls on the edge of the Eastern bank.

Being abreast of South Brother, and at 2 miles distant, steer about South until it bears N.N.W.; and whether the vessel has passed eastward or westward of the Brothers, after having brought the South Brother to bear N.N.W., steer about S. by E. towards the Alang Tiga islands, and endeavour to keep in from 14 to 16 fathoms. With a working wind, the best track is to stand to the eastward until in 17 fathoms, about mid-channel, and into 12 fathoms towards the Sumatra shore, but not under this depth in passing Dato and Basso points, as the shoal fronting the latter is steep-to, with 8 to 14 fathoms near its edge; after passing Basso point, the coast may be approached occasionally to 6 or 7 fathoms.

The best track with a fair wind is about mid-channel between Basso and the Alang Tiga island, or pass about 2 or $2\frac{1}{2}$ miles westward of these islands at discretion.

Having passed the Alang Tiga islands, keep Mudiu the southernmost, to the northward of N.W. by N. until Seera island bears East, to avoid Speke rock; the proper track from the Alang Tiga islands to Varella is to keep along the Sumatra coast in 9 to 12 fathoms, borrowing to 6 or 7 fathoms towards the coast, with a working wind.

Caution is however necessary if navigating here in thick weather or at night, on account of strong tides setting into or out of the mouths of the rivers, or to the banks extending 6 or 7 miles off the coast westward of Tanjong Bon.

Varella island may be passed at about 2 miles distance in 10 or 12 fathoms; but the spit surrounding Tanjong Bon is steep-to, and should not be approached under a depth of 10 fathoms.

From a position about 10 miles eastward of Tanjong Bon to abreast Batakarang point, at the entrance of Banka strait, the course is about S.S.E., and the distance 66 miles, and the whole of the bank fronting the coast is in this space flat, with regular soundings, except the spit with 4 to 5 fathoms, extending from 10 to 12 miles south-eastward of Tanjong Bon. The best guide, therefore, after leaving Varella, is to keep along the coast in from $5\frac{1}{2}$ to 7 fathoms, until Batakarang point is approached; and $6\frac{1}{2}$ or 7 fathoms are the proper depths to preserve, when passing this point and entering Banka strait, westward of Frederick Henry rocks; when working, Batakarang point may be approached to $5\frac{1}{2}$ or 5 fathoms.

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