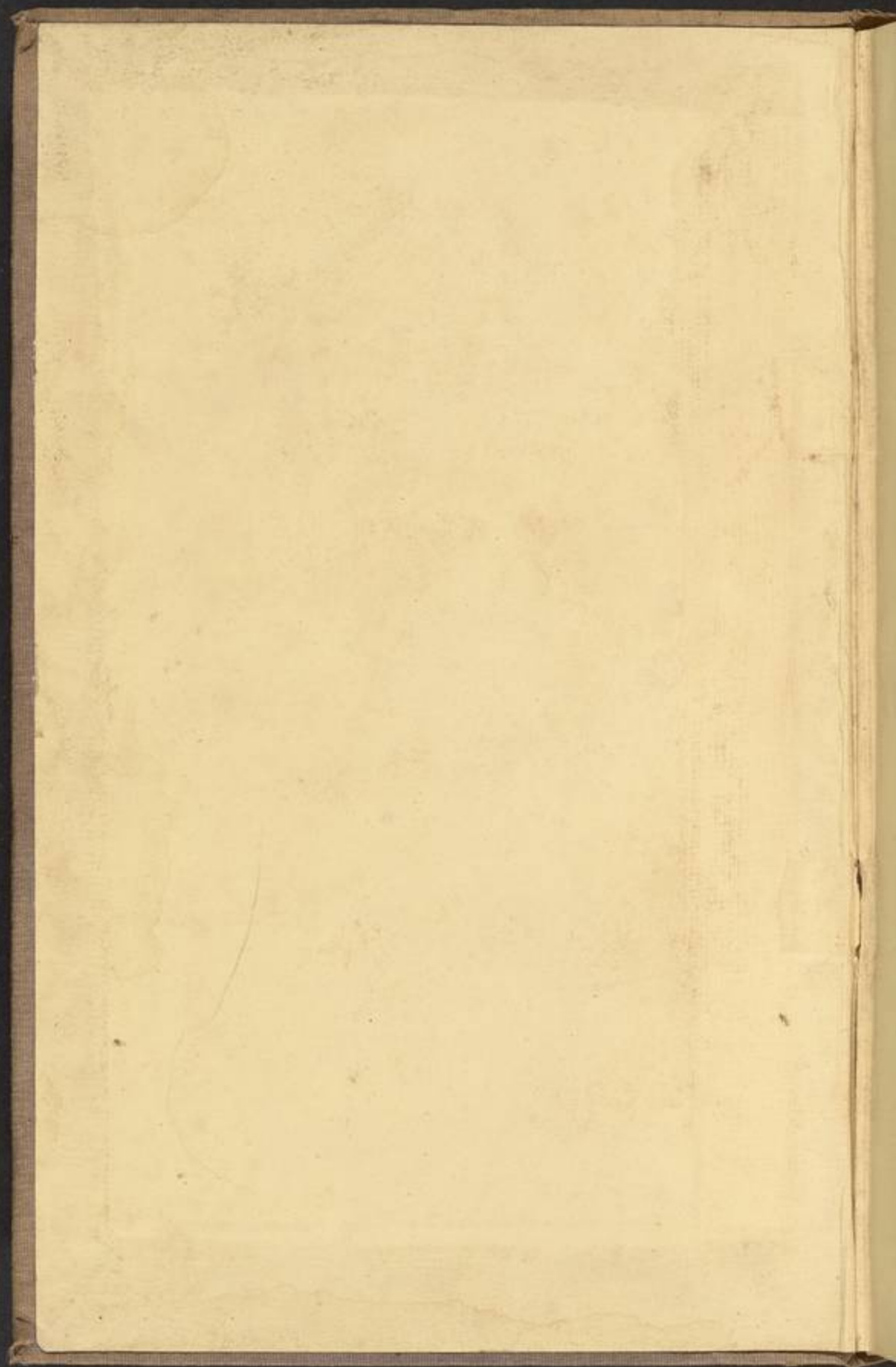


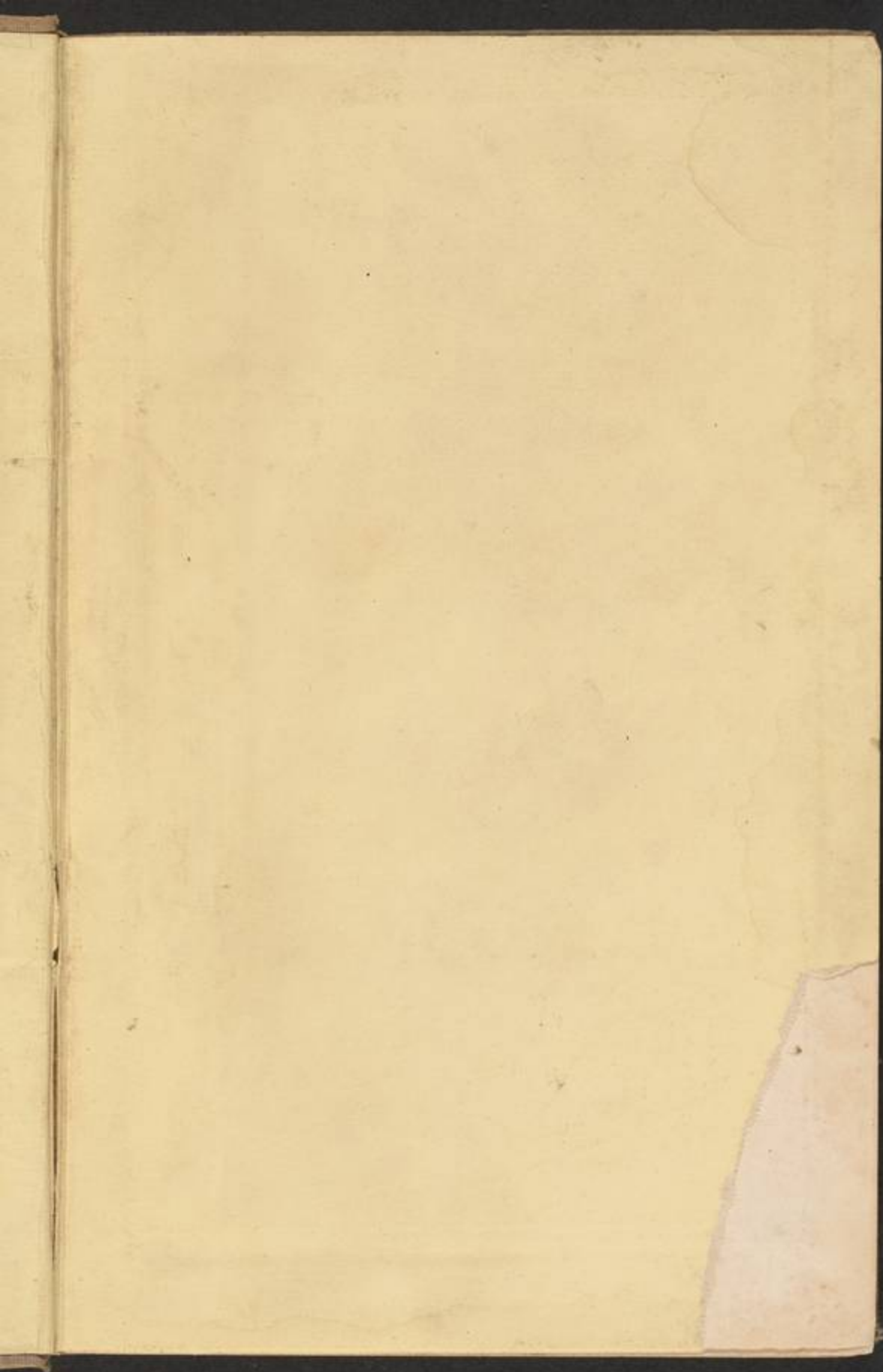
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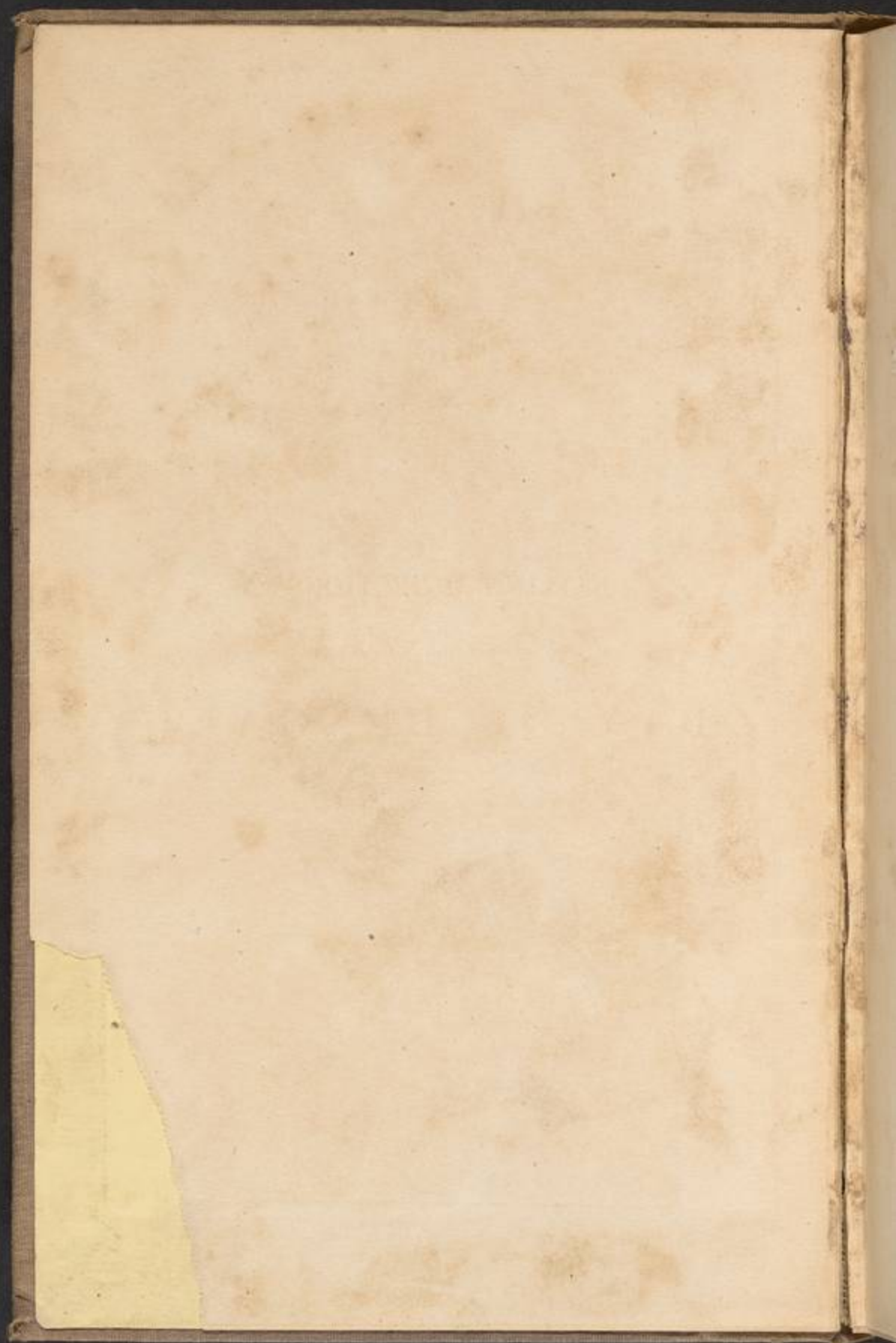


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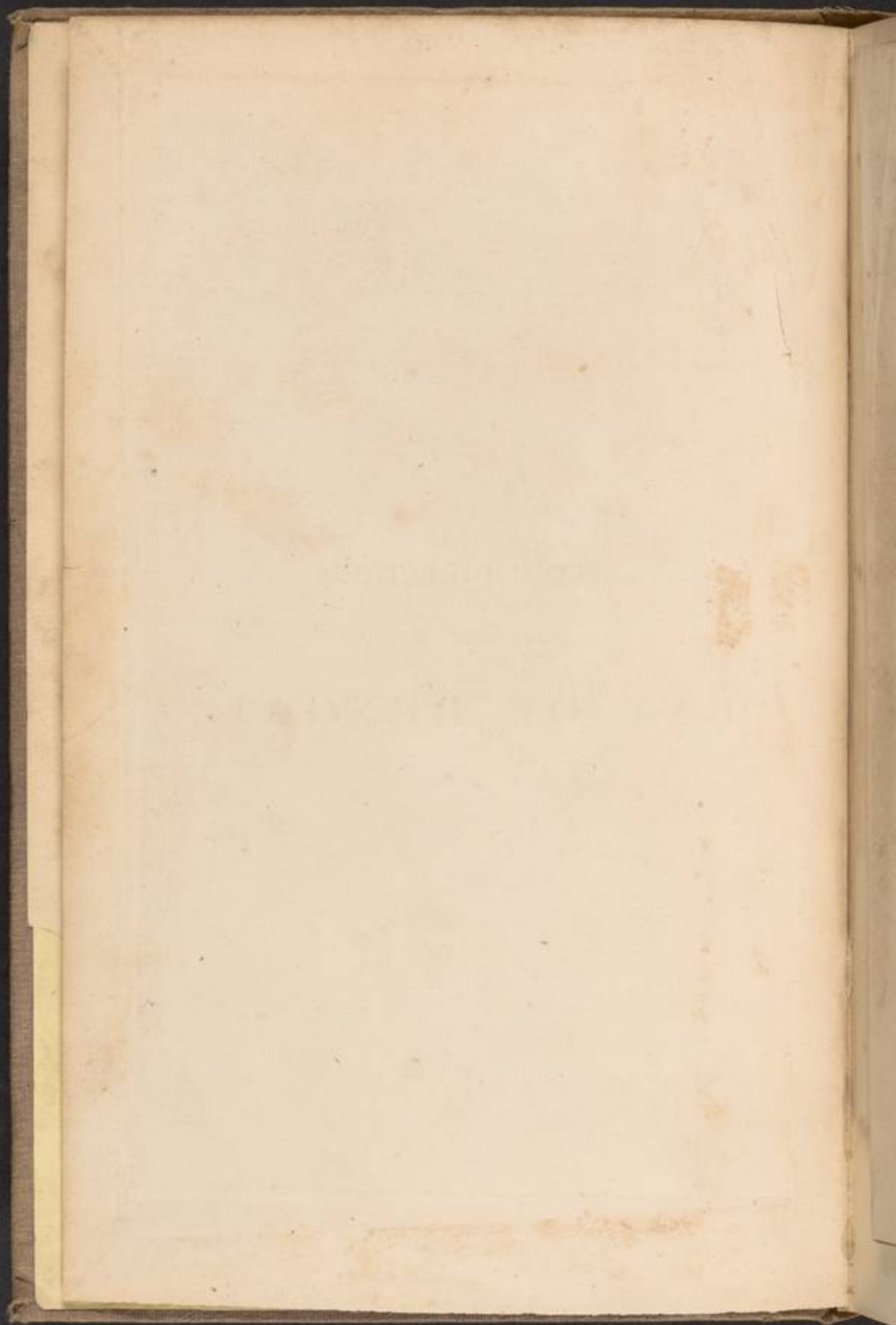
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SAILING DIRECTIONS
FOR THE PRINCIPAL PORTS IN THE
BAY OF BENGAL.



SAILING DIRECTIONS
FOR THE PRINCIPAL PORTS IN THE
BAY OF BENGAL,
WITH REMARKS UPON THE
WINDS AND CURRENTS;
AND SPECIAL INSTRUCTIONS FOR MAKING
PASSAGES UP AND DOWN THE BAY.

BY

W. H. ROSSER AND JAMES F. IMRAY, F.R.G.S.



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PREFACE.

THE extensive and constantly increasing traffic between the various ports of the Bay of Bengal seems to demand special Sailing Directions for that part of the Indian Ocean. To supply that demand, the following pages have been compiled from all the best and recognised Authorities, supplemented by information derived from Harbour Masters, Masters' Attendant, and Lloyd's agents, at many of the principal ports, as well as from the most recent Surveyors.

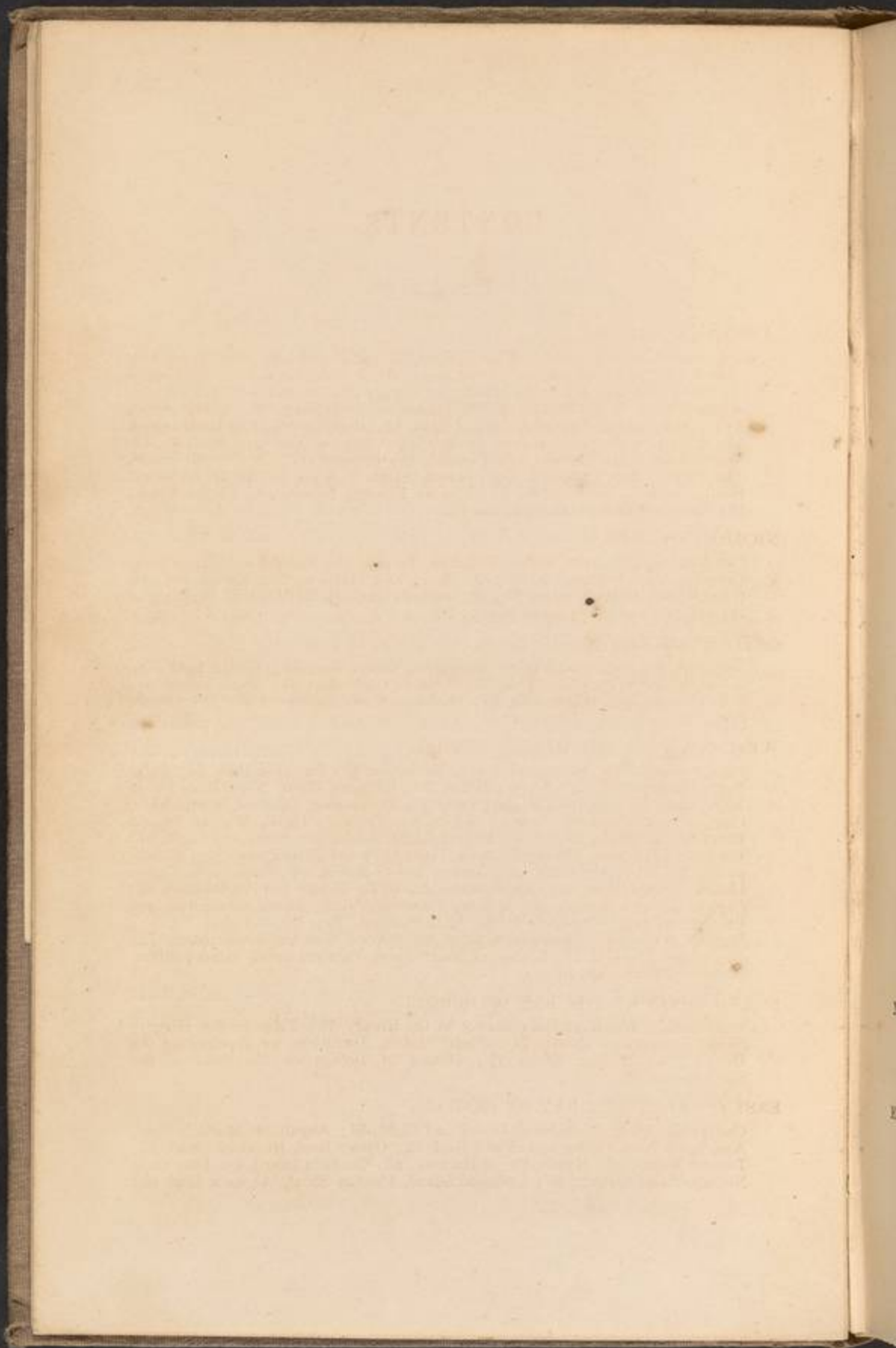
To the Directions are appended a general description of the Wind and Weather, and of the Currents during the two Monsoons; followed by some brief and necessary remarks on the Navigation of the Bay.

A Table of Positions is also now for the first time published in a collected form, with the Meridians from which the Longitudes are determined. An attempt has been made to rectify the heretofore uncertain positions of the Andamans and Nicobars; in the latter the observations of the Austrian frigate *Novara*, and those of the Dutch have been consulted, —if the positions here given be not absolutely correct, they are probably so within 2' or 3'.

No work of this character can be perfect; improvements in the arrangement can easily be suggested, and new material must always be coming to hand. Still, it is hoped that the BAY OF BENGAL DIRECTORY, as now issued, though not entirely free from defects, will be useful to the Navigator.

The Publishers will at all times be glad to receive any communications that may tend to enhance its value to those for whose special benefit it has been compiled.

LONDON, *March 1st*, 1866.



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SAILING DIRECTIONS

FOR THE

PRINCIPAL PORTS IN THE BAY OF BENGAL.

*** IN THIS WORK THE BEARINGS AND COURSES ARE BY COMPASS, UNLESS EXPRESSED TO THE CONTRARY, AND ARE INDEPENDENT OF WINDS AND CURRENTS, FOR WHICH ALLOWANCE MUST BE MADE. THE DISTANCES ARE IN NAUTICAL MILES OF 60 TO EACH DEGREE, AND THE DEPTHS ARE REDUCED TO THE LEVEL OF LOW WATER SPRING TIDES.

IN THE WESTERN PART OF THE BAY OF BENGAL THE VARIATION IS ABOUT 1° E.; AND IN THE EASTERN PART $2\frac{1}{2}^{\circ}$ E. IT IS SUPPOSED THAT THERE IS LITTLE IF ANY ANNUAL CHANGE.

ANDAMAN ISLANDS.

THESE islands extend from latitudes $10^{\circ} 27'$ N. to $14^{\circ} 56'$ N., and between longitudes $92^{\circ} 25'$ and $93^{\circ} 45'$ E. They contain many fine harbours and anchorages, capable of receiving fleets of the largest vessels; but are seldom visited, as there are no places of trade. The inhabitants bear the repute of being extremely treacherous; hence it is necessary on landing to take all possible precautions against being attacked and cut off from the boats; but very little is really known of the natives of these islands beyond what is contained in occasional notices of shipwrecks, and these invariably represent them as irreclaimably savage, implacable, hostile, and inhospitable.* The islands are covered with dense forest, and there is abun-

* Captain J. H. Miller, in a communication to the *Nautical Magazine*, 1842, says: "The islands on the west side of the Andamans are frequented during the fine season, from December to April, by a mixed and mongrel race of Malays, Chinese, and Burmese fishermen for *bêche de mer* and edible birds' nests, who are of very doubtful honesty; and it is necessary to take a few muskets and cutlasses, just to show them that you are prepared for mischief in case of need. These fellows are also 'fishers of men,' and to their evil deeds much of the hostility of the islanders may be attributed; they carry off children, for whom they find a ready market

dance of fresh water. At Port Blair, in latitude $11^{\circ} 43'$, a convict settlement has recently been formed by the Government of India.

The Andamans were partially surveyed by Lieutenant Blair and Captain Moorsom in 1789-90, and in 1858 by the Committee appointed by the Governor-General of India, to discover a suitable place for a convict settlement. It is mainly from the reports of these surveys that the following description of the islands is derived.

PREPARIS, the northernmost of the Andamans, is $4\frac{1}{2}$ miles long in a N.N.E and S.S.W. (*true*) direction, and very narrow, being not more than a mile wide in its broadest part. It is of moderate height, covered with wood, and slopes gradually to the sea. On its east side, at a few paces from a fine sandy beach, formed between two ledges of rock, where boats can land with safety, there is a pond of fresh water, very convenient for watering: from it the highest part of the island bears N.W. This east side of the island is very steep, there being at a very short distance from it a depth of 10 fathoms, rapidly deepening to 17 and 22 fathoms. The north end of the island is in latitude $14^{\circ} 54' 30''$ N., and longitude $93^{\circ} 43' 30''$ E.*

Both the east and west shores of Preparis Island are bordered by a reef, which is prolonged southerly from its south end $3\frac{1}{2}$ miles; upon it are some rocks above water. This reef is extremely dangerous, its edge being very steep, and the soundings near it are such that the lead gives little indication of its vicinity.

At about $1\frac{1}{2}$ mile from the north end of Preparis there are some islets, named Cow and Calf, connected with which is a bank of 6 to 8 fathoms, extending from them nearly 2 miles in a N.W. and S.E. direction. A channel 11 to 24 fathoms deep separates these from Preparis.

On the west side of Preparis, a reef, with some islets upon it, has its outer edge $2\frac{3}{4}$ miles from the island; in the narrow channel between this reef and the island are soundings of 9 to 15 fathoms. There is also a reef south of this one, on the same side of the island, having some rocks upon it above water, situated about 3 miles westward of the reef which extends southward from the south end of the island; this reef is seated upon a bank of 6 to 10 fathoms, and its south end is distant from the south end of Preparis about $6\frac{3}{4}$ miles in a S.W. by S. $\frac{1}{4}$ S. direction, and from the extremity of the reef extending from the south end of that island S.W. $\frac{3}{4}$ W. 4 miles.

The anchorage at Preparis is on its eastern side, in 12 to 14 fathoms, or nearer the island, at half a mile from the shore, in 8 or 9 fathoms; the bottom consists of sand, coral, and shells. It is probable that there is anchorage also on its western side.

Although Preparis is considered one of the Andaman Islands, it does not appear to be united to them by a bank of soundings; for in mid-

as slaves in the neighbouring countries. I have been told that formerly they were friendly, and assisted these fishermen, until a large party was invited on board a junk or prow (the Chinese got the blame of it), and after being intoxicated, were carried off and sold at Acheen; and the practice is still carried on by these fellows, who land and carry them off whenever they can catch them. The Andamanians have retaliated fearfully whenever any foreigner has fallen into their power, and who can blame them?"

* This is according to the Admiralty chart No. 152, but the observations of the Danish corvette *Galathea* place the north end of Preparis in longitude $93^{\circ} 38' 37''$, supposing Fort Cornwallis, Penang, to be $100^{\circ} 20' 10''$ E.

channel, between it and the Great Coco (the northernmost of the group), there is no bottom at 100 fathoms.

GREAT COCO.—At about 46 miles S. by W. $\frac{1}{2}$ W. from the south end of Preparis is Great Coco Island, which is sufficiently elevated to be visible from a distance of about 18 miles. It is or was covered with trees. It is about 7 miles long, from north to south, and 2 miles broad, and has a reef extending from its south end about 4 miles, upon which is an islet; two islets, named Table and Slipper, also lie off its north end. A reef is said to run off a short distance from its north-east shore. The island is seldom visited, except for firewood and water.*

Great Coco Island has been only imperfectly examined; the above particulars are therefore uncertain. The usual anchorage is on its eastern side, in 12 to 20 fathoms, at about $1\frac{1}{2}$ mile from the shore; it is probable that vessels may also anchor off its west side in a similar depth.

LITTLE COCO.—This island lies about 10 miles south-westward from Great Coco, is of moderate height, and visible from a distance of about 18 miles. Its extent from north to south is only $2\frac{1}{2}$ miles, and its breadth does not exceed half a mile. It is or was covered with trees. According to Lieutenant Blair's chart, a reef surrounds it, except on its east side (which was apparently left unexamined), and extends from its north and south ends about a mile; this reef is steep, there being at a short distance from it a depth of 10 to 17 fathoms. Fresh water may possibly be obtainable on the east side of the island.

The anchorage at Little Coco Island is said to be eastward of it, at a moderate distance from the land; and also off its north-west end, with soundings gradually decreasing to the reef bordering the shore. It is also stated that boats may land at a sandy bay on the west side of the island.

The channel south of Little Coco Island, between it and Landfall Island, off the north end of North Andaman, is about 20 miles wide, and from 12 to 40 fathoms deep for a distance east and west of about 18 miles, when bottom will be suddenly lost sounding in 100 fathoms. The ground is coral, but occasionally sand and mud. During the North-east Monsoon, the current sets frequently through this channel

* The Great Coco has timber of a large size growing upon it, and a ship getting disabled in beating down the bay in the South-west Monsoon, may take shelter under this island, and procure sufficient spars to enable her to proceed on her voyage, or may caulk any open butts or seams. She may then, if bound across the Equator, pursue her course to the southward, inside of the Andaman and Nicobar Islands, and round Acheen Head, without loss of time. This, I think, would in many cases be better than putting back, when it often happens that the expense for necessary repairs is but a fraction of the "tottle." On the 10th of October, 1839, I landed the following list of animals on the island—one goat in kid, four pigs, eight ducks, and six fowls; and on a subsequent voyage pigeons and rabbits.—*Captain J. H. Miller.*

The Cocos are sheltered by the Andamans from the heavy south-west swell of the Bay of Bengal, and afford facilities for careening vessels in safety; of both the islands it may be said that they have a fine sandy beach all round, one or two commodious bays, and good anchorage, and that at the southern extremity of each there is a reef of rocks, extending several miles into the sea. Both islands also are uninhabited. The Burmese occupy the Great Coco during the whole of the North-east Monsoon, leaving it at the commencement of the South-west Monsoon, when it is probably less healthy; they say that whatever sickness prevails among them originates at Little Coco, and that they generally improve in health on their return to Great Coco. Little Coco is a very marshy, and of course unhealthy, place; for this reason the Burmese only make short trips to it, to obtain cocoa-nuts, which are very abundant.—*Report on the Andamans, 1859.*

to the north-westward; in the South-west Monsoon it flows mostly to the eastward; in fine settled weather the prevailing currents are, flood N.N.E, ebb S.S.W.

When sailing between Little Coco and Landfall Islands it is necessary to maintain a good look-out, it being probable that more reefs exist than are inserted in charts. In 1809 the *Daphne* (drawing 10 feet) was said to have struck on a rock, at about 5 miles S. by W. from the south-east end of Little Coco; alongside it rocks were visible under water, and from the vessel's deck the surf breaking on the shore of the island could not be seen: hence the estimated distance of 5 miles may not be greatly in error.

GREAT ANDAMAN.—The three principal islands of the group are so closely connected together, that for all practical purposes they may be considered as one island, which is hence called Great Andaman. The straits dividing them can only be navigated by boats at high water. The islands are named North, Middle, and South Andaman. They are surrounded by a bank of soundings, which extends westward from them about 20 miles, and eastward not more than 5 to 8 miles. The outlying islands, in addition to Preparis and the Coco Islets, already noticed, are Narcondam, Barren, Little Andaman, and the Sentinels. In our description we shall follow the east coast, commencing at Cape Price, and afterwards add a few remarks on the west coast.

East Coast of the Andamans.—The northern Andaman Island is about 44 miles long in a north and south direction, and 14 miles broad in its widest part. Cape Price, its north point, has an islet, named Pocock, off its east side, which is surrounded by a reef, and separated from the shore by a narrow and possibly a navigable channel. At sixteen miles southward from Cape Price, is Port Cornwallis, a splendid landlocked harbour, which contains excellent anchorage ground, sheltered from all winds, with good holding, and is sufficiently capacious to accommodate a fleet of the largest vessels. This appears to be the only harbour in the northern island. The surface is so densely covered with wood, that it is almost impossible to penetrate into the interior; and it is related by Mr. Mouat, in 1857, that his exploring party could never proceed more than 5 or 6 miles in a day, and then it was almost always necessary to cut a path through the jungle.

At the north end of the North Andaman are some islands and reefs, the largest and most elevated of which is Landfall Island. This island, and that next eastward of it, East Island, are seated on a reef, and it is probable that there is no passage between them. West Island is about 7 miles south-westward from Landfall Island, is distant from Cape Thornhill about 3 miles in a northerly direction, and is also surrounded by a reef. South-westward of West Island, and nearer the shore, are Cliff and Reef Islands, having rocks about them. The passage between Landfall and East Islands and the shore is named Pondicherry, a French ship of that name having passed through it; it should be used only with the greatest circumspection, the survey of it having been indifferently executed, and a reef named Cleugh being in mid-channel,—there is also much rocky ground, many shoal spots, and numerous overfalls scattered about. In the western and middle parts of the channel the soundings vary from 18 to 10 fathoms. The flood sets eastward through it, and the ebb westward.

Union Ledge, &c.—The outermost of the known reefs off the north-east end of the North Andaman is Union Ledge, a reef of 6 feet water at low tide,

situated about 8 miles E. by S. from Cape Price, or in latitude $13^{\circ} 32' N.$ The *Jackson*, a ledge of similar depth, is distant 3 miles due East from East Island; and between them is the *Ranger*, a reef of only 4 feet at a corresponding period of tide. These reefs are all so steep that the lead gives but little indication of their vicinity. The most dangerous, from its situation, is the Union, which is the more difficult to avoid, as it is only about 3 miles within the edge of the bank of soundings. At a very short distance from the eastern edge of the Union are soundings of 30 to 40 fathoms, and from the same side of the Jackson 8 fathoms, which rapidly deepens to 20 fathoms. As these shoals are extremely dangerous, and it is probable that all the reefs in this neighbourhood have not been discovered, it is strongly recommended to give this part of the Andamans a wide berth in passing, especially at night or in thick weather.

Lieutenant Blair's remarks upon Union Ledge, &c., are as follow:—
 "Outside the opposite bearings of Table Islands and Pocock Island the soundings are more regular than inside those bearings, deepening to 30 and 35 fathoms at about two leagues from the land. The navigator must not be deceived by this false appearance; for immediately beyond the depth of 35 fathoms, the water suddenly shoals to 20 fathoms, which depth will be found within 100 yards of Union Ledge, on which there is only 1 fathom at low water. The greatest extent of this very dangerous ledge is about half a mile in the direction of the meridian; the breadth about 300 yards. The soundings are a little irregular, even to eastward of this ledge, there being 20 fathoms immediately without it, and beyond that depth so little as 12 and 10 fathoms, whence it deepens to 30, 50, and 76 fathoms, and at the distance of 4 miles eastward of the ledge there is no ground with 110 fathoms. From Union Ledge, Pocock Island bears $W. 25^{\circ} N.$ (*true*) distant 7 miles, and the eastern Table Island $S. 30^{\circ} W.$ (*true*) the same distance. Many lines of soundings have been run between Union and Jackson Ledges; and as the depth is very unequal, this part should be avoided, although no dangers have been discovered in it.

"Jackson Ledge is situated one league East (*true*) from the north extremity of East Island: its extent, in a south-east direction, is nearly half a mile, and the breadth a quarter of a mile, and the least water found on it was one fathom. North-westward from this, at the distance of a mile, is situated Ranger Reef, a small circular spot of 100 yards' diameter, with only 4 feet on its shoalest part; it bears from the north extremity of East Island E. by N. (*true*) 2 miles. Northward of these ledges I was very particular in sounding, and found very considerable inequalities in the depth, on some spots not more than 5 fathoms; but by a very diligent look-out from the mast-head, I have no reason to think that there is any less than that depth northward of Ranger Ledge. The alarming inequalities of depth do not extend more than 2 miles northward of Ranger Ledge, and there is a continuation of similar soundings to westward, extending the same distance round East and Landfall Islands.

"There is a good and deep passage between East Island and Ranger Ledge, for which, however, there is no leading mark, the distance of Pocock Island being so great that any bearings of it would be too indeterminate. East Island should be rounded very closely, to avoid the ledges eastward of it. During the South-west Monsoon I consider it would be improper to attempt this channel; for a ship rounding East Island as close as it can be done with safety would have great difficulty in weathering Jackson and Union Ledges."

PORT CORNWALLIS.—At nearly 17 miles southward from Cape Price is Port Cornwallis, a large land-locked bay, previously mentioned. Midway, or perhaps nearer the bay, are some islets at a considerable distance from the shore, but connected thereto by a reef, named Table Islands; as these islands are surrounded by a reef, the outer edge of which is probably at some distance from them, and is besides so steep as to have a depth of 17 and 20 fathoms close to it, they must be approached with the greatest precaution. Lieutenant Blair mentions a coral reef, which, we suppose, forms part of the reef upon which the islands are seated. "They are surrounded to eastward with an extensive coral reef, and there is, besides this, a ledge of rocks, some of which just appear; they bear from the east extremity of the islands S.S.E. (*true*) $1\frac{1}{2}$ mile, and there are 24 fathoms at a very small distance without the rocks."

Port Cornwallis consists of a bay extending about 6 miles in a north-westerly direction, with an average breadth of $2\frac{1}{2}$ miles. It is surrounded by elevated land densely covered with vegetation to the water's edge, and abounds with shallow creeks which have not been examined; there is an abundant supply of fresh water, and oysters, besides other varieties of shell-fish, are plentiful. The entrance from shore to shore is about two miles wide, but the navigable channel is contracted to less than half this width by a reef which runs off from the south point towards Ross Island, an islet off the north point of the bay; this islet is surrounded and connected to the north shore by a reef. In the bay there are several islets, the most considerable of which, named Chatham, is 2 miles long, and many years since was the seat of a settlement formed by the East India Company, but which was abandoned, the site proving unhealthy. The depth in mid-channel of the entrance is 18 fathoms; thence it decreases to 16, 14, 10, and 5 fathoms towards the head of the harbour. When within, a vessel will ride completely sheltered from all winds.*

Lieutenant Blair's remarks upon the port are as follows, 1793:—"The entrance of Port Cornwallis is in latitude $13^{\circ} 17' N$. Being the first opening northward of Saddle Mountain, and near that mountain, its situation is marked with peculiar precision. The access is easy, the entrance being 2,500 yards broad; it is bounded on the north side by a reef extending from Ross Island, and on the south side by South Reef, a dangerous ledge separated by a narrow channel of 6 and 7 fathoms from Dundas Point,—from this reef an extremely narrow spit of 7 to 10 fathoms, but in one spot of only $3\frac{1}{2}$ fathoms, extends nearly half a mile in a north-east direction. Atalanta Bay, immediately round Dundas Point, has soundings of 10 to 4 fathoms, and is a good place to anchor in during the South-

* Port Cornwallis was visited by Mr. Mouat in 1857, who says:—"The remains of the settlement on Chatham Island were disentangled from the dense vegetation by which they were concealed with extreme difficulty. Fragments of the brickwork were found in excellent preservation, but all other traces of habitation were effaced. A few cocoa-nut trees alone indicated the attempt to introduce economical plants not indigenous to the soil. According to Blair's survey, the sea must have encroached on the north-eastern end of Chatham Island some 40 or 50 feet. On the south-western extremity of the same island was an extensive mud bay, uncovered at low tide, skirted by belts of mangrove, with low, flat country on the opposite shore in the same direction. The only sea-surge that could reach the settlement was the north-east wind, which blows over a small portion of the northern aspect. To these causes—to the pestilential nature of the mud-banks when uncovered, and to the abundance of rank, reeking, decayed vegetation in every direction—the excessive unhealthiness of the early settlement was doubtless due."

west Monsoon. In nearly mid-channel of the bay, at 2 miles from the entrance, is a very small island, named St. George, surrounded by a coral reef, and having at low water an area of about 300 yards; from this island in time of war vessels might be much annoyed in their progress up the harbour. At the extremity of the 4-fathom spit extending 1 mile west from this island, there is a spot of coral which is almost dry at low water.

"Above St. George's Island the harbour opens to the breadth of 2 miles and to the depth of $1\frac{1}{2}$ miles, and contains excellent anchorage; it is bounded on the east by Hood Point and the east side of Minerva Bay, on the west by the east side of Chatham Island and Shore Point, and on the north by Minerva Bay, Perseverance Point and the continuation of the harbour. The ground is soft tenacious clay, and the depth regular, decreasing from 20 fathoms in the entrance to 10 and 9 fathoms abreast of Perseverance Point; here the harbour is contracted to the breadth of 1600 yards by the shoulder of Chatham Island to westward, and a continuation of the land in a direction nearly north from Perseverance Point to the eastward. The harbour extends a mile north from Perseverance Point, and beyond this there is a narrow and intricate channel which leads to a very secure and convenient basin adjoining the northern point of Pil Island.

"The shoulder and north part of Chatham Island is encompassed by a bank having a depth of 3 fathoms on the outer edge, which is about 300 yards from the island. The continuation of this bank with a gentle curve and westerly direction joins the west point and embraces Ariel Island, from the north part of which it takes a circular direction, enclosing another commodious basin north of Ariel Island, and then by an easterly course terminates at the north-west point of Wharf Island. Within the margin already described, there is a very extensive mud bank, portions of which appear at low water; it occupies a space of about 4 miles. This flat, named by us Shoal Bay, is situated westward of Pil, Chatham, and Ariel Islands; it is of irregular form, with an extensive branch to the north-westward and several inlets to southward.

"The two basins are well situated for the accommodation of vessels under repair, and are capable of being well defended. The range of the harbour being N.W., the prevailing winds (N.E. and S.W.) are fair for either entering or quitting the port.

"At 1200 yards above Perseverance Point there is a spring of fresh water, which afforded in the month of February 1793 150 tons per day, nor was there any perceptible diminution in this supply so late as the 6th of April, the latter part of the dry season. This spring is in a very convenient part of the harbour, and issues out of the ground at about 20 feet above high water mark; adjacent are two rills.

"Near Hood Point is another very productive spring.

"The land in the vicinity of the harbour abounds with timber of excellent quality, fit for all the purposes of shipping."

If bound to Port Cornwallis from the north-westward, the bank of soundings between Landfall and Little Coco Islands may be safely crossed in latitude $13^{\circ} 43' N.$, as this will give the former island a berth of about 4 miles, nearer than which it should not, under ordinary circumstances, be approached, it being probable that there are reefs about it not inserted on the charts; during the South-west Monsoon especially, it should have a berth given to it of at least 3 miles. Having passed Landfall Island and steered eastward 8 or 10 miles, a course may be directed to the southward in such a manner as to pass outside or eastward of Jackson

and Union Ledges, for which a good look-out must be maintained; these reefs, it will be remembered, are very steep. In thick weather it is recommended, after passing Landfall Island, to steer East until the bank of soundings is quite crossed, and the depth of 40 or 50 fathoms reached, and then in the course southward to keep along the edge of the bank, by which means Union Ledge will be avoided.

Craggy Island.—At about 4 miles southward from Port Cornwallis, following the coast, is a small island named Craggy, connected to the shore by a reef, under or on the south side of which a vessel may anchor in 10 to 4 fathoms. Opposite this island is the Saddle Mountain, the most elevated in the Andamans, estimated to be 2,400 feet high; it is covered with vegetation to its summit, is of considerable extent, and its eastern side appears broken by densely wooded ravines,—when viewed from eastward or westward two peaks rise into view, giving the mountain the appearance of a saddle, hence its name: it is reported to be visible from a distance of about 60 miles. The coast hereabout is apparently well peopled.

From Craggy Island to Andaman Strait, a distance of 15 to 18 miles, the land is hilly nearly to the water's edge, and affords no good landing-place. In one or two places a near approach reveals some tolerably deep caves. It has not been surveyed, hence it is not known if it is clear of reefs; the soundings off it are reported to be regular to the distance of 5 miles, when the lead drops into 100 fathoms.

Sound Island.—Andaman Strait is fronted by Sound Island, the channel within which is named Stewart Sound. Mr. Mouat says: "We steamed through Stewart Sound and right round Sound Island, which is of an irregular quadrilateral shape, forming one side of a land-locked bay, accessible at all seasons to vessels of every class. The island consisted of ridges of high land, traversing it in all directions, and prolonged in spurs to the point of the bay indenting its margins. It was fringed with belts of mangrove, and surrounded by coral reefs, with occasional fine sandy beaches.

"Towards its southern end is a horse-shoe shaped harbour, nearly three-quarters of a mile in depth, and rather more than half a mile in breadth. Its northern and eastern aspects are skirted by coral banks; but in the rest of its extent it has good anchorage-ground for large vessels.

"The ridge of hilly ground surrounding this bay is about 120 feet in height, and furnished an extremely grand and repeated echo on the firing of the evening and morning guns.

"The existence of a practicable passage from the east to the west coast of the Great Andaman, debouching at Interview Island, had been left undetermined by Blair. The *Pluto* was next anchored off the mouth of Andaman Strait, and a fast boat, with a strong picked crew, was sent to explore this strait and ascertain how far it was navigable. After pulling through a very tortuous passage for several hours, our progress was arrested by finding that at low tide the mud was exposed in the main channel, and we had very great difficulty in retracing our steps. The swamps and sunderbunds traversed for about a third of the breadth of the island in this place were extremely putrid and pestilential. Vegetation was extremely luxuriant, but confined to mangroves. There was no trace of habitation nor of animal life in the dense swamps bordering the strait. The fact of the non-existence of a passage for any useful purpose was fully established."

THE ARCHIPELAGO.—The Middle Andaman, commencing at Andaman Strait, extends southward 50 miles, and is 16 miles broad in its widest part. It is for the most part hilly to the sea-shore. At 38 miles southward from Andaman Strait, commences an archipelago of islands, which has not been sufficiently examined to show what harbours it may contain; but enough is known of it to enable us to state that navigation among the islands is rendered extremely dangerous by coral reefs; it was on the south-east side of the largest island that the troop-ships *Briton* and *Runnymede* were wrecked in November 1844, when such was the hostility of the natives that all attempts to hold amicable intercourse with them failed. These islands are represented as generally high, well wooded, and connected more or less with each other by reefs; the bank of soundings probably extends eastward of them about 12 miles. The channel between them and the shore, named Diligent Strait, has soundings of 30 to 8 fathoms, the latter being in its narrowest part where the bottom is very irregular; it is consequently deep enough for the largest ships, but, until properly surveyed, cannot be considered safe, as coral reefs are believed to exist that are not inserted in charts.

When running through Diligent Strait from southward, it is recommended to keep in mid-channel, making a frequent use of the lead; if from northward, the two islands, North and Middle Button, are an excellent guide to the north-east entrance, which is 7 miles wide and thence decreases in width to the middle of the strait, where it is only 2 or 3 miles wide. In the northern part of the strait are some shoals, and reefs project from some of the islands and from the opposite shore. The anchorage in the middle of the strait is good and well sheltered from easterly and westerly winds: in the shoalest part the bottom is of rock.

Lieutenant Blair, 1793, says: "Northward from Middle Strait (the channel separating South from Middle Andaman) there are great inequalities in the surface of the land, some parts low and others rising very abruptly, and nearly insulated by the sea; the direction is N.E. by N., but deeply indented with bays and inlets; the soundings are regular, and there are no dangers without the depth of 10 fathoms. The distance to Strait Island is 13 miles, in a N.E. direction. Here the Archipelago contracts the breadth of Diligent Strait to 3 leagues, and from Strait Island to Round Hill (which is the narrowest part) the breadth is only one league. The number and variety of the islands, agreeably diversified with rugged cliffs and luxuriant forests, present a prospect beautiful and picturesque. On a near approach the caves appear, that are inhabited by innumerable flocks of the small swallow, which make the edible bird's nest, so much valued by the Chinese as a delicacy and restorative. The principal cave is situated at the south point of Strait Island, which is rocky, but not exceeding 40 feet in height. The entrance, which is washed by the tide, is an irregular aperture of about 6 feet wide, and the same height; on advancing 30 or 40 feet, the height diminishes to 4 feet, and the breadth increases to 20 feet. Here it is rather dark and very warm, and the tops and sides of the cave are covered with nests; an astonishing number of birds, twittering and on the wing, whisk past the ears and eyes: this, contrasted with the melancholy noise of the waves resounding through the gloomy cavern, formed a very uncommon and interesting scene. The birds are probably induced to choose this situation from the caves being inaccessible either to snakes or quadrupeds, and probably defensible against birds of prey. The nests in general are in form of a quarter of a sphere,

of 2½ inches diameter: of this shape, one of the sections being firmly fixed to the rock, the other section leaves the nest open above. The substance is glutinous: those most in estimation are white and semi-transparent. It has been doubtful, and various conjectures have been formed of what the nests are composed. In smaller and more accessible caves I have observed a mucilage exuding from the rock, moistened by exhalations from the sea, which washes the lower part of those caves. This mucilage, on being levigated and dried, had the texture, colour, and taste of the nest; but what removed all my doubts of this being the substance, was seeing the birds in immense numbers resorting to a cave very productive of the mucilage, in the month of January, which is the season when the birds build their nests. It may now be presumed that the nests are neither of animal nor of vegetable, but of a mineral substance.

"In addition to the contraction of width of Diligent Strait, the soundings become very irregular, and there are many dangerous patches of coral on either side; one in particular, half a league eastward from Strait Island, is very dangerous. The spit, extending about the same distance north from Round Hill, the reefs connected with Middle and North Buttons, and an extensive and dangerous coral bank and reef to north-westward of those islands, should deter strangers from entering Diligent Strait except in cases of necessity; when, should such a measure become necessary, strict attention to the following instructions will lead through the strait in safety. If entering from northward, first steer for the North Button, which is a small island rendered remarkable by several white cliffs; pass to right or N.W. of it, not exceeding one mile distant; when abreast, steer N.E. and pass Middle Button, leaving it also to N.E., and observing the same distance; when the last is brought to bear E.N.E. it will be necessary to alter the course to South, and to steer in that direction until the North Button is just perceived to eastward of Middle Button; with this mark steer about S.W. by S., observing to keep the islands in the same position, and this will lead through the narrow part of the strait, clear of the dangers on either side.

"The Archipelago appears to consist of eleven islands of various sizes. I speak with doubt, as the largest or fourth island may probably be intersected by narrow channels, which would increase the number. The south island, which is very small, bears from Port Blair nearly E.N.E. distant 7 leagues. It is surrounded by a coral bank to south and east; the least water on which is 7 fathoms, except a small reef from the south extremity, which has 3 fathoms about half a mile distant from the island. The passage between this and the second island is clear, the ground coral, with some spots not exceeding the depth of 5 fathoms.

"On the south extremity of the second island there are a few cocoa-nut trees. It is moderately high, the major part rocky, but covered with trees, except some cliffs which rise abruptly from the sea at the north-east end, near the north-west extremities. From the south point there is a reef on which the sea breaks at half a mile from the shore. A bay is formed between the two northern points, but it is too shallow for ships. The passage between the second and third island is nearly two miles broad and clear of danger, with very deep water near the third island.

"The third island is of a triangular form, with a considerable projection on the north side. The south point, which is acute, is formed of high white cliffs; one in particular, which is almost insulated, has in many situations the appearance of a sail. On the south-east side there are two small bays, and at the bottom of the northern one there are several cocoa-

nut trees at a place where some natives usually reside. The water is very deep on this part of the coast,—about 40 fathoms at two miles from the land. From the north-west angle to the north point of the projection the soundings are very regular. Close to this point, there is a narrow channel of 7 fathoms over a reef which extends from the points of the island almost three miles in a north-east direction: between this point of the reef and another extending from an angle of the fourth island, there is another narrow channel. By the long reef and the two islands, a small but commodious harbour is formed. The passage between the third and fourth islands is shut up to eastward by coral reefs. The north-east angle of the third island must not be approached nearer than 3 miles, to avoid a coral reef which appeared to be connected with the island.

“The figure of the fourth island, as well as its surface, is very irregular, and the soundings around it correspond. On the east side, ships must not approach closer than 6 miles, as Minerva Bank is situated at that distance to eastward of the island, and on some parts of the bank there is not more than $2\frac{1}{2}$ fathoms at low water. The east extreme of East Island N.N.W. leads eastward of the bank. The east side of the island is deeply indented, and some parts behind Rugged Island may probably be insulated. Round Hill (which is remarkable from its regular shape, and being the highest land of the Archipelago) forms the north-east angle of this island; it is seen from a distance of 30 miles in clear weather. Eastward of this angle, there are several banks which run off a considerable distance.

“The passage between the fourth and fifth islands has deep water in the western entrance. At about the middle there is a reef from the fourth island. Across the eastern entrance there is a bar of sand and coral with only 3 fathoms on it.

“The fifth island is low, and almost bisected by the opposite bays. On the north and south sides of the island, the water is deep, and the soundings are pretty regular.

“The bays and inlets formed by the three islands north of Strait Island (of which Long Island is the northern), are too confined and intricate to be of material use, though they might afford shelter in the event of a vessel being driven in by distress.

“Abreast of the south end, opposite the middle, and towards the north extremity of Long Island, there are three dangerous patches of coral, about two miles distant from the island. To avoid these and the large coral shoal north-westward from the North Button, it will be safe not to approach that part of the coast nearer than the North Button bearing North.

“The small inlet in latitude $12^{\circ} 29'$ is very remarkable, having a bold bluff point on either side. The entrance is narrow, and there is not sufficient depth within for ships. There is an extensive reef from the north point, and there is rocky ground about half a league beyond it. From this part of the coast to latitude $12^{\circ} 45'$ the land rises rather abruptly to a considerable height.”

Middle Strait.—This narrow strait separates Middle Andaman from South Andaman Island. Its eastern entrance is in latitude $12^{\circ} 3' N.$, or just within the southern part of Diligent Strait, whence it trends in a northerly direction, and has a general depth of 6 to 9 fathoms, excepting at the eastern entrance, where there is a bar of 9 to 12 feet; it is consequently not navigable. From this strait to Shoal Bay, 7 miles to the southward, the shore should not be approached nearer than two miles, except with extra precaution, on account of possible off-shore dangers.

Lieutenant Heathcote, of the Indian Navy, says: “The Middle Strait is

one of peculiar formation; it is for the most part a narrow, deep crevice between the mountains by which it is bounded on both sides, and which are in no part distant from it much more than 300 yards, while at places the rocks completely overhang it. The channel is thus narrowed at one or two points to about 80 yards, its general breadth being from 400 to 500 yards. Its depth varies, but it is mostly deepest where it is narrowest, 25 fathoms being found where the rocks abut immediately upon the channel, and 6 fathoms where they are more distant; a depth of from 12 to 14 fathoms is, however, very generally found throughout the narrow part of the strait, its western portion, where it runs north and south, being both broader and shallower. Its western entrance from the sea has now (1857) a depth of from 4 to 6 fathoms, it having been filled up to some extent during the last seventy years, while the interior of the strait has suffered scarcely any perceptible change. We found no variation in the depth, nor in the contour of the shore; even small islets of less than 50 yards in length appearing in precisely the same state as to size, elevation and position, as represented by the first surveyor. But while the depths before mentioned are found in the strait itself, its eastern mouth is almost closed by a bank of sand and mud, which has only from 6 to 10 feet water on it; and this, I believe, may be looked upon as the effect of the current of the South-west Monsoon, which, being driven upon the west coast of the island, finds its way through this narrow strait, and deposits at its exit the sediment which it had taken up or set in motion on its passage. The area of drainage of this strait, though small, is sufficient to throw into it a considerable quantity of silt and sand, and the very form of this bank indicates that it has come out *from* the strait, and not that it has been thrown *into* it by any effort of the winds and currents of the North-east Monsoon; and moreover, were this latter the case, some corresponding effects would surely be observable at some of the other openings on the same side of the island, such as Port Cornwallis, the entrances north and south of Sound Island and Port Blair, at all which places instead of shoals we find deep water."

Port Meadows, &c.—Along the coast immediately south from Diligent Strait are three inlets, named Port Meadows, Oyster and Shoal Bays, of which the first-named is the northernmost. Port Meadows is a small but convenient harbour, with an island at the entrance, inside of which the depth is probably 10 to 7 fathoms; the channel on the north side of the island is unsafe,—vessels therefore always use the south channel, although it is less than a quarter of a mile wide, and has two rocky patches of 24 to 27 feet in the fairway. The shores of the harbour have coral reefs off them. The surrounding land is generally low, with extensive tracts of mangrove jungle, intersected by creeks and forming several islands.

Oyster Bay, 2 miles southward of Port Meadows, has soundings of 10 to 5 fathoms. Shoal Bay, 2 miles further southward, has a depth of only 18 to 4 feet; it is separated from Oyster Bay by an island.

PORT BLAIR.—This is a large inlet or bay near the south end of South Andaman, the entrance to which is in latitude $11^{\circ} 44' N$. It has soundings from 30 fathoms at the entrance, gradually decreasing to 3 fathoms nearly at the head of the bay, where the mud-flats become dry at low tide. Facing the inlet there is a small islet named Ross, the western side of which has a reef extending from it some distance; upon this reef the depth is 2 to 4 fathoms. Within the bay is an island called Chatham. The country surrounding the inlet is extremely fertile, and

there is much less of mangrove and swampy land than at Port Cornwallis. Everywhere there is an abundance of wood and water, and the rocks abound with shell-fish.*

When running into Port Blair, Ross Island may be passed on either side, but the north side is the better channel, being wider than that south-west of the island, and also deeper, as it has a depth of 30 to 20 fathoms, while the south-west channel has only $5\frac{1}{2}$ fathoms in its shoalest part. The anchorage is 2 miles within the entrance, near Chatham Island, in 9 to 6 fathoms. Water can be obtained on the north shore of the harbour, opposite Chatham Island.†

At about a mile S. by E. $\frac{1}{2}$ E. from the south end of Ross Island, and half a mile from the shore, is the easternmost of two reefs of 9 and 15 feet respectively, the latter being the farthest from shore. As these reefs are steep, with soundings of 6 fathoms at a very short distance from them, extra precaution is necessary when sailing in their vicinity. It is probable that between them and the land is a channel of 8 and 9 fathoms. It will be prudent not to approach them nearer than the extremity of Atalanta Point, well open of South Point, bearing N.W. $\frac{1}{4}$ N., or the south point of Ross Island N.N.W.

From Port Blair to the south point of the South Andaman the distance is about 14 miles, and the coast is bold throughout its whole extent. The bank of soundings is supposed to extend from it not more than $1\frac{1}{2}$ mile.

RUTLAND ISLAND.—At the south end of the South Andaman there is a large island, named Rutland, separated from it by Macpherson's Strait,

* When making Port Blair, the land from its north point will be observed to rise rather abruptly to a height which may be seen from a distance of more than 30 miles: a continuation of this for about 9 miles, in a broken ridge, in the direction of North, very pointedly marks the situation of Port Blair. At the northern extremity of the ridge the descent is more gentle, terminating where Shoal Bay is formed; it retreats to southward behind the high land, and to northward round an island where a second mouth is formed, which abounds with oysters. This extensive double inlet is too shallow for vessels.—*Lieutenant Blair*, 1793.

† Port Blair is a fine harbour of refuge, in which a vessel in the Bay of Bengal caught by a gale of wind, and able to keep the sea, can find complete shelter. A correspondent of the *Nautical Magazine*, 1861, who writes under the signature of "North," says in reference to it:—"On leaving the Sandheads in May, June, or July, and the weather has set in stormy, which is very likely to be the case (I do not mean an actual gale, but blowing hard), and the wind hanging to the southward, so that you cannot weather the Andamans without tacking to the westward, I consider that these boards to the westward are mere waste of time, with unnecessary tear and wear to ship and crew. It is better in such cases—and they often happen—to pass through the Preparis Channel, and proceed to the settlement under the lee of the Andamans in smooth water, than to contend against the heavy swell of the bay with a deeply-laden ship, at the risk of damage and putting back, or even foundering, as many ships have done within my recollection. I speak in earnest and as a practical sailor, when I state that most if not all of these crippled and foundered ships might have pursued their voyage with ease and safety by the course above recommended. A ship crippled in the matter of spars will find all that she requires for the cutting on the Andamans; and good spars they are, as I have reason to know. She might also caulk leaky and strained butts, and, in short, put sufficiently to rights to proceed on her voyage, instead of putting back to Calcutta at a ruinous loss to all parties.

"After passing inside of the Andamans, let her stand on to the southward close-hauled on the starboard tack, and it will be very unusual if she cannot weather the Seyer Islands; but, if she cannot weather them, the passage is safe inside of them, if they are not approached under four miles, so that she will soon afterwards be able to make over to the coast of Pedier, and get round Acheen Head with facility by attending to Horsburgh's Directions, and find little difficulty in reaching the trade-wind, which at this season blows right home to the equator."

a narrow and intricate channel of 13 to 6 fathoms. The island is 10 miles long, and 6 miles across in its widest part, well wooded, and abundantly supplied with fresh water. The dense forest covering its south side exhibits marks of exposure to the full force of the South-west Monsoon, the trees in many places being uprooted, and for a considerable extent beaten down, by the violence of the wind. The shores are difficult of access, and, except in Macpherson's Strait, it contains no good harbour. It is probably well peopled.

Macpherson's Strait is about $1\frac{1}{2}$ mile wide at the eastern entrance, and 13 fathoms deep; in almost mid-channel there is a rock;—thence it trends north-westward towards a number of islands and reefs, named the Labyrinth Islands, when the navigation is rendered extremely intricate by numerous reefs of coral. This part of the Andamans is very imperfectly represented in charts.

Off the west end of Rutland Island are two islets named the Twins, or Sisters.* They are about a mile from the shore, and the soundings between are 15 and 10 fathoms. It is prudent to give them a good berth, as a reef is said to project from them about a mile in a south-westerly direction, near to which the depth is 9 to 13 fathoms.

From Rutland Island a bank of soundings extends 10 miles to the south-westward, upon which the depths are 7 to 10 fathoms. There are reasons for believing that some parts of this bank may be dangerous.

Cinque Islands.—This is a group of islands off the south-east side of Rutland Island, from which they are separated by Manners Strait, a channel 2 miles wide and 19 to 35 fathoms deep. They are moderately high, and joined together by a reef; a reef also extends about a mile from their southern end, and has upon it from 3 to 6 fathoms,—close to the outer edge of this reef are soundings of 17 to 25 fathoms.

Passage Island, &c.—At $3\frac{1}{4}$ miles southward from Cinque Islands is an island named Passage Island, having a rocky islet at a short distance north-westward from it. And, at about $3\frac{1}{2}$ miles south-eastward from these are two rocky islets, named the Sisters; these are close together and connected by a reef.

West Coast of the Andamans.—At about 7 miles westward from Cape Price is West Island, a small low islet surrounded by a coral reef, some parts of which extend probably half a mile beyond high water mark; in other respects the island is bold. From this island westward to the edge of the bank of soundings, the depths are regular, increasing from 12 to 16 fathoms in the first 6 miles, and thence gradually deepening to 40 fathoms close to the edge of the bank. Cape Thornhill, southward of West Island and 7 miles south-westward from Cape Price, is a round hill of a regular form, having the appearance of being insulated by a narrow channel. At a short distance westward from Cape Thornhill is Cliff Island, a steep rocky islet, apparently bold on its west side, and 2 miles southward of this islet is another of slight elevation, surrounded by a reef; the channel between these is believed to be shallow. In a south-westerly direction from Cape Thornhill, about 6 miles, is another promontory, apparently insulated, especially when viewed from the south-westward, there being on its south side an inlet; this promontory is low and flat,—in the entrance to the inlet are an islet and several coral reefs.

* The correct longitude of the Sisters, according to Mr. Bradley, of H.M.S. *Fox*, 1848, is $92^{\circ} 44' 49''$ E. (Madras Observatory, $80^{\circ} 14' 19''$ E.).

On this part of the coast of the Andamans the ground is generally of coral, with very great overfalls. In a S.S.W. direction, 6 miles from the last mentioned inlet, there is a dry rock at about 3 miles from the coast; and 6 miles farther, in the same direction, at the same distance (3 miles) from the land, is a small flat island. North Reef Island, 7 miles S.S.W. from this small flat island, has a reef jutting out from its south side 2 or 3 miles in a southerly direction; on the east side of this island there is a deep water passage to Port Andaman, but at about 2 miles from it, in a south-easterly direction, is a patch of rocky ground over which are violent overfalls.

Of the west coast of the Andamans but little is known, it being seldom visited, and perhaps less is known of the part between Cape Price and Interview Island than of the coast southward of that island. A bank of 20 to 30 fathoms, but having upon it numerous overfalls of 7 to 10 fathoms, and probably of 4 fathoms or even less, fronts it at the distance of 15 to 20 miles; the south end of this bank is in latitude $13^{\circ} 2' N.$, and is believed to be dangerous,—the north end is in latitude $13^{\circ} 25' N.$ Lieutenant Wales, L.N., of the *Ranger*, in his examination of this bank, did not find a less depth than 7 fathoms, but supposed, from the irregularity of the soundings and nature of the bottom, that there might be less. A Captain Nimmo has reported as little as $4\frac{1}{2}$ fathoms near its north end; for which reason Lieutenant Blair says, the bank should certainly be avoided by large vessels.

Captain Horsburgh says:—"A country ship from Masulipatam, bound to Pegu, at daylight, saw the Great Andaman bearing East, and observed at noon in latitude $13^{\circ} 0' N.$, then distant from the island 9 or 10 leagues. Hence she steered 3 or 4 miles eastward with a light breeze, and at 2h. P.M. coral rocks were perceived under her, covered *apparently* with so little water that the rudder seemed nearly to touch them; hauled instantly to the westward, and soon got into deep water. The India ship *Pitt*, bound from Bengal to England, had the Saddle Mountain bearing East 9 or 10 leagues, and the extremes of Great Andaman from N.E. by E. to S.E. by S.; she then tacked in 14 fathoms, and had 8 fathoms coral rocks, in stays. Standing northward with a light breeze, she had 11, $7\frac{1}{2}$, 14, 16, 24, 18, 12 to 9 fathoms in the first part of the night, then tacked and stood S.W. by S., deepening gradually till daylight. At sunrise the mountain bore E.N.E., and the extremes of the land from N.E. by N. to S.E. by S. distant 9 or 10 leagues, then in 60 fathoms. Between the shoal bank and the coast the soundings vary from 40 to 20 fathoms, and 15 fathoms near the land."*

* Captain William Richardson says, "My chief officer ran due West on this bank for two leagues in 6 to $4\frac{1}{2}$ fathoms. He supposed that to be its breadth, and that it runs lengthways North and South, as the islands do."—(1816).

Minns Bank.—In an old chart of the Andaman Islands a bank of 35 to 4 fathoms is represented as extending from lat. $13^{\circ} 12'$ to $13^{\circ} 36' N.$, at about 42 miles westward of Great Andaman;—the depth, 35 fathoms, being at the south end, and that of 4 fathoms at the north end of the bank. The existence of this bank is not credited, and it is probably the bank above alluded to, as it is between nearly the same latitudes, but differs considerably in longitude.

Another bank, the existence of which is also doubted, is also inserted in the same old chart at about 20 miles north-eastward of Minns Bank, in lat. $31^{\circ} 50' N.$, and between longitudes $92^{\circ} 16'$ and $92^{\circ} 32' E.$ The soundings given are 52 to 20 fathoms, the latter being the westernmost. We suspect that this is only the western edge of the bank of soundings surrounding the Andamans, reported by some shipmaster in error as to his position.

PORT ANDAMAN.—Interview Island, on the western side of this harbour, is 13 miles long, and is everywhere surrounded by a broad belt of mangrove, except near its southern end, where the land is higher and more healthy-looking. It has but moderate elevation, probably furnishes an abundance of fresh water, and is covered with dense vegetation, which shows evidence of exposure to the violence of the South-west Monsoon. At some distance from its south end is an islet, named South Reef, which is surrounded by and connected to the island by a reef. Between the island and the coast are several islets and reefs. All this part of the Andamans has been very imperfectly examined.*

Flat Island, &c.—At 18 miles southward from Port Andaman is a small island, close to the shore, and surrounded by a reef, named Flat Island; between are some reefs, at various distances from the land. Hence southward to the north-western entrance of Middle Strait the distance is about 16 miles: this strait has already been mentioned, it need only be observed, therefore, that when visited by Mr. Mouat in 1857 it was found to be for the greater part bounded by deep patches of stunted mangrove, the growth of which was evidently checked by the quantity of fresh water that falls into the strait during the monsoons.

Coral Banks.—These are two extensive banks, of 4 to 20 fathoms, or less water, situated about 16 miles off the west coast of the Andamans. The shoalest spot discovered (4 fathoms) is in latitude $12^{\circ} 34' N.$, and is only 4 miles within the edge of the bank of soundings.

PORT CAMPBELL.—Port Campbell, the entrance to which is in latitude $11^{\circ} 59' N.$, is an extremely fine harbour, and contains excellent anchorage, in depths varying from 6 to 13 fathoms. Its extent is about 6 miles, in a south-easterly direction. At the entrance are two islets, one on each side, of which that off the west point is named Montgomery; from these, banks extend and contract the channel to a width of about half a mile. The channel being so narrow renders the harbour difficult of ingress and egress, but within the shelter is perfect, being almost landlocked. Near Montgomery Island is a native village. Wood and water are abundant.

PORT MOUAT is a harbour within the Labyrinth Islands, at the south-west end of South Andaman, and nearly opposite Port Blair on the eastern coast, from the head of which it is distant about 2 miles. It is of considerable extent, well sheltered, and bordered by low hills covered with lofty trees. It is accessible only from the south through the passage between the Labyrinth Islands, a navigation far too difficult and dangerous to be used by vessels in distress during the South-west Monsoon. Mr. Mouat, who discovered it in 1857, says: "On attempting to run parallel to the coast in steaming northward, the coral reefs, which are here very extensive, were found to be far too near the surface to admit of the passage of a vessel, even of so light a draught as the *Pluto*, the water shoaling rapidly from 8 to $1\frac{1}{2}$ fathoms. An attempt to stand to sea in the direction of the largest island outlying to the westward, the North Sentinel, failed from the same cause."

NORTH SENTINEL.—This is an island of about 4 miles in extent, situated 15 miles westward from the Labyrinth Islands, and in or near lat.

* "A large and easily accessible harbour is formed between the eastern canal of Interview Island, and the adjoining western aspect of North and Middle Andaman. We steamed round Interview Island, and at its southern extremity, near South Reef Island, came into violent collision with the natives, in an attempt made to enter into amicable intercourse with them."—*Mr. Mouat, 1857.*

11° 34' N., longitude 92° 27' E.* It is of sufficient elevation to be seen from a distance of 18 to 20 miles, and is said to have a level summit and to be well wooded. Around it shoal water with reefs extends out about a mile. At its south end are two islets, and there is also one off its north-west side. It is probable that fresh water may be obtained from the island. Landing is represented as difficult.

The bank of soundings on the west side of the Andamans does not extend out from the west side of the North Sentinel, more than 3 or 4 miles, when from the depth of 100 fathoms bottom will be suddenly lost. The soundings are 20 or 30 to 50 fathoms, with sand and coral towards the shore; in 40 to 50 fathoms it is generally oaze.

LITTLE ANDAMAN.—This island is about 27 miles long from North to South, and 13 miles across in its broadest part, which is in the middle. Its north end is 30 miles southward from Rutland Island, or in latitude 10° 53' N.; and its south end in latitude 10° 26' N.† It is not very lofty, being visible only from a distance of about 20 miles; and when first seen has a level appearance; it is described as rising with an easy swell towards the middle, or rather nearer the south end, and the whole is well wooded. The west and east coasts are believed to be clear of sunken dangers except what are close to the shore;—the soundings are mostly from 10 to 18 fathoms, at 1 or 2 miles off, thence in a distance of 5 or 6 miles deepening to 50 or 55 fathoms, after which bottom is lost at 100 fathoms. The south side is more steep, there being at a little eastward of its south-west point 38 to 40 fathoms within 1 or 2 miles of it, and no bottom at 3 or 4 miles from shore.‡ On the north-west side of the island there is a small bay, where vessels may anchor in 5 fathoms.

At 5 or 6 miles W. by S. from the south-west point of Little Andaman is a bank of coral rocks, upon which the depth is said to be 6 and 7 fathoms; but it may be less. Between it and the island are soundings of 12 to 20 fathoms.

SOUTH SENTINEL.—This is a small island situated 17 miles north-westward from the north-west side of Little Andaman, in about latitude 10° 58' N. It is only a mile in extent East and West, is well wooded, and has a reef projecting some distance from each end, over which the sea breaks heavily during the South-west Monsoon. At about a quarter of a mile from its east end there is no bottom at 40 fathoms; at nearly midway between it and Little Andaman, but nearer the latter, the depth is 45 and 50 fathoms, and thence gradually decreases eastward, until at 1 or 2 miles from that island it is 13 and 10 fathoms.

BROTHERS.—The Brothers are two small islets covered with trees, whereof those on the southern islet are described as rugged in appearance, and those on the northern islet as perfectly flat; hence the latter is sometimes called Flat Island. Their position is 5 to 8 miles north-eastward from the north end of Little Andaman, and they are distant from each other about 3½ miles. A reef surrounds the North Brother,

* This is according to the Admiralty chart, No. 825, edition 1856, but the observations of Mr. Bradley, of H.M.S. *Fox*, 1848, tend to show that the whole of the southern islands of the Andamans are placed in that chart 12 miles too far eastward; hence the correct longitude of this island is probably 92° 15' E. (Madras Observatory being in longitude 80° 14' 19" E.).

† The south-east point of Little Andaman, by the observations of the Danish corvette *Galathea*, is in longitude 92° 30' 17" E.,—dependent upon Fort Cornwallis, Penang, being 100° 20' 10" E. The latitude was not stated.

‡ This does not agree with the Admiralty chart, No. 825.

and projects from its northern and south-western sides nearly a mile; the South Brother is also surrounded by a reef. Between the Brothers there is a ledge of rocks, named Leeboard, the position of which, not well ascertained, is believed to be 2 miles N.E. from the southern islet. There is also a reef, Ariel Ledge, at about $1\frac{1}{2}$ mile south-westward from the same islet. The channel between the Brothers and Little Andaman, although 5 miles wide from shore to shore and 6 to 10 fathoms deep, is so narrowed by Ariel Ledge and the reef running out from the latter island, that it cannot be recommended, and should be considered unsafe. This remark applies equally to the channel between the Brothers.

DUNCAN PASSAGE.—The channel north of Little Andaman, between it and Rutland Island, derives its name from Captain Duncan, of the *Ganges*, who sailed through it in 1760, and was probably the first European voyager who traversed it. It is 27 to 30 miles wide from shore to shore, but only 13 miles wide if the Brothers and Sisters Islets are considered the southern and northern limits. The soundings are 11 to 20 fathoms, and the navigation is believed to be safe, there being no known danger besides what is represented on the chart.* If necessary, a vessel may anchor in the channel in 12 to 17 fathoms on sand, and proceed at convenience; a good look-out should be maintained, the channel not having been surveyed.

Horsburgh says:—"In light breezes and fine weather, a kind of tide sets through the channels among these islands to the eastward and westward, but at times currents prevail which are generally governed by the wind. In the North-east Monsoon on both sides of the islands, the current sets mostly to the S.W. or southward; a ship running for Duncan Passage should therefore endeavour to keep a little to the northward in this season, and to the southward in the opposite monsoon, according to the prevailing wind, that she may preserve a leading breeze to pass through the channel."

NARCONDAM.—This is a small island, an extinct volcano, 2150 feet high, situated in latitude $13^{\circ} 28' N.$, and longitude $94^{\circ} 17' 22'' E.$ (Fort Cornwallis, Penang, being in $100^{\circ} 20' 10'' E.$). When viewed from a distance it appears like a cone or pyramid with its summit broken off. Close to its east side there is an islet or rock, and off its south point another. It is not known if a bank of soundings surrounds it.

BARREN ISLAND is a small island in latitude $12^{\circ} 16' N.$, and longitude $93^{\circ} 55' 26'' E.$, according to the observations of the Danish corvette *Galathea*.† It is only 2970 yards in diameter, in shape nearly circular, and about 975 feet high. The sea around it is believed to be very deep because at a short distance from it there is no bottom at 100 fathoms, except on its south-west side, where, within the distance of a quarter of a mile, are soundings of $4\frac{1}{2}$ to 14 fathoms. Landing is difficult. When visited in 1857 the island was covered with trees, and the sea in its immediate vicinity was quite hot. The volcano is in an active state at intervals.‡

* See the Admiralty chart, No. 825.

† Dependent upon Fort Cornwallis, Penang, being $100^{\circ} 20' 10'' E.$ Mr. Bradley of H.M.S. *Fox*, 1848, made the island in longitude $93^{\circ} 53' 45'' E.$

‡ See a very interesting description of Barren Island in the *Nautical Magazine*, 1860. Although we say that the sea around Barren Island is believed to be very deep, it is possible that there may be banks of soundings in its vicinity that have not been discovered. It was reported in 1816, that a Captain Sharrington, of the *Bahar*, country

INVISIBLE BANK.—An extensive bank of 17 to 50 fathoms is situated between latitudes 11° and $11^{\circ} 28' N.$ and longitudes $93^{\circ} 31\frac{1}{2}'$ and $93^{\circ} 45' E.$ The ground near its outer edges consists frequently of oaze or sand, but well in upon the bank it is occasionally foul and rocky, especially in the vicinity of the Flat Rock. The name "Invisible" was given to it by Lieutenant Blair in 1790, because the water upon it did not appear to him to be discoloured, and showed little if any indication of the existence of the bank.

Flat Rock.—This very dangerous rock, situated in latitude $11^{\circ} 8' N.$ and longitude $93^{\circ} 40' E.,$ * is only 20 to 30 feet above the water, and not more than 100 feet in diameter; it is therefore difficult to avoid in very calm weather when the breakers do not show much, and at night: hence the greatest care and vigilance must be exercised when in its vicinity. Rocky ground extends from it about twice its length, upon which the sea breaks in bad weather. At a short distance from it the depths are from 13 to 20 fathoms, coral and sand, which increase as you stand away from it on all sides to 30 and 40 fathoms towards the edge of the bank.

When in the neighbourhood of the Flat Rock the lead should be kept going, especially as its position has not been well ascertained. The soundings about it are not always regular. It is recommended when soundings are obtained to tack at once and haul out into deep water.

NICOBAR ISLANDS.

The Nicobars (or, Sambilangs, *Nine Islands*, in Malay) are a cluster of islands southward of the Andamans, between those islands and Sumatra. Some are of considerable size, and all are covered with trees and a dense vegetation. They are reported to be extremely unhealthy. Some of the islands contain good harbours, and to most of them a vessel may with care stand pretty close in, as the coasts are remarkably free from detached sunken dangers. The principal and only moderately civilised island, that most frequented by country vessels, is Car Nicobar,—the northernmost one. The natives of this island have obtained the character of being very honest, kind, and hospitable; and many of them speak a little broken English.

ship, had struck bottom in 4 fathoms at 5 or 6 leagues S.S.E. from the island. No further particulars were given, nor have any attempts been made to examine this bank that we are aware of.

"Looking to the interior of the island it is well called 'Barren Island,' for it is truly a valley of desolation, dark and gloomy; but, as viewed from the sea, it is extremely fertile, all the slopes seaward being clothed with thick vegetation, though of what kind I had no opportunity of seeing. There is no anchorage, and landing, except in very calm weather, is not possible, as there is but one spot where a landing can be effected, and the water must be very still to make it practicable even there. The sea becomes hot as you approach this landing place, till, near the shore, it becomes scalding hot—a circumstance which occasioned a little merriment; for some of our men, not expecting anything of the kind, jumped out of the boat as usual into the water, and of course began dancing about very actively till they could either get in again or on shore."—*Rev. Charles Parish*, Bengal Service, 1862.

* So inserted in the Admiralty chart, No. 825, where also another position is given for it on the authority of Captain W. Owen, R.N., of H.M.S. *Seaflower*, 1806,—namely, latitude $11^{\circ} 17' N.$, longitude $93^{\circ} 29' E.$, which nearly agrees with what Mr. Bradley, of H.M.S. *Fox*, supposes to be its correct position, namely, $93^{\circ} 26' E.$

The Nicobars have not been surveyed; the description we have of them is consequently imperfect. A partial examination of the islands has been made by the Danes, and a chart the result of this examination was published in 1846. Another reconnaissance was made by the officers of the Austrian frigate *Novara*, in 1858, and a chart of the islands was subsequently issued at Vienna. It is remarkable that the geographical positions in these two charts do not by any means agree, but differ in some instances so much as 8' to 20' in longitude.

The channels among the islands are safe to navigate, although at times there are very great rippings and overfalls, which are alarming to strangers; the currents generally set East and West through them. The shores are in general lined with coral reefs, and most of the projecting points have a reef jutting out from them; hence a good look-out is always necessary, and a free use must be made of the lead.

CAR NICOBAR has an extent of about 7 miles from N.E. to S.W., and is nearly 6 miles broad. It is of moderate height, except on its western side, and towards its south-east point where the land rises into hills. There are villages all round its coast, the inhabitants of which are fond of barter, being always ready to exchange produce for cloth and other goods. The position of the village of Saoui, at the north side of the island, according to the *Novara's* observations (taken on the reef), is latitude $9^{\circ} 14' 8''$ N, and longitude $92^{\circ} 44' 53''$ E.*

The soundings around Car Nicobar at a mile from the shore average 20 fathoms, on sand or sand and coral, which rapidly increase seawards to 100 fathoms; the edge of the bank is steep. Anchorage can be obtained almost anywhere, but the coral bottom makes it indifferent; the most eligible place is off the village of Saoui in 10 or 12 fathoms.

The north-west point of Car Nicobar has a reef extending from it; hence it should have a good berth, especially as broken water is said to lie off it as much as $1\frac{1}{2}$ mile. Captain Hay, of the *Inglis*, says, that "a large ship should not approach it nearer than the depth of 14 or 12 fathoms, as I did for the convenience of getting refreshment quickly on board, having anchored abreast the village in $9\frac{1}{2}$ fathoms at one mile distance, the north point bearing N.E. $\frac{1}{2}$ N.; the south point W. by S. with 30 fathoms of cable out,—a rock was seen under the ship, having only $7\frac{1}{2}$ fathoms on it. A ship ought to anchor at about half-way between the north-west point of the island and the village, in 12 or 14 fathoms, sand, but never so near the village as did the *Inglis*."†

* Assuming the observatory at Madras to be $80^{\circ} 14' 19''$ E. All the *Novara's* longitudes of the Nicobar Islands are dependent upon this meridian. The *Novara* anchored in $14\frac{1}{2}$ fathoms, coral sand, at about two miles from the shore, between the villages of Mosse and Saoui. An approach to the shore, to about 3 or 4 cables' length, can be made, as the depth at that distance is about 10 fathoms, clay. From the offing Car Nicobar appears level, with a low eminence rising towards its centre; the coast is overgrown with cocoa-nut palm.

The Danish corvette *Galathea* made the village of Saoui in latitude $9^{\circ} 12' 43''$ N., longitude $92^{\circ} 43' 20''$ E., dependent upon Fort Cornwallis, Penang, being $100^{\circ} 20' 10''$ E.

† "There are a number of villages around the island of Car Nicobar. You can approach within 10 or 11 fathoms, hoist all your colours, and you will soon have the natives off to show you the best place to anchor. Tell them what you have come for, and after you have got your ship comfortably at an anchor, and decks cleared, show them your barter; you will soon get familiar with them. They are very forward in their manners, and take many liberties, but do not mean any harm. It is only for the want of knowing better, being only half civilized; therefore on no account get angry with them—they will do anything for kindness."—*Mr. Major, agent for Lloyds', Moulmain.*

BATTI MALVE.—This small island is distant from Car Nicobar about 18 miles, in a S. by E. direction; its centre being in latitude $8^{\circ} 49' N.$, longitude $92^{\circ} 51' 30'' E.$ * Its height is 150 to 200 feet, in shape it is nearly quadrangular, and it is not more than $1\frac{1}{2}$ mile across. Its highest part is its west side, whence it slopes eastward, causing the island to resemble a wedge at a distance. The surface consists of bare rock so thinly covered with soil, that only shrubs and a few scraggy trees will grow on it. There is no fresh water, and no inhabitants.

Batti Malve is seated on a bank of soundings, the extent of which is unknown. At 4 miles S.S.E. from the island the depth is 22 to 25 fathoms, at $1\frac{1}{2}$ mile westward from it 47 fathoms, and at a mile eastward from it $7\frac{1}{2}$ to 10 fathoms.

TSCHAURA is distant 24 miles S.S.E. $\frac{1}{4}$ E. from Batti Malve, its east end, according to the observations of the *Galathea*, being in latitude $8^{\circ} 25' N.$, longitude $93^{\circ} 3' 37'' E.$ It is only $1\frac{1}{2}$ mile in extent, and not more than 6 feet above the surface of the water, excepting at its south-east corner where it rises as an immense rock of great height, perpendicular to the sea, far above the trees on the island. This rock is said to give the island the appearance of the crown of an old-fashioned hat with the flaps let down, the low land then resembling the flaps, and the rock the crown of the hat; hence the Portuguese gave it the name of *Sombrero (hat)*. The village is on its north-east side. The produce of the island is chiefly hogs and poultry; all kinds of tropical fruits may also be obtained. The natives are reported to be friendly to strangers.

The north-west, west, and south-west sides of Tschaura are bordered by a reef which extends out from a half to three-quarters of a mile; the edge of this is steep. Anchorage may be obtained all round the island, but the usual place is off the village in 20 to 30 fathoms, sand.

Tschaura is seated on a bank of soundings, the extent of which is unknown. At 2 miles eastward from the perpendicular rock the depth is 50 fathoms; at a mile north-eastward from the village it is 45 fathoms, and at the same distance seaward from the south-west point of the island it is 93 fathoms. According to the Danish chart of 1846, a coral bank of 8 to 17 fathoms lies $2\frac{1}{2}$ miles north-westward from the island; it may possibly be a part of the bank of soundings, as the chart represents soundings of 16 to 8 fathoms between it and the shore.†

TERESSA is the island next southward of Tschaura; its west point, according to the observations of the *Galathea*, is in latitude $8^{\circ} 18' 45'' N.$, longitude $93^{\circ} 5' 29'' E.$ It is about 10 miles long, N.W. and S.E., and 2 to 3 miles broad, and when viewed from a considerable distance appears like two islands, the land towards each end, particularly the north part, being much higher than in the middle. Its productions are similar to those of Car Nicobar; it is, however, said to be less populous. Ships generally avoid the island as much as possible during the South-west Monsoon, as it is considered an awkward place to visit at that season.

The west, north, and south-east sides of Teressa are foul to some distance off, especially at the latter part where the reef runs out about a mile. The island and Bompoka, eastward of it, are both seated on a bank

* The Danish corvette *Galathea* made its south point in latitude $8^{\circ} 50' 4'' N.$, longitude $92^{\circ} 49' 55'' E.$

† This bank on the Austrian chart is inserted as uncertain, and the soundings are 9, 8 $\frac{1}{2}$, and 17 feet, not fathoms,—the authority for its insertion is apparently the Danish chart.

of soundings the extent of which has not been ascertained. There is anchorage all round the island, but the depth is considerable, there being 30 to 40 fathoms at a quarter to half a mile from the west shore, and 30 fathoms' coarse sand almost immediately outside the reef extending from the south-east point; the usual place of anchorage is off the eastern shore, in about 20 fathoms.

BOMPOKA, an island on the south-east side of Teressa, is not more than 2 miles long, N.N.E. and S.S.W., and 1 mile broad. It is 2 miles from the shore of Teressa, being separated from it by a channel 30 to 50 fathoms deep. It consists of a mountain partly covered with wood. Its summit is a sharp ridge, extending North and South about half the length of the island, from which the declivity on all sides is regular to the water's edge. The inhabitants are very few, and the women are considered to be fairer and handsomer than those of the neighbouring islands.

At a short distance from the east shore of Bompoka are soundings of 18 to 29 fathoms. The anchorage is on its western side, in 15 to 20 fathoms.

TILLANGSCHONG is an island 30 miles north-eastward from Bompoka, the anchorage on its west side, at two miles from its north point, being in latitude $8^{\circ} 32' 29''$ N., longitude $93^{\circ} 34' 14''$ E.* It is about 8 miles long, and with the islets off its south and north points occupies an extent of nearly 11 miles. It is very narrow, and consists of a high rugged mountain, 450 feet high, which may be seen from a distance of 12 to 14 miles, and when first seen has the appearance of a cocks-comb. The greater part of the island is covered with trees, and it is said to be inhabited only by exiles from the other islands. The outermost rocky islet off the south end of Tillangschong is named Laouk.

The east side of Tillangschong is steep, and has at a short distance from it a depth of 13 to 34 fathoms.† The west side is perhaps equally steep, there being almost close to it, and to the islets and rocks off the south end of the island, soundings of 30 to 75 fathoms. The extent of the bank of soundings east, west, and north of the island is unknown.

CAMORTA is the island next southward of Tillangschong. Between are soundings of 17 to 65 and 57 fathoms, the first being off the north end of Camorta, and the last at a short distance southward from Laouk, the rocky islet off the south end of Tillangschong; in mid-channel the depth is 40 to 65 fathoms. The extent of this bank in an east and west direction is unknown.

Camorta, Trinkut, and Nangcovri together occupy an extent of 19 miles, in a N.N.W. and S.S.E. direction, and of about 7 miles East and West. Camorta, the principal island, is 15 miles long, and its north point is in latitude $8^{\circ} 14' 5''$ N., longitude $93^{\circ} 31' 11''$ E., according to the *Galathea*. The northern and middle parts of the island are flat, and have only moderate elevation, but the land in its west part is high, especially near Nangcovri Harbour; it is here that the principal village of the island is

* So determined by the *Novara*, but the chart of the Nicobars, from the observations of the surveying officers of that ship, has it in longitude $93^{\circ} 36'$ E. The *Novara* stood in for the north shore of the island to within 100 feet of the steep octagonal-shaped cliff which forms its north point, and afterwards skirted the north-west coast for about $2\frac{1}{2}$ miles, at the distance of 150 to 200 feet. The highest part of the island did not apparently exceed 300 feet. At its south-east side there is a well-sheltered anchorage.

† Mr. Ritchie says, "At 10 fathoms' distance eastward from Tillangschong there is no ground with a line of ordinary length."

situated, at the base of a perpendicular ridge. The island has been described as "irregular broken land, mostly covered with trees and under-wood; the trees are three or four sorts of the poon, very fit for masts and to build houses. There are several plains of pasturage three or four miles round; the soil is rich, as sugar-canes grow without cultivation, and it produces the finest yams in India—there are besides fine flavoured pine-apples, plantains, guavas, &c. Water is obtained from wells, but is not plentiful in the dry season, owing to the small number of wells sunk by the natives. There are no tigers nor other dangerous beasts; but many snakes, though few of them are venomous." The inhabitants are not numerous. Its western side abounds with bays and fine haabours; there are good places at the north-east and north-west parts for cocoa-nuts; the village is named Kakana.

At about $2\frac{1}{2}$ miles northward from the south-west point of Camorta, on the west coast, is the entrance to a large bay named Ulala, which is three-quarters of a mile wide at the entrance, and probably within is deep enough to receive vessels of considerable size.

The depths along the west shore of Camorta are 28 to 30 fathoms at about a mile from the land, and it is not known how far westward the bank of soundings extends. A reef is reported to run out about 3 miles from the north-west point of the island.

Triukut, on the south-east side of Camorta, is $5\frac{1}{2}$ miles long, and very narrow. It is low and level, and covered with betel and cocoa-nut trees. The channel between it and Camorta is about a mile wide in its narrowest part, and, excepting at its southern end, is shallow, too shallow we believe for vessels of even moderate draught. From its north-east point a reef runs out about a quarter of a mile.

The soundings at a short distance from the east shore of Triukut are 4 to 7 fathoms, which rapidly increase to 17 and 20 fathoms, the latter being at about 2 miles from the land; it is not known how far eastward the bank extends. Between the north-east end of the island and Camorta vessels anchor in 8 or 9 fathoms, coral; and, also, at a short distance westward of its south point, in 6 to 8 fathoms, soft ground.

Nangcovri is about 5 miles in extent, of triangular shape, having its apex to the south, rugged, uneven, and almost covered with wood. It is very thinly inhabited.

At $1\frac{1}{2}$ mile eastward from the south point of Nangcovri the depth is about 32 fathoms, and at 3 miles southward from the same point 74 fathoms. It is believed that the last-mentioned sounding is on the southern edge of the bank upon which the three islands, Camorta, Triukut, and Nangcovri, are seated.

NANGCOVRI HARBOUR, the narrow channel separating Nangcovri Island from Camorta, is considered the finest harbour in the Nicobars. It is deep enough for the largest vessels; the anchorage is nearly land-locked, and access to it is either from eastward or westward. A few Moravian missionaries from Tranquebar were stationed some years ago in Cross Harbour (one of the bights), to convert the natives to Christianity; their settlement was called Hermann, and we believe it has been abandoned. Very few refreshments can be obtained here, the land being hilly and not cultivated, although on the north side of the harbour the soil is good.

The western entrance of Nangcovri Harbour is about one-eighth of a mile wide, and 27 to 33 fathoms deep; the points of land on each side are high, and from that on the north side (the south-west point of Camorta) a

bank of 6 to 12 fathoms, on irregular rocky bottom, runs out a short distance in a south-westerly direction.* The eastern entrance is a little wider than the western, being contracted by rocky banks which line the shore on each side, having 12 and 14 fathoms close to them, and from 18 to 20 fathoms in mid-channel. There is less water outside or eastward of this narrow part of the eastern entrance, but it is nowhere less than 6 to 11 fathoms deep;—generally the soundings close to the rocky banks off the shores are 5 fathoms. The navigation of the eastern entrance is considered easier than that of the western entrance, on account of its greater width.

The harbour is divided into two parts by a point of land jutting out on each side. The easternmost, named Cross Harbour, from its form, is the smaller, and contains several shelves of rock in its southern arm with 5 or 6 fathoms close to them. The western, or larger part of the harbour is a great basin of an oblong form, about two miles long and one broad, with a cove on the west side, and another at the south end; in its north-west part there is a rocky bank of 5 and 6 fathoms, sand and patches of rock, distant from a half to two-thirds of a mile from the shore. The depths throughout the harbour are generally 10 or 12 fathoms near the shore, and 18 or 20 fathoms in the middle, except near the western entrance, where there are 27 to 34 fathoms; the bottom all over is soft, and good for holding. The tide runs strongly with eddies through the western entrance. The flood runs eastward, and sets out of the eastern entrance with some strength, although in the harbour it is scarcely perceptible.

When running into Nangcovri Harbour by either the eastern or western entrance, it is recommended to keep in mid-channel, and as an extra precaution to have a man at the fore or fore topsail-yard to look out for the edges of the rocky banks that line the shores.

KATSCHAL.—At about 4 miles westward from Nangcovri Island is the island of Katschal, which is 10 miles in extent N.W. and S.E., and of very irregular form, its eastern and western sides being each indented by an extensive bay. Its north and west parts are moderately elevated and level; the other parts of the island are much higher and sufficiently lofty to be visible from a distance of about 25 miles. The island is covered with wood, and furnishes abundance of cocoa-nuts.

Along the north-west, south-west, and east sides of Katschal there is anchorage; on the south-west side of the island the best position is in about 11 fathoms off the entrance of the bay. The north-east coast is so steep that at half a mile from it the depth is said to be 50 to 100 fathoms. The extent of the bank of soundings westward of the island is unknown.

At about a mile from the south coast of Katschal there is a rock 12 feet under water, and at 5 miles southward from the island there is said to be a coral bank of 9 to 17 fathoms,† having soundings of 70 to 80 fathoms close to it.

LITTLE NICOBAR.—This island is about 12 miles long and 8 miles

* "The western entrance to Nangcovri Harbour is scarcely 100 fathoms wide, by 14 in depth, and is marked by two rocky pinnacles. Directly opposite lies the island of Katschal, thickly wooded to the water's edge, and stretching out long and low, without any marked elevation above the sea level."—*Narrative of the Novara's Voyage.*

† It is so represented in the Danish chart of 1846, but in the Austrian chart (the voyage of the *Novara*) the same soundings are given as feet, not fathoms,—in both charts its existence is stated to be uncertain. Captain Mackay of the *Albion*, 1770, reported a coral bank of 9 to 18 fathoms, in latitude 7° 43' N. or about 10 miles southward from Katschal; he failed in obtaining bottom at 69 fathoms at a short distance from it,—probably this is the same bank.

broad; it is moderately elevated, hilly, and, like most of the islands of the Nicobars, covered with wood. Its north point is surrounded by a reef. At about 10 miles north-westward from its north point is a small low island named Meroe, and midway between are two others, named Treis and Track, of which the former is the larger in size; these two islets have sunken rocks about them. At nearly midway between Treis and the north point of the island there is a small bank of 6 fathoms, having close to it a depth of 25 fathoms.

At nearly 3 miles from the east shore of Little Nicobar there is a small islet named Montschal. In the channel between are soundings of 19½ to 30 fathoms.

The anchorage at Little Nicobar is on its north-west side, under protection of a little islet named Milu. The depth is 9 to 12 and 14 fathoms, sand and coral, and the approach is from westward or northward; in either case care is required to avoid the coral reefs that line the shore. Mr. Major says of this anchorage, "It is a beautiful little harbour, only open from N. ½ W. to N. W. by N.; the entrance is directly opposite Track Island in the Sombrero Channel, and a ship can lie within 100 fathoms of the shore in 9 fathoms water, on the starboard side of the harbour under the small island of Milu (or Buseh Island, as it is called by the Danes). The natives here are very inoffensive and willing to trade, but they are very poor. This harbour is perfectly safe at all seasons of the year, and Poon spars are procurable in abundance in the jungle for disabled ships, without any expense—only the trouble of cutting them by the ship's crew, and bringing them to the ship, which would not be much labour. Of the islands Treis and Meroe, the former must not be closely approached; the latter can, and a great number of cocoa-nuts can be got there, but it is not safe in the South-west Monsoon."

GREAT NICOBAR.—This island is about 30 miles long, N.N.E. and S.S.W., and 14 miles wide in its broadest part, which is in the middle, whence it diminishes to a point at its south end, ceasing in low level land covered with trees, and fronted by a sandy beach. The highest parts (probably 1900 feet) are in about its centre and towards its north side, where the hills run across the island in an E.N.E. direction. The soil is of great fertility, and in many parts densely covered with timber. The sugar-cane in great abundance is to be met with growing wild, coffee also and numerous tropical fruits. The natives of the interior are believed to be of different race to those on the coast, and are supposed to be savages. There is no place for trading for cocoa-nuts. Quantities of tortoise-shell can at times be picked up. According to the observations of the *Novara*, the little sandy beach at the south end of Condul Island, off the north shore of the island in St. George's Channel, is in latitude 7° 12' 17" N., longitude 93° 39' 55" E.; and the east side of Galathea Bay at the south end of the island (at the landing place near the extremity of the point) in latitude 6° 48' 26" N., longitude 93° 49' 45" E.*

Galathea Bay at the south end of Great Nicobar Island has an extent of two or three miles; it affords excellent anchorage in 5 to 9 fathoms,

* The *Galathea* made the middle of the west side of Condul, about a mile N.W. (true) from the sandy beach where the observations of the *Novara* were made, in latitude 7° 12' 50" N., longitude 93° 43' 31" E.; and the south point of Great Nicobar Island, the west side of Galathea Bay (3' south, and 2' of longitude west from the landing place alluded to by the *Novara*), in latitude 6° 45' 49" N., longitude 93° 50' 40" E.

sand and clay, and shelter from the monsoons. At the head of the bay there is a barred river, a pistol-shot wide, which runs up the centre of the island. A reef jutting out from the west point of the bay (the south point of the island) requires some caution to clear.

At about two miles from the east shore of Great Nicobar Island, and 13 miles from Galathea Bay, there is an isolated rock named Boat Rock. In the channel between it and the shore are soundings of 20 and 18 fathoms.

Around Great Nicobar Island there is a bank of soundings the extent of which is unknown. At two or three miles from its west shore the depth is 17 to 24 fathoms; at five or six miles from its south-west side, 25 to 30 fathoms; and at six miles from its south-east side, 40 to 50 fathoms.

St. George's Channel.—The wide and deep passage between the Great and Little Nicobar Islands is named St. George. Although a very convenient channel it is seldom used, except by vessels trading with the islands, the masters of which may be supposed to have some local knowledge. The bottom is said to be foul, and strong tides and currents running in eddies prevail to a considerable extent, rendering the anchorage generally unsafe. At the eastern entrance is the little islet Cabra, two miles from the shore of Great Nicobar, and with soundings between of 20 to 40 fathoms; and at the western entrance is the larger island of Condul, from the north and south ends of which a reef projects—the passage through the channel is northward of this island. Vessels sometimes anchor in Ganges Harbour, a small bay on the south shore just within the eastern entrance of the channel, in 9 to 16 fathoms, coarse sand and clay; care is required to avoid a reef in front of the bay, and another just off its east side.

General Summary.—The following is a general summary of the result of the examination of the islands by the officers of the Austrian frigate *Novara*.

“With but few exceptions the shores of the whole group of the Nicobars consist of coral sand, or are fringed with coral banks, which latter extend seaward to a depth of 30 fathoms. In like manner almost all the bays seem to be edged with coral reefs, if indeed they are not actually studded with them. The promontories frequently present cliffs both above and below the level of the ocean, extending a couple of miles into the sea, which, what with the occasional rapid currents and light breezes, are not always very easily weathered. The prevailing winds are the two monsoons, the North-east in the months of November, December, January, February, and March; the South-west in May, June, July, August, and September. During the months of April and October, there are variable winds and calms, extending more or less into the adjoining months. The currents vary in direction with the passages between the islands, and depend upon the ebb and flow of the tide, varying in force and direction with the tidal phenomena. Ordinarily these make themselves felt during the making of the tide from S.W. to N.E., and in a contrary direction during the ebb.

“Due south of Car Nicobar we found, while lying at anchor, a current running $3\frac{1}{2}$ miles an hour, two days after the full moon; north of Little Nicobar, near the small island of Treis, where the current compelled us to anchor, its velocity, as we experienced two days after new moon, is as high as $4\frac{1}{2}$ miles an hour. These observations refer to a period when the velocity of the current was at its maximum. In light winds, and when near the coast, one must always let go the anchor, or at least lay out a kedge, the latter however being barely sufficient at several spots immediately after the full or the new moon. According to observations made during five days

about the period of full moon, the time of H. W. at Car Nicobar may be assumed at 9h. 40m., and the difference in height between ebb and flood at 5 feet.

"In these waters, and in a still more marked degree in the latitude of Sumatra, occurs a belt within which the wave-currents form what is known to English navigators as 'Ripples.' The sea here is ranged zone fashion, so to speak, as though in fact in a state of ebullition, and makes a considerable noise, yet without there being anything to indicate an increased strength of current; since, on the contrary, we found when reaching these tracts, that the velocity of the current was if anything rather diminished. We conceive this phenomenon may be attributed to the agitation caused by partial tidal currents, crossing each other's course, and occasionally even running counter to each other, as also to certain special conditions of ocean temperature at varying depths. The changes of the tides at points of the coast, proportionally speaking so near each other, are so widely different in point of time, and the height reached by the waves is so little uniform, that any such phenomenon as the above must naturally make itself perceptible at the surface in the open sea.

"While the change of tide at Car Nicobar takes place every 9h. 40m., that of Cape Diamond in Sumatra is laid down in the English chart at 12h., and on the sandbanks in the Strait of Malacca at only 5h. 30m. The difference in elevation assigned exhibits a similar discrepancy in the estimates; that for Car Nicobar being stated at 5 feet, that for Cape Diamond at 10 feet, and on the sandbanks already mentioned at 15 feet. The hurricanes of the Bay of Bengal seldom visit the Nicobars; they seem to originate part near or about the Andaman Islands, or on the west coast of Sumatra, proceeding in the former case towards the northern portions of the Bay, and in the latter towards the Coromandel coast and Ceylon.

"During the South-west Monsoon, in which occurs the rainy season, frequent thunder-storms and even gales of wind occur, especially in the vicinity of Great Nicobar. The dry North-east Monsoon again brings fine weather, but sometimes blows with considerable strength.

"Car Nicobar has no regular harbour, but presents on its north side a spacious land-locked bay nearly rectangular, the holding ground of which is a coral sand of from 10 to 16 fathoms, and is thoroughly sheltered to the S.W. and N.E. During the North-east Monsoon it is advisable to lie somewhat closer in with the northern promontory of the island. At this season it is difficult to find any spot at which small boats can disembark. However, near the northern point it is possible to reach the shore in a small cove, the western boundary of which presents an open space of coral sand, where it is possible to lie-to in deep water with even a good-sized boat. The village of Saoui, which gives its name to the roadstead, is not readily accessible during the North-east Monsoon in consequence of the surf, but the very next indentation of the coast facing eastwards, which is protected seaward by a coral reef, offers a well-sheltered point of disembarkation, where the boats can be beached on the smooth coral sand, and thereafter drawn up high and dry.

"During the North-east Monsoon it is also practicable to avail oneself of the bay on the south side of Car Nicobar, or to anchor anywhere along the west side of the island, but such anchorages possess no other protection than is afforded by long points of land projecting far into the ocean, and usually protracted by coral reefs.

"Both in the bay of Saoui, and on the south side of Car Nicobar, are

found small brooks, which run with water, even during the dry season. It is difficult, however, to water hereabout, because these rivulets are blocked up with sand-bars, not to speak of the obstacles interposed to the landing of boats, by the tremendous surf and the low swampy shore at most periods of the year. In cases of extreme necessity, however, the little rivulet called the Areca might with some difficulty be made available.

"Tschaura, Camorta, and Bompoka have no regular anchorages: a vessel must be content to ride to leeward of that coast, which will serve as a shelter against whichever monsoon happens to be blowing. Disembarkation by means of boats is extremely difficult, and it is much better to make use of a native canoe, which, after transporting the visitor through the surf to the land, can be more easily drawn up on the beach.

"Tillangschong possesses a beautiful harbour on the south side, which, however, is open to the S.E., but during the greater part of the year affords an excellent anchorage. The most southerly point has numerous cliffs and needles of rock where it projects into the sea, but it is possible to approach within a few fathoms of the southernmost of these with vessels of any size. On the west side of the island, at the spot where its two halves may be said to blend, the northernmost rugged, the more southerly flat, a pretty good anchorage will be found, which seems to be sheltered toward the S.W. by several solitary projecting rocks. Generally speaking, but more especially to the N. and E., this island presents a steep precipitous shore, so that, with the exception here and there of a few solitary rocks, close in to the shore, there is nothing but clear deep water around almost the entire island to within about 10 fathoms of the land.

"The harbour of Nangcovri is rather roomy, but of very unequal though for the most part considerable depth; the soundings in its midst giving between 20 and 30 fathoms. The promontories are all more or less low-lying, and thickly beset with coral reefs, and caution is the more necessary, since it is far from unusual, after working in from 20 to 16 fathoms, to find the water shoal suddenly to 4 or even 3 fathoms. The anchorage formed by the two islands of Camorta and Nangcovri has an entrance from the east and also from the west, the navigation of which by large ships demands the utmost vigilance. The western entrance is barely a cable's length in width, while the island of Nangcovri has hardly any fairway for vessels along its exterior coast-line. In consequence of the two islands trending towards each other at that point, the harbour near its middle is greatly narrowed, so that there may almost be said to be two harbours. In either of them a vessel is quite safe, being in fact so thoroughly sheltered from all winds that the heat is occasionally overpowering.

"On the west side of Camorta, 6 or 7 miles north of the western entrance of the harbour, will be found a large sheet of water, called Ulala Bay, in the first half of which there is excellent anchorage; but the vapours emanating from the abundant mangrove swamps render residence here extremely unhealthy. As Ulala Cove runs for the most part parallel with Nangcovri Harbour, and is separated from the latter only by a range of low eminences, the near proximity of these mangrove swamps likewise imparts their baneful influence to the air of Nangcovri Harbour. There is absolutely no water here fit for drinking.

"Katschal has large bays both on its east and its west sides, but they are almost entirely silted up with coral sand. The channel between Katschal and Camorta is clear. Here we made short tacks in passing through, approaching the shores on either side within half a mile.

"Little Nicobar has a good harbour on the north side, formed by the island of Milu and the north coast of Little Nicobar, which is bent almost at a right angle. This anchorage is accessible in all winds, and is well sheltered, but a considerable portion adjoining the shore of Little Nicobar is rendered useless by banks of coral. Notwithstanding the most careful examination of this part of the coast, we could not discover the spot which in the Danish charts is marked as furnishing water fit for drinking, but perceived nothing save mangrove swamps, with numerous water-courses filled with brackish water, the two largest of which we navigated in our gondola as far as practicable.

"The island of Condul in St. George's Channel forms another very fair anchorage; and similarly on the north side of Great Nicobar, one finds several suitable bays, the most easterly of which, called Ganges Harbour, is fringed with coral banks, rendering it proportionately difficult of access. The anchorage of Condul may be selected for one reason, namely, that it is land-locked towards both N.E. and S.W., besides having the additional advantage of being airy and distant from the mangrove swamps, whereas in the bays on the north coast of Great Nicobar these are of immense extent. One of these mangrove swamps in the central cove was traversed by one of the naturalists, the result of which was that he found a river debouching into the sea through the very heart of the swamp, which, however, so long as the sea-water could find entrance, was not of course drinkable.

"On the west side of Great Nicobar, along the whole length of which we sailed, but which we could not visit more carefully, owing to want of time, and the heavy S.W. swell of the ocean, several other promontories and coves are apparently available as harbours, and moreover may be supposed to be the embouchures of rivers. At the south point of Great Nicobar there is a large bay, which, however, being quite exposed from S.W. to S.E. must be anything but a safe anchorage during the South-west Monsoon. During the prevalence of the North-east Monsoon it seems tolerably well suited for an anchorage, if the eastern promontory be kept S.E. by S., and the anchor be cast in soundings of from 10 to 13 fathoms. Landing, however, is at all times a matter of difficulty, as the surf is very boisterous, and the swell of the sea pretty heavy. Its most remote point is the mouth of the river Galathea, which, however, is closed by a sand-bar, and for that reason cannot be easily reached. This bay, owing to its configuration, is excessively hot and sweltering, and with reference to its salubrity cannot be recommended as a suitable abode.

"The climate of the Archipelago, though tropical, is not nevertheless to be ranked among the hottest, in consequence of its insular position, and of the whole of the islands being thickly clothed with forest. Hence the quantity of rain is sufficient to keep the rivers full even in the dry season. According to the meteorological observations made on these islands by various observers at different periods of the year, the average temperature does not exceed 77° Fahr.; much about the temperature of the fluid found in the fresh unripe cocoa-nut. But during the months of April and October respectively, at which period calms prevail in these islands, the maximum temperature of 86° to 88° Fahr. is reached.

"Considering the violence with which rain falls, and that the dry season of the North-east Monsoon from November to March, and the damp season of the South-west Monsoon from April to October, are by no means so sharply defined on these islands as on the adjoining coasts of

the mainland, the quantity of annual rainfall must be enormous. At certain times it is not much less than 100 or even 150 inches, and yet it probably is not so high as that presented by other localities, which experience the regular changes of the monsoons, as for instance in the Strait of Malacca, where the annual rainfall is 208 inches, or Mahableshwur, south of Bombay, where it amounts to no less than 254 inches. March is the driest month in the year. During the whole of the month which we spent on the islands, or in their immediate vicinity, we only had three sharp thunderstorms. These become more frequent and severe during April, until, about May or June, the South-west Monsoon sets in and envelopes the islands in rain-clouds."

CEYLON.

COLOMBO.—The following directions are by Mr. JAMES DONNAN, Master Attendant at Colombo, 6th July, 1864:—

"The roadstead of Colombo, although exposed to the S.W. Monsoon, is a safe one for vessels well found in ground tackle. Vessels generally ride out the Monsoon at single anchor, with a long scope of chain. A gale of wind may occur about the changes of the Monsoon, in the months of May, June, November, and even as late as December; though a gale in the latter month is very rare, and several years sometimes pass away without any beyond a stiff Monsoon breeze. These gales are seldom violent, and it is only during them that casualties occur to the shipping. Only five vessels have been wrecked within the last thirty-two years. Communication between the shore and shipping is seldom interrupted, although there are occasional spells of squally weather and a high sea during the S.W. Monsoon, which make the passage over the bar difficult and dangerous, especially for small boats.

"A vessel may anchor anywhere in the outer roads with the flagstaff bearing from S. $\frac{1}{2}$ E. to S.E. by E. in $6\frac{1}{2}$ to $9\frac{1}{2}$ fathoms water, and distant from the north bastion of the fort from half to one mile. The best anchorage is with the flagstaff bearing about S.S.E. $\frac{3}{4}$ E., in 8 fathoms water. Vessels arriving during the S.W. Monsoon, or about the changes of the Monsoon, should not anchor nearer the north bastion than half a mile, or bring the rocky point at Mutwal (which is about $1\frac{1}{2}$ mile northward of the fort) to bear northward of N.E. $\frac{1}{2}$ E.; and they are recommended to ride with not less than 80 fathoms cable to the hawse, and to have all the shackles looked to, and the small pins well secured, before coming to an anchor. The constant pitching motions which vessels are subject to causes the cables at some distance from the hawse to beat and chafe on the ground, and the shackle pins frequently work out, if not well secured. The small pins should be of iron, with large heads, and the other ends well clinched over a ring; if not clinched they invariably loosen, and work out.

"The Inner road or harbour is mostly occupied by the native coasting vessels. It is considerably sheltered from the S.W. Monsoon by the north bastion of the fort and bar, and affords good and safe anchorage for vessels drawing not over 11 feet. The bar is a shifting sand-bank, extending for about $1\frac{1}{2}$ cables' length from the north bastion in a direction towards Mutwal Point; there are 7 to 12 feet water on it, and $3\frac{1}{2}$ fathoms inside and beyond it. Strangers should not enter the Inner road with-

out a pilot; and as the sea sometimes breaks on the bar during the S.W. Monsoon, and several lives have been lost by boats being swamped, they should not use their own boats in landing, but employ one of the outrigger canoes which are always available, until they become acquainted with the passage over it.

"The Ballast Ground during the S.W. Monsoon is in 15 fathoms water, with the flagstaff being about East; and during the N.E. Monsoon in the same depth of water, with the flagstaff about E.S.E., where vessels may discharge their ballast overboard.

"*Tides and Current.*—The current off Colombo, and in the Gulf of Manaar, is subject to considerable variation, particularly about the changes of the Monsoon, when it is the strongest, but, generally speaking, it sets with the Monsoon, and is never so strong as to inconvenience vessels making Colombo. The greatest difference between high and low water recorded at Colombo is not more than 2 feet 10 inches. In the S.W. Monsoon, when the mean level of the ocean is the lowest, the difference between high and low water is from 5 to 15 inches. On those days when the difference between high and low water is not more than 6 inches, the rise and fall has been observed to take place four times within twenty-four hours.

DIRECTIONS.—"Vessels bound to Colombo during the S.W. Monsoon from south of the Equator, should not cross it to the eastward of 78°, as between 3° N. and the coast of Ceylon a strong current sets to the eastward, and the wind frequently hangs from West until the Gulf of Manaar is entered, thus making it difficult to fetch the port if not well to windward. The coast for 30 miles south of Colombo may be approached with safety to a distance of 2 miles.

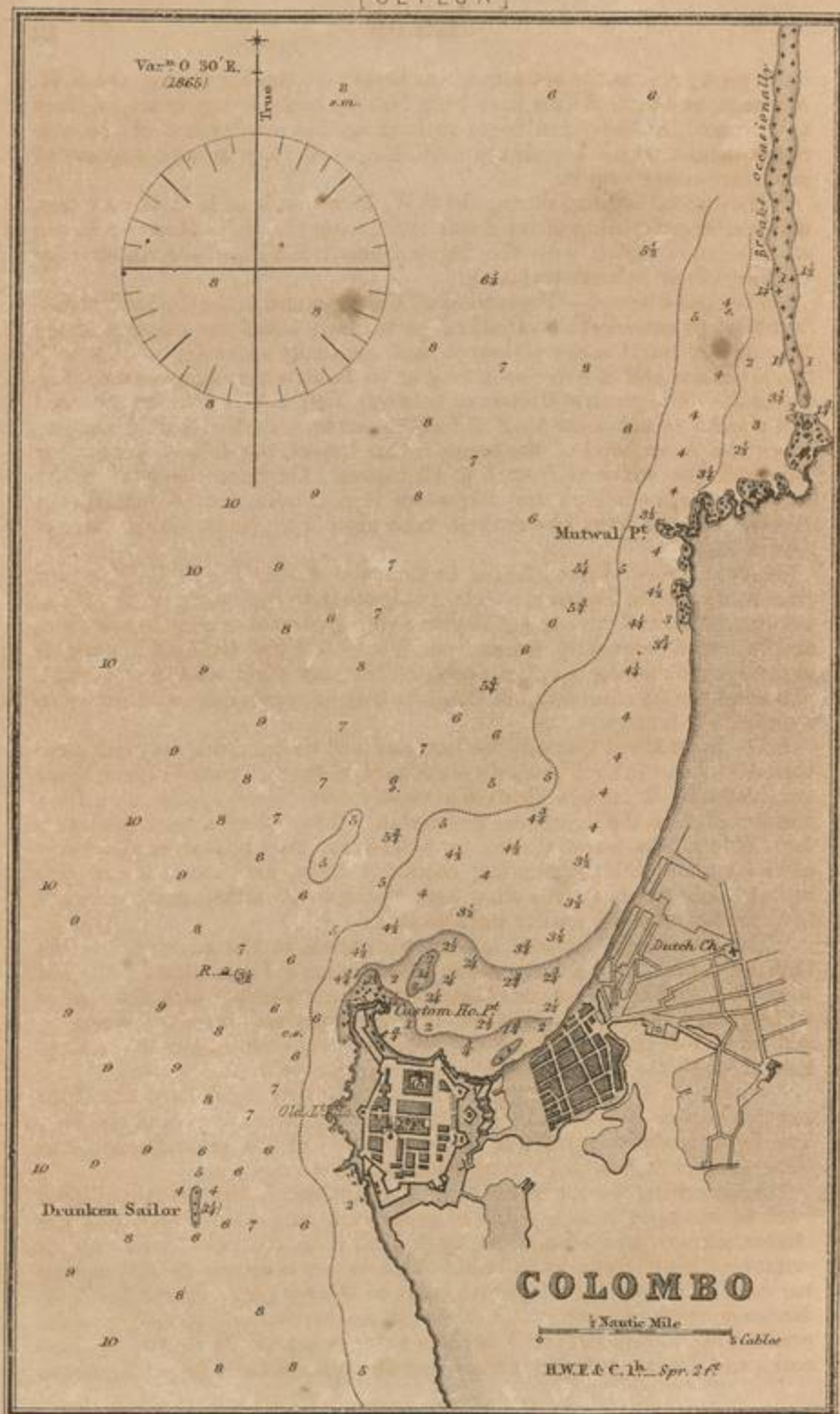
"The coast about Colombo is low, and not visible from seaward more than 10 miles. About one mile northward of the fort near Mutwal there are some lofty fir trees, which are generally seen (when approaching from seaward) before the lighthouse or flagstaff. They afford a good landmark for Colombo, as, when viewed from seaward, they appear considerably elevated above the surrounding cocoa-nut trees, and seem as one *tope* rather thinly planted. No other part of the coast, either north or south of Colombo, affords a similar mark to this.

"There are some isolated hills at a distance in the country, and the high mountain on it, a sharp cone, called Adam's Peak, about 7420 feet above the level of the sea, has been seen in clear weather at a distance of 30 leagues. In the N.E. Monsoon it is generally visible in the morning, and sometimes throughout the day, but is rarely seen in the S.W. Monsoon through the humid atmosphere which prevails in that season.

"*Light.*—A *fixed white* light is exhibited every night from the clock tower, a square, grey-looking building, standing in the centre of the fort. The light is elevated 133 feet above the level of the sea, and visible in clear weather from a ship's poop 18 to 20 miles.

"Approaching the roadstead from the southward, the Drunken Sailor must be avoided: it is a ledge of rocks with only 6 feet water over the shallowest part, which bears W. by S. $\frac{3}{4}$ S., from the light tower, and is distant off shore about half-a-mile. This danger is clearly defined during the S.W. Monsoon, by a constant break of the sea; but during the N.E. Monsoon, with smooth water, there is no break, and it will then be prudent not to come under 9 fathoms water, when in the vicinity of these rocks, as there are 8 fathoms close outside them; a more prudent course,

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however, would be not to approach the shore within $1\frac{1}{2}$ mile until the light tower bears eastward of E. by N., then to stand in for the shipping, as no advantage can be gained by steering close to these rocks at any time.

"The approach from the westward is quite clear, and also from the northward, with the exception of a ledge of rocks that stretches along shore to the northward from Mutwal; but as this ledge is only about a quarter of a mile off shore, and so much out of the usual track of shipping, it is scarce worthy of note as a danger.

"A rock, with 24 feet of water on it, has been discovered in the southern part of Colombo roadstead, which is now marked by a *red buoy*. Vessels arriving in the roadstead must give the buoy a clear berth of half a cable's length, as there is foul ground for some distance around it."

NEGOMBA, 16 miles to the northward of Colombo, is in lat. $7^{\circ} 12\frac{1}{2}'$ N., long. $79^{\circ} 48'$ E.; it is a place of some trade, but ought not to be visited during the S.W. Monsoon, or at least from May to August inclusive. It may be recognised from seaward by a point well covered with cocoa-nut trees, whence there projects in a N. by W. $\frac{3}{4}$ W. direction, for the distance of $3\frac{1}{2}$ miles, a reef, or rocky ledge; near the shore this ledge, for the distance of a quarter of a mile, consists principally of rocks awash, thence there is a depth of 3, 4 and 5 fathoms in places, but the extremity is a coral patch, with not more than 9 to 12 feet over it. Bound to Negomba from the southward, the fort should be brought to bear S.E. by S., then steer direct for it, and anchor abreast the fort in 5 or 6 fathoms.

The bottom between Negomba and Colombo is mostly mud, with regular soundings, but the coast should not be approached nearer than 4 miles, nor under 10 or 12 fathoms, until Negomba flagstaff bears S.E. by S. To the northward of Colombo, and opposite the river Mutwal (or Kalany Grange), some rocks, with a line of breakers, upwards of 4 miles long, stretch about a mile from the coast.

The following additional remarks are from Mr. J. J. FRANKLIN'S "Instructions for Navigating the Gulf of Manaar," 1846, &c. :—

"**Chilaw Bungalow**, in latitude $7^{\circ} 34'$, may be known by its high, red-tiled roof, seen 8 or 9 miles off in clear weather. Some rocks, once supposed to be at some distance from the shore, are now known to be not more than $\frac{3}{4}$ mile off, and consequently cannot be considered as forming any obstacle to general navigation; they are situated 5 miles due North of the bungalow, and are in a line between it and the next point. North of the bungalow, at the distance of 21 miles, and off Narakadoo, uneven soundings on rock to as little as $3\frac{1}{2}$ fathoms are found from 3 to 4 miles off shore, with 6 and 8 fathoms immediately outside; large vessels, therefore, ought to be careful not to come within this distance of the land hereabouts, although small craft can at all times go over the shoal. The coast between Narakadoo (latitude $7^{\circ} 59\frac{1}{2}'$) and Dutch Bay, must not be approached under 20 to 25 fathoms, for at 10 to 6 fathoms much foul ground extends thence to the shore.

"**Dutch Bay**, in lat. $8^{\circ} 19'$ N., is well sheltered from all winds, but more particularly from the S.W., which are the strongest on the coast. Vessels can anchor here in $2\frac{1}{2}$ to 3 fathoms stiff mud, close inside the neck of sand that forms the western side of the bay, with a cocoa-nut tope and house, called Paringethoray, bearing S.S.W. The only dangers in the approach to it are a rocky patch, with $2\frac{3}{4}$ fathoms over it at low water, 2 miles W.S.W. of the north end of the neck of sand before mentioned; and some shoal water 3 miles N.N.W. of the same point, and

$2\frac{1}{2}$ miles West of some Palmyra trees, a few of which are leafless, on the island of Karateevo. This last extends North and South about 2 miles, with an average breadth of 1, having over it from 3 feet to 3 fathoms, with a small patch of sand, generally dry, due West of the above trees. There are 4 to 5 fathoms to the eastward of this reef, but no person without being well acquainted with the coast ought to attempt the passage inside. From seaward the north end of the neck of sand ought to be brought to bear S.E. $\frac{1}{2}$ E., when it can be steered for and passed within 50 yards, carrying 3 to 4 fathoms sand.

"Very good anchorage in the S.W. Monsoon may also be found under the lee of Kodramallai Point, in latitude $8^{\circ} 32' N.$, which may be known by the three long hills seen over the low land of Karateevo. In steering for this anchorage, the north end of the hills ought to be kept about E. by S. till well past the island, when the anchor may be let go in $2\frac{1}{2}$ to $3\frac{1}{2}$ fathoms sand, with the rocky promontory bearing S.S.W. to S.W., $\frac{1}{2}$ to $1\frac{1}{2}$ miles off.

"No vessels ought to proceed on the Ceylon side further towards the head of the Gulf than this, as there are many shoal places at some distance from the shore, and no good holding-ground. In the S.W. Monsoon a strong current is found setting to the northward over Adam's Bridge, which abates as the Indian coast is approached; and a confused sea is generally found to prevail near Manaar."

The coast between Colombo and Point de Galle has many outlying dangers near it, especially that part nearer to Galle; they consist of coral reefs, shoals, and rocky islets, but all are well cleared by not approaching the shore nearer than 3 to 4 miles, at which distance off Caltura (latitude $6^{\circ} 35' N.$, longitude $79^{\circ} 57' E.$), as well as north and south of it, there are soundings of 14 to 16 fathoms; southward of $6^{\circ} 21' N.$, and thence to Galle, the soundings vary from 20 to 35 fathoms at that distance from the coast, although the dangers stretch further to seaward along this part.

In the immediate vicinity of Point de Galle there are several rocks and shoals very dangerous to navigation.

Whale Reef, nearly $1\frac{1}{2}$ mile wide, stretches westward from Point de Galle lighthouse, to the distance of 3 miles, and has on it a general depth of from 4 to 10 fathoms, but there are several very shoal spots. The *Whale Rock*, $1\frac{1}{4}$ mile from the shore, and W. $4^{\circ} N.$, $2\frac{3}{4}$ miles from the flagstaff, always breaks, but in fine weather only once in four or five minutes. *Little Whale Rock* is small, and above water; it lies half-way between the Whale Rock and Galle flagstaff, and has several dangerous rocks between it and the shore. Between the Whale and Little Whale Rocks there is a clear channel, with 8 to 10 fathoms, but this should never be attempted except through sheer necessity.

North-westward of Whale Reef lies *Gindurah Rock*, with only 9 feet on its shoalest part, and 4 to 5 fathoms within a cable's length of it. This dangerous rock is opposite the entrance to Gindurah River, distant $2\frac{1}{4}$ miles, and bears W. by N. $\frac{1}{2} N.$, $4\frac{1}{2}$ miles from Point de Galle flagstaff. A coral spot, with only 3 fathoms on it, lies E. by N. $\frac{1}{2} N.$ $\frac{2}{3}$ of a mile from the Gindurah Rock; and there is a depth of 16 fathoms between the two shoals. The soundings between Whale and Gindurah Rocks deepen gradually from 8 fathoms near each to 20 fathoms in mid-channel.

S.W. $\frac{1}{2}$ W., 3 miles from Point de Galle lighthouse, is Gallehogalle

Bank, with 17 fathoms water on it; from north to south it is $\frac{2}{3}$ of a mile long, and $\frac{1}{2}$ a mile wide from east to west.

Should the wind fail, and the current be unfavourable, ships may anchor on the bank of soundings, extending 3 or 4 leagues to the southward of Point de Galle; the bottom is generally sand and gravel, but occasionally rocky. *During the night*, vessels coasting between Galle and Caltura should not come under 40 fathoms, and between Caltura and Colombo not under 20 fathoms.

POINT DE GALLE BAY.—The Bay of Point de Galle was re-surveyed in 1860 by George F. McDougall, Master R.N.; and the following Sailing Directions and description of the dangers in the vicinity of the Bay have been issued:—

“Point de Galle Bay is formed between Point de Galle and the sloping land to the eastward, on the highest part of which, at an elevation of 264 feet, stands Edward’s Pillar, painted *white*; thence the land trends to the S.E., and terminates in Oonawatty Point, which projects farther seaward than the true point.

“The inner part of the bay is between Point de Galle (which is low) and a rocky bluff to the eastward, named Watering Point, which has a natural *red* patch on the slope of its western face. The distance between the two points is a little more than a mile in an E. by S. $\frac{1}{2}$ S. direction; the actual entrance, however, is narrowed, and the anchorage within is much confined by numerous dangerous reefs, having only from 3 to 15 feet water over them. At the head of the bay is a low sandy beach bordered with cocoa-nut trees. Near the centre are two rocky promontories, known as Gibbet Island and Glosenburg.

“The anchorage frequented by shipping is in from 6 to 4 fathoms, sandy bottom, on the western side of the bay, abreast the fort, where supplies of every kind may be procured; but the space is too limited to accommodate the yearly increasing number of vessels visiting this port.

“The land in the vicinity of Point de Galle is comparatively low and ill defined, but the position of the bay may be readily known by the *light-house* which stands at the southern extremity of the western point of entrance. On this point the fort and town are built, the sea-front being rendered inaccessible by a line of coral reefs on which the sea breaks heavily.

“Several rocky islets extend a quarter of a mile to the southward from the lighthouse point; on one of these (Pigeon Island) stands a solitary cocoa-nut tree (1860). The dangers are all above water, and may therefore be easily avoided.

“*Light.*—A *fixed white* light is exhibited from an iron tower, 80 feet high and painted *white*, on the south bastion of the fort of Point de Galle; the light, elevated 100 feet above the sea-level, is visible at a distance of 12 miles.

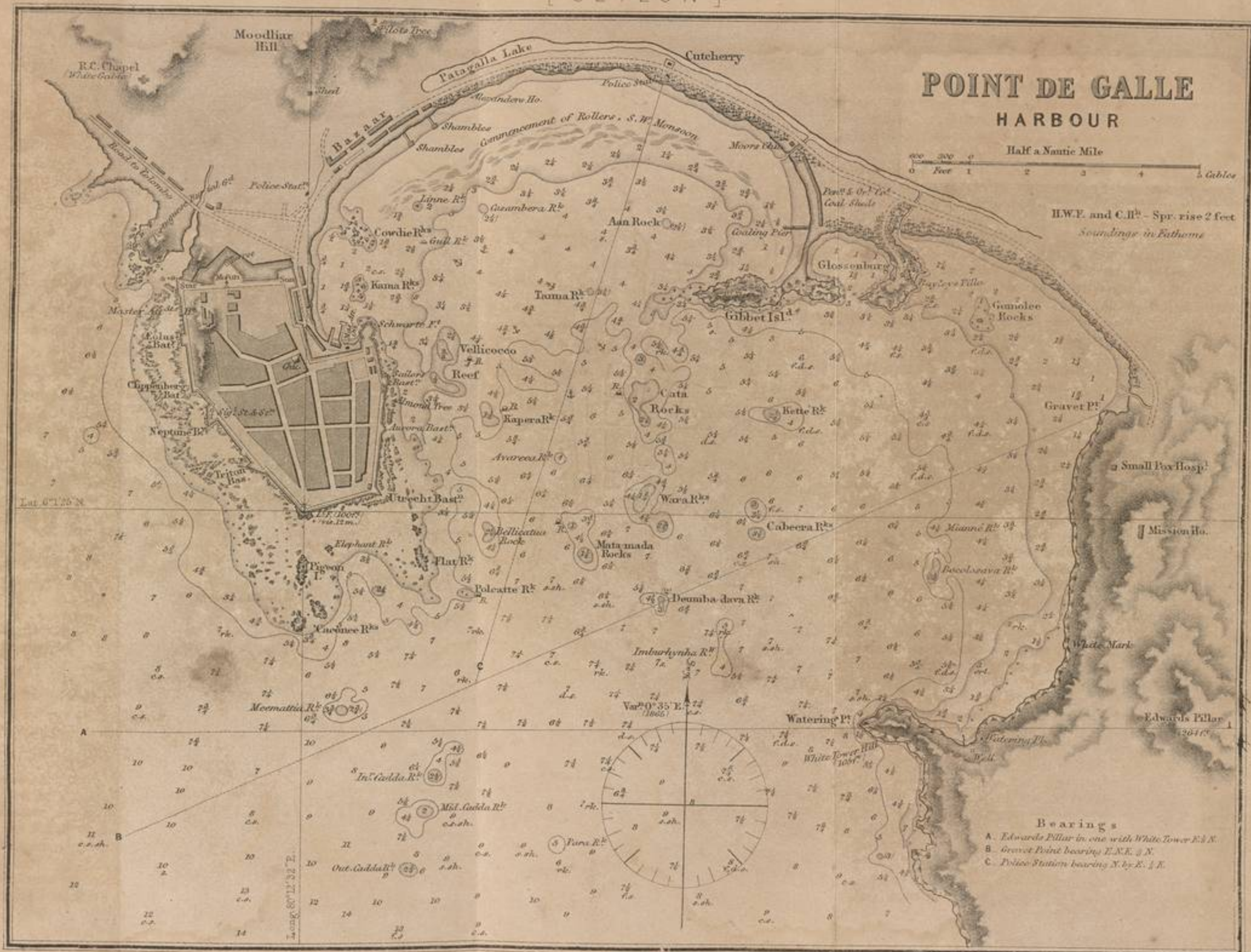
“*Anchorage.*—During the N.E. Monsoon, the best anchorage in the roadstead of Point de Galle Bay is in 16 fathoms, with the Pilots’ Tree and the Church in the Fort *in line*, and the rocks off Oonawatty Point on with a point to the eastward of Oonawatty. In the S.W. Monsoon, vessels seldom anchor in the road, but should they do so, the best temporary anchorage will be in 16 fathoms, with the lighthouse bearing N.E., and distant about $1\frac{1}{2}$ mile off shore.

“*Tides.*—The tidal stream does not exercise any perceptible influence in this bay. The streams are regular, east and west, rather more than 1 knot.

POINT DE GALLE HARBOUR

Half a Nautic Mile
 0 100 200 300 400 500 Feet

H.W.E. and C.H.ⁿ - Spr. rise 2 feet
 Soundings in Fathoms



Bearings
 A. Edwards Pillar in one with White Tower E. 3 N.
 B. Gravel Point bearing E. N. E. 3 N.
 C. Police Station bearing N. by E. 1 E.

" *Supplies.*—Point de Galle is now much frequented as a port of call for orders, in consequence of the Electric Telegraph, which is in communication with every part of India. Supplies of every kind, including coal, can be obtained. Water may be procured from a small bay within Watering Point, where there is an excellent spring and a wooden pier. Native boats and crews can be hired to supply ships with water.

" The OFF-LYING DANGERS are as follow:—

" The *Cadda Rocks* consist of a series of disconnected patches, nearly 2 cables in extent, N. by E. and S. by W., and having 2 fathoms on the shoalest part. There is deep water between the rocks. During the S.W. Monsoon, heavy breakers extend the whole length of the reef, but in the N.E. Monsoon there is seldom a break.

" The *Outer Cadda*, on which the least water is 13 feet, lies S. $\frac{1}{2}$ E., about two-thirds of a mile from the lighthouse, with the Pilots' Tree* and Sailors' Bastion in line, and the *white* mark on the western side of the bay almost shut in with Watering Point.

" The *Middle Cadda*, with 2 fathoms on it, lies with the Pilots' Tree open of the Almond Tree, and the *white* mark a sail's breadth open of Watering Point.

" The *Inner Cadda* has 15 feet on its shoalest part, from which the Pilots' Tree is in line with Flat Rock, and the signal-staff on Neptune's Bastion is open east of the cocoa-nut tree on Pigeon Island.

" *Para Rock*, having 5 fathoms over it, never breaks. From it the lighthouse and east end of Elephant Rock are in line, and the *white* mark is shut in with Watering Point.

" *Meemattia Rock* is half a cable in extent, has 17 feet on it, and breaks in bad weather during the S.W. Monsoon. It lies nearly in mid-channel, between the Inner Cadda and the islets extending south of the lighthouse; from it the east turret of the Church in Fort is seen touching the west side of Elephant Rock, and Flat Rock is in line with Cutcherry police-station.

" The DANGERS IN GALLE BAY are as follow:—

" *Polcatté Rock* has only 3 feet on it, and always breaks. The marks for it are, the lighthouse open south of Flat Rock, and the Button Rock on with left high shoulder of Moodliar Hill. A *black* buoy is moored in 6 $\frac{1}{2}$ fathoms, about 30 yards E.S.E. of the rock.

" *Mata-Mada Rocks* form two distinct patches about three-quarters of a cable apart, and always break. A *red* buoy is moored in 6 fathoms west, about 30 yards off the inner and shoalest patch of 6 feet, from which the white gabled Chapel, on an eminence outside the fortifications, is just open of Schwarte Fort, and the cocoa-nut tree on Pigeon Island is on with the north end of Flat Rock.

" *Bellicatua Rock*, with 2 $\frac{1}{2}$ fathoms on it, forms with the inner Mata-Mada Patch, distant 1 $\frac{1}{2}$ cable in an E. by N. direction, the narrowest part of entrance to the western portion of the bay. The marks for it are, the Pilots' Tree just open eastward of the Gull Rock, and the cocoa-nut tree on Pigeon Island on with north end of Flat Rock. This rock breaks in bad weather during the S.W. Monsoon.

" *Wara Rocks* always break, having only 3 feet on their shoalest part,

* The Pilots' Tree stands on Moodliar Hill, and forms one of the most important leading marks into the bay. It is large and mushroom-shaped, but being almost hidden by the growth of trees in its neighbourhood, it has been recommended that these latter be removed, that this valuable mark may be more easily recognised.

from which the Pilots' Tree is in line with the Arrack store; and the Church in Fort is on with the Almond Tree.

" *Kapera Rock*, on the west side of the bay, has on it a shoal patch of only 9 feet water, from which the cocoa-nut tree on Pigeon Island is on with the centre of Elephant Rock, and the Sun Bastion is touching the end of Schwarte Fort. A red buoy is moored in 5 fathoms at a third of a cable E. by N. from the 9 feet patch.

" *Cata Rocks* consist of a long ledge, extending in a southerly direction from near the west end of Gibbet Island, towards the Wara Rocks. There are several detached patches on the ledge, with from 1 to 3 fathoms on them, and deep water around. From the westernmost patch in 2 fathoms, the garrison flagstaff is on with the north end of Schwarte Fort, and the lighthouse is seen over the angle of Utrecht Bastion. A red buoy is moored in $5\frac{1}{2}$ fathoms, about 80 yards west of this patch.

" *Avareea Rock*, with 4 fathoms on it, lies directly in the channel, midway between the Kapera and Wara Rocks, with the lighthouse open of Utrecht Bastion, and the Sun Bastion on with rocks off Schwarte Fort.

" *Vellicocco Reef* consists of two rocky patches, carrying from 3 to 9 feet water. The shoalest part of the northern patch, with only 3 feet on it, is the spot on which the Peninsular and Oriental Company's steamship *Malabar* struck, causing her total loss, in May 1860. From it the Pilots' Tree is seen just open east of the Gull Rock, and Edward's Pillar, its own breadth, south of the white-mark. A red buoy is moored in 4 fathoms East, 40 yards from this patch.

" *Tanna Rock*, with $3\frac{1}{2}$ fathoms on it, lies with the cocoa-nut tree on Pigeon Island open of Utrecht Bastion, and the Pilots' Tree nearly midway between the Arrack store and Alexander's house (a little nearer the former).

" *The Gull* is a small round rock, about 5 feet in diameter, and 3 feet above the sea level. There is a large iron ring on its summit, to which native vessels secure their stern hawsers.

" *Imburynha Rock*, with 4 fathoms on it, never breaks. It is the southernmost part of a rocky ridge of 5 fathoms, one cable in length north and south, and distant a quarter of a mile in a W.N.W. direction from Watering Point, with a general depth of 7 fathoms between. The marks for it are, the Pilots' Tree on with the middle of the Arrack store, and the lighthouse in line with Flat Rock.

" *Deumba-Dava Rock* has 12 feet on it, and breaks during the S.W. Monsoon. From it the white gabled Chapel on an eminence outside the fortifications is just open of Schwarte Fort, and Elephant Rock is on with south end of Flat Rock.

" *Cabeera Rocks* are two patches, half a cable apart, north and south, with 5 and 6 fathoms between. From the northern and shoaler patch in 3 fathoms, the Chapel just mentioned is in line with Cowdie High Rock, and the Church in Fort is open north of the Almond Tree.

" *Kette Rock*, on which the least water is 15 feet, lies with the belfry just open of Schwarte Fort, and the Pilots' Tree open its own breadth west of Alexander's house.

" *Bocolosava Rock* is well on the eastern shore of the bay, and is distant a $\frac{1}{4}$ of a mile in a N. by E. direction from the nearest part of Watering Point. The least water on it is $3\frac{1}{2}$ fathoms, from which the Church in Fort appears open north of the Almond Tree, and the Cutchery police-station is seen over the neck of Gibbet Island.

" DIRECTIONS FOR MAKING THE BAY.—As the approaches to Point

de Galle Bay are rendered dangerous by numerous sunken reefs, it is essentially necessary that vessels should obtain the services of a pilot. In most cases, the pilot canoe, with flag displayed (white, red, white, horizontal), awaits a ship beyond the limits of the off-lying dangers; but as circumstances may possibly compel a vessel to seek a place of refuge when the heavy sea precludes the possibility of a boat leaving the bay, the following directions, if closely attended to, will lead into safety.

"During the N.E. Monsoon, from December to March (inclusive), the bay is at all times accessible, and an anchorage can be obtained with facility; for a sea-breeze varying from S.S.E. to W. generally prevails during some part of each day. Early in the morning the wind is generally off the land from the northward, and enables vessels to leave the bay.

"During the S.W. Monsoon, from April to November (inclusive), though the wind frequently veers round even to the northward of West, there is generally a heavy swell setting directly into the mouth of the bay from the southward; this sometimes occasions much difficulty in bringing a vessel up in an anchorage already so overcrowded as to compel vessels to be moored by means of stern hawsers, which, if required, are supplied by the local authorities.

"Approaching the bay from the westward, by bringing Point de Galle lighthouse E. by N. $\frac{1}{2}$ N., a vessel will pass clear to the southward of the Whale and Little Whale Rocks, both of which are nearly in the same line of bearing, about W. $\frac{1}{2}$ N. from the lighthouse, the former being distant $2\frac{1}{2}$ miles, and the latter about $1\frac{1}{2}$ mile.

"The rocky islets off the lighthouse may be approached in safety so long as the Church in the Fort is kept westward of the lighthouse; here the pilot's boat will generally be found.

"To pass north of the Cadda Rocks, keep the *white* mark on the east side of the harbour well open of Watering Point, or Edward's Pillar on with a natural *red* patch on Watering Point; both will lead between the Meemattia Rock and the Inner Cadda Rock. Proceed with these marks on, until the west turret of the Church in the Fort* is on with Elephant Rock (which is a high, smooth, round-topped rock, unlike any other), then steer for Gravet Point (the termination of the high land in the N.E. corner of the bay), until the signal-staff on Neptune Bastion is in line with the lighthouse. Then haul up for the Cutchery police-station, N. by E. $\frac{1}{2}$ E., which will lead through in mid-channel between the *black* buoy of Polcatté and the *red* buoy of Mata-Mada. When the lighthouse is shut in with Utrecht Bastion, anchor in about 6 fathoms.

"To pass south of the Cadda Rocks, keep the Church in the Fort west of the lighthouse until the *white* mark is *well* shut in with Watering Point; the rocks off Oonawatty Point will then be open of the Point, and in line with a distant point to the eastward. Then steer to the eastward until the Pilots' Tree (the large mushroom-shaped tree on the summit of Moodliar Hill) bears N. by W.; the left shoulder of the hill will then be clear of the Almond Tree, near Sailor's Bastion. Haul up for the Pilots' Tree until the signal-staff and lighthouse are in line, then proceed as above directed, between the Polcatté and Mata-Mada buoys.

"*Caution.*—Sailing vessels approaching Galle should be careful to keep a weatherly position to enable them to sail in, and it should be borne in

* Care must be taken not to confound the white gabled Chapel, on an eminence outside the fortifications, with the Church in the Fort.

mind that the current sets along the line of coast with great velocity—to the eastward during the S.W. Monsoon, and to the westward during the N.E. Monsoon.

“Vessels during the S.W. Monsoon, by getting to leeward of the port, have taken weeks to regain their position, and in some instances have been compelled to bear up for Trincomalie.”

COAST BETWEEN POINT DE GALLE AND THE GREAT BASSAS.—From Point de Galle to Dondra Head the coast is low and sandy, with intervening rocky projections: from Dondra Head to Tangalle it is more rugged, and thence to the eastward is again sandy and barren.

Dondra Head, the southernmost point of Ceylon, in latitude $5^{\circ} 55' N.$, longitude $80^{\circ} 35\frac{1}{2}' E.$, is low, with a grove of tall cocoa-nut trees on its extremity; from it a reef of rocks projects to the westward, having only 9 to 10 feet on it.

The ground is more or less foul within a mile of the coast line, the whole distance between Galle and Kirinde (N.W. of the Great Bassas), and should not be approached within 3 miles (nor under 25 or 30 fathoms), which will clear all dangers: during the night it would be prudent to draw more off shore.

GREAT BASSAS.*—This is a dangerous reef of rocks 6 miles distant from the nearest part of the south-east coast of Ceylon. It is about half a mile broad and a mile long in a N.E. $\frac{1}{2}$ E. and S.W. $\frac{1}{2}$ W. direction, and being only about 8 feet above the surface of the ocean, is the terror of the mariner at all times when he has to round the southern point of that island in his passage to or from the Bay of Bengal.

A series of good observations with the sea horizon at the anchorage of H.M.S. *Cyclops* on their northern side, during the survey of these dangers and the adjacent coast, in the course of May, June, and July, places the north-east and highest part of the reef (distinguished by a pole) in latitude $6^{\circ} 9' 53'' N.$, and $1^{\circ} 15' 30'' E.$, from Point de Galle lighthouse, and therefore in longitude $81^{\circ} 28' 2'' E.$ from Greenwich, assuming that lighthouse to be in $80^{\circ} 12' 32'' E.$ † This result being obtained with nine excellent chronometers from many good observations of meridian distance run both ways, not only between the Bassas and Galle, but also between Galle and the station on shore at Potana Point, with which the Bassas is connected by triangulation, may be considered well worthy of confidence.

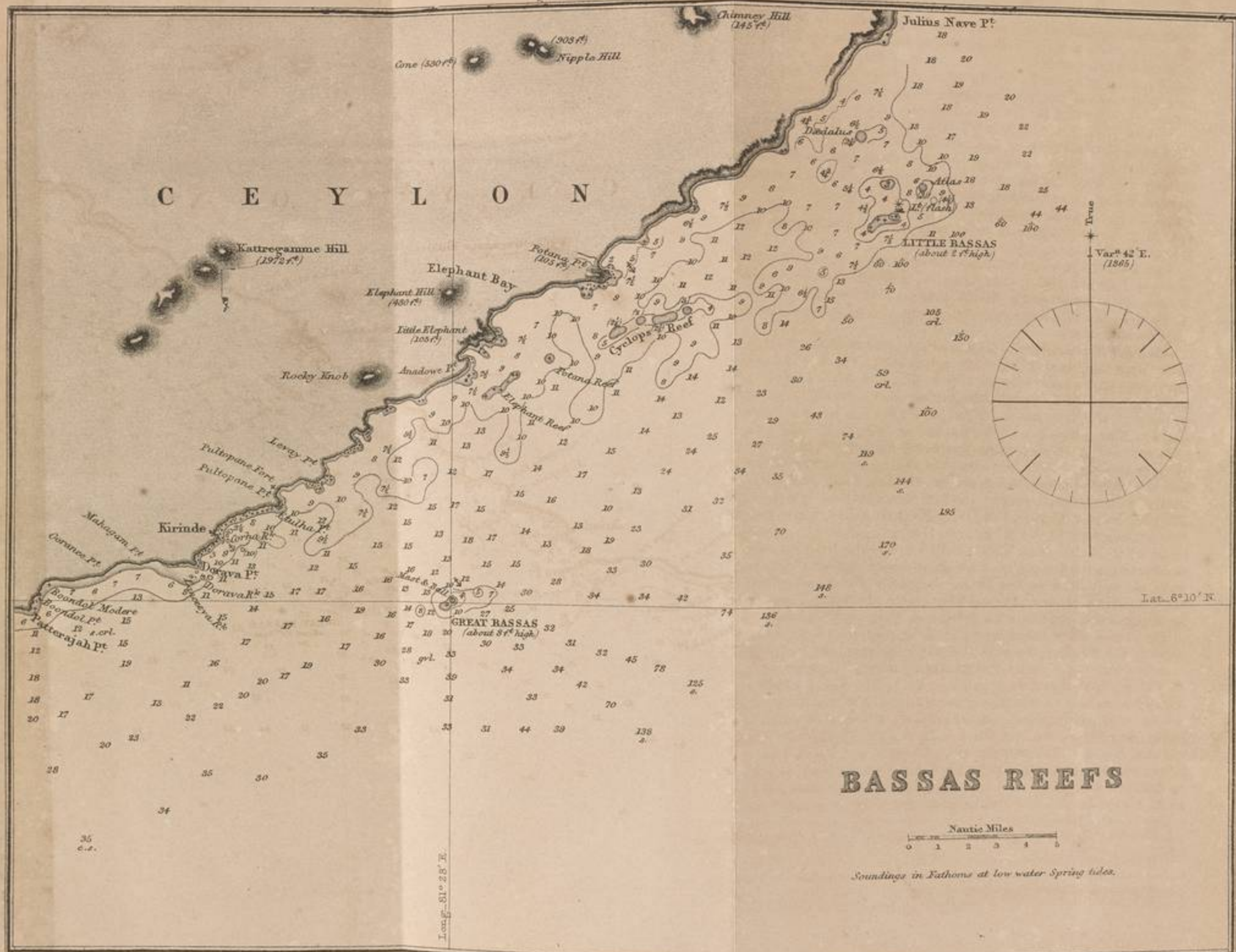
The reef is one continuous rocky field, portions only showing here and there in the wash of the sea: the north-eastern part is the highest and broadest, forming a rocky wedge-shaped ledge, 70 yards long, N.E. and S.W., by about 30 yards broad, and from 6 to 8 feet above high water. A mast with ball, 68 feet above the sea-level, was erected on it in 1858.

The reef has deep water to within half a mile of it on all sides; there being 16 to 19 fathoms on the southern side, 11 and 12 fathoms on the western, 9 and 10 fathoms on the northern, and 7 and 8 on the eastern sides; but beyond these depths, on the western side, about 1 mile from the reef, there is a patch of 8 fathoms; and on the eastern side at $1\frac{1}{2}$ mile, there is another of 5 fathoms, with deeper water between it and the reef.

* These Directions are from the Survey of Captain W. J. S. Pullen, R.N., H.M.S. *Cyclops*.

† Dependent upon the observatory at Madras being $80^{\circ} 14' 19'' E.$ From Point de Galle several meridian distances were run to and from Trincomalie by Captain Pullen. The longitude of Trincomalie (see page 44) is the mean result of meridian distances to and from Madras by Captain C. F. A. Shadwell, R.N., 1853, and Captain Pullen, 1860.

[INDIAN OCEAN]



C E Y L O N

BASSAS REEFS

Nautic Miles
0 1 2 3 4 5

Soundings in Fathoms at low water Spring tides.

From the pole on the reef, Kettregamme Peak bears N.W. by N.; Elephant Hill, North a little westerly; Chimney Hill, N.N.E.; and Nipple Peak, N. $\frac{3}{4}$ E. This latter line of direction also passes a little eastward of Little Elephant Hill, a round-topped hill of 105 feet elevation close to the beach, on the west point of the bay next west of Potana.

Anchorage.—The proper station for a light-vessel for the Great Bassas would be in 10 or 12 fathoms water, sand, and stones, with the pole on the highest part of the reef, bearing S.S.W. $\frac{1}{2}$ W. to S.W. by W. distant half a mile. This was the usual anchorage of the *Cyclops*, where she rode out many strong breezes.

LITTLE BASSAS.—The centre of this reef bears N.E. $\frac{1}{2}$ E. (N. $49^{\circ} 45'$ E. true), distant 20 miles from the pole on the Great Bassas, and from being only about 2 feet above water, is even more dangerous. It appears to consist of large boulders, which even by daylight are scarcely perceptible from a ship till close up to them.

The extent of that portion usually shown by breakers is not more than a quarter of a mile across, about E. by S. $\frac{1}{2}$ S. and W. by N. $\frac{1}{2}$ N.; but W.S.W. from its western part are many sunken patches, breaking so much in heavy weather that occasionally the sea covered with surf is $1\frac{1}{2}$ mile in extent. The anchorage of the *Cyclops* was on the north-east side of the reef, and from observations similarly obtained as those at the Great Bassas anchorage, the centre of the reef is in latitude $6^{\circ} 22' 48''$ N., longitude $81^{\circ} 43' 23''$ E., being $1^{\circ} 30' 51''$ East of Galle lighthouse.

The Little Bassas is not more than $4\frac{1}{2}$ miles from the nearest part of Ceylon; and on its northern side are several patches of shoal water, one of which, named the 3-fathoms tail, carrying the least water, 3 fathoms, bears N. by W. distant $1\frac{1}{2}$ mile from it. This patch is of very limited extent, having $3\frac{1}{2}$ and 4 fathoms water close to it on its southern and western sides, and 6 and 7 to the northward and eastward. From a description by Horsburgh it is concluded to be the shoal on which the *Atlas* (one of the fleet of Indiamen under convoy of H.M.S. *Dardalus*) first grazed over on the morning of the 2nd of July, 1813.

The Atlas Reef, bearing N.E. $\frac{3}{4}$ N. $1\frac{1}{2}$ mile (nearly) from the centre of the Little Bassas, is another patch of 3 fathoms, with 4 and 5 fathoms water close around it, and being most probable where the *Atlas* grazed the second time in getting out clear of the shoal water on that eventful morning, is so named in consequence.

There is much difficulty sometimes in discovering the Little Bassas (the light-vessel will now point out their position), especially when approaching them from the westward, while the sun is in the eastern horizon. The *Cyclops*, when sounding off the coast, in hauling in from deep water for her friendly mark, the Chimney Hill, had no bottom with 110 fathoms of line, and almost the next cast had soundings in 9 or 10 fathoms, with the breakers just perceptible, close aboard of her,—a practical proof of the steep nature of the bank in the vicinity of the reef on its outer side, and the danger of approaching it from the eastward and southward in that direction on any course from N.N.W. to N. by E. inclusive.

The following are the bearings from the reef:—Chimney Peak, N.W.; Nipple Peak, N.W. by W. $\frac{1}{2}$ W.; Elephant Hill, W. $\frac{3}{4}$ S.; and Kattregamme Peak, W. $\frac{1}{4}$ S. By seeing either of these objects on the bearings stated against it, the mariner will know that the Little Bassas Reef is in the same direction. The reef should always be approached with caution, and a vessel should never attempt to pass between it and the Ceylon shore.

Anchorage.—Between the Atlas and Little Bassas, and clear of the 5-fathoms line of soundings around the reefs, is a space at least half a mile wide, with depths varying from $5\frac{1}{2}$ to 8 fathoms water, where the *Cyclops*, while examining these shoals, in 1860, usually anchored on a bottom of sand and small stones. This being good holding ground, is the position best adapted for a light-vessel for the Little Bassas; and if moored in 6 fathoms of water nearly, with the Little Bassas S.S.W., distant two-thirds of a mile, about half-way and a little westward of an imaginary line from this reef to the Atlas shoal, it would be sufficiently clear from tailing into shoal water in either the S.W. or N.E. Monsoon. Some experience of this anchorage in the S.W. Monsoon has led to the conclusion that there need be no kind of apprehension whatever for the safety of the light-vessel.

Light-vessel.—A light-vessel is now moored (1st of June, 1863) inside the Little Bassas Reef, the centre rocks of the reef bearing S. by W. $\frac{1}{2}$ W., distant about one-third of a mile. She exhibits between the hours of sunset and sunrise a *flashing* white light at intervals of *one minute and a half*. The light is 33 feet above the sea, and to a ship within 7 miles of it, in fine weather, it will not entirely disappear; and it is visible from a ship's deck 18 feet above water at the distance of 11 miles.

Coast.—The foregoing being a description of the off-lying dangers, the following is a brief account of the coast, as well as of the high conspicuous land in its vicinity, the heights of which may be used in the daytime, on certain bearings, to point out the position of these dangerous reefs.

The south-east coast of Ceylon between Dorava and Julius Nave Points, a space of 30 miles, trends nearly N.E. and S.W., with ranges of high mountains inland, often obscured, however, by the hazy state of the atmosphere, said to be peculiar to this part of the island, particularly during the S.W. Monsoon.

Near the coast inside the line of the Bassas, are several hills of a remarkable form (about to be described), which from their position form admirable landmarks, during daylight and fine weather, for navigating in the vicinity of the Bassas.

The shore is comparatively low and barren, fringed with a belt of sand, but without any marked salient features; the points are generally rounded and sandy, rising to elevations of about 100 feet. Off the pitch of all the points are rocky patches, extending in some cases to the distance of a quarter of a mile. Along the whole line of coast the surf breaks heavily on the beach, the first roller rising at the average distance of a cable's length from the shore.

Kattregamme Hill.—The most prominent land seen when approaching the Bassas from the westward is the Kattregamme range of hills, the nearest and highest of which is between 7 and 8 miles distant from the sea. These hills are sometimes conspicuous both from the eastward and westward, when others nearer to the sea are hardly discernible. Their summit presents an irregular ridge, the north-east peak of which is the highest, being 1972 feet above the sea.

Elephant Hill, the next height to the eastward, is conspicuous from standing alone on the low land near the shore, and bearing a remarkable resemblance to the animal from which it is named. It is 2 miles from the beach, bare and destitute of trees on its summit, which is 480 feet above the sea.

Little Elephant Hill, in shape resembling a haycock, stands on the

extreme point forming the western horn of Elephant Bay ; its elevation is 105 feet, and from it Elephant Hill bears N.W. $\frac{1}{2}$ N. 2 miles.

Off this point, at the distance of one-third of a mile in an E.S.E. direction, is a rock just above the water.

Anadowe Point, next west of Little Elephant, may be known by its off-lying rocks. The outer one, which is about 4 feet above the sea-level, is distant three-eighths of a mile from the shore, and is steep-to on the outside, having 7 fathoms within a cable's length.

Nipple Hill, farther inland, bears from Elephant Hill N. by E. $\frac{3}{4}$ E. distant about 9 miles. Rendered conspicuous by its superior elevation, 903 feet above the sea, which places it as if alone, this peak is also distinguished by a flattened summit, with two lumps (one at each end) in a direction about W.S.W. and E.N.E., from which it derives its name ; the western of these nipples is the higher, the position of which was determined. This hill may also be known by a remarkable cone W.S.W. of it, generally distinguishable, but more so from the eastward, although only 520 feet above the sea.

Chimney Hill, next in succession eastward, is of much service to a vessel for ascertaining her position in reference to the Bassas. It is $4\frac{1}{2}$ miles from the nearest beach, 445 feet above the sea, and very conspicuous, being the highest part of a low range which takes an east and west direction ; it appears to be separated from the western part of the range, and derives its name from its resemblance to a chimney. From the Great Bassas it is not easily seen, being in fact sometimes entirely concealed by the haze which generally hangs over the land, especially in the S.W. Monsoon.

Potana Point is rather more than one-third the distance along the coast, between Elephant and Chimney Hills. The station on this point, a sand-hill 105 feet above the sea, is in latitude $6^{\circ} 21' N.$, longitude $81^{\circ} 33' 23.45'' E.$, depending on the position assumed for Galle lighthouse, and is the mean of the runs to and from Galle, being $1^{\circ} 20' 51.45'' E.$ of that lighthouse. The station bears from the pole on the Great Bassas, N. $24^{\circ} 35' E.$ (true), distant $12\frac{3}{4}$ miles ; and from the centre of Little Bassas S. $79^{\circ} 10' W.$ (true), distant 10 miles.

Potana Point forms perhaps the deepest bay on this coast, and would afford shelter, in the S.W. Monsoon, for small craft not drawing more than 10 feet, but a heavy sea always setting into it throws the surf up to its innermost south-west angle, permitting no one to land or embark without a good wetting. Off the point, and also to the westward of it, the shore is beset with detached rocks for about a mile out, with some showing and others covered, on which the sea is always breaking ; thus presenting the characteristic feature of the coast—viz., a rocky, sandy shore, wherever there is any tendency to a point.

Off Potana Point is the only anchorage in-shore that was used or was even found available for the *Cyclops* in the course of the survey. She anchored in from 5 to 6 fathoms water, with the point bearing about W.S.W.

DANGERS WITHIN THE BASSAS.—*Elephant Reef* is $1\frac{1}{2}$ mile in length, N. E. $\frac{1}{2}$ E. and S.W. $\frac{1}{2}$ W., and a quarter of a mile broad. The north-east breaker on it is $1\frac{1}{2}$ mile from Little Elephant Hill, which is in line with Elephant Hill.

The south-west extremity is S.E. $\frac{1}{2}$ E., seven-eighths of a mile from the detached rocks of Anadowe Point. Between is a clear channel carrying 8 to 9 fathoms.

Potana Reef, the centre of which lies E. by N. $\frac{3}{4}$ N. $1\frac{1}{2}$ mile from the north-east end of Elephant Reef, and N.N.E. from the pole on the Great Bassas, is a rocky patch about half a mile broad and nearly square, on which the sea always breaks. No broken water was seen between it and the Elephant Reef; and there may be deep water between them, but the space could not be examined owing to the heavy sea, and should not therefore be attempted.

Cyclops Reef is a hard, narrow, sandy ridge, with patches of rock and boulders, having only 2 fathoms on it in some places. It is $3\frac{3}{4}$ miles long, E. by N. $\frac{1}{2}$ N., and W. by S. $\frac{1}{2}$ S., and from a quarter to half a mile in breadth.

From its west end, in 3 fathoms, Potana Point bears N. two miles; and from its eastern end, in 4 fathoms, Chimney Hill bears N. $\frac{1}{2}$ W., the shore in that direction being $3\frac{1}{2}$ miles distant. This reef is more dangerous than either of the former, in consequence of the sea breaking only occasionally on it, and from its having deep water close to on each side. In the course of the survey the *Cyclops* struck on it three times, in different places.

There is a channel between the western extreme of the Cyclops Reef and the Potana Reef 2 miles wide, with from 8 to 10 fathoms, frequently used by the *Cyclops* in passing between her anchorage at Potana and the Great Bassas. Chimney Hill, on with Potana Point, leads through in mid-channel.

Two lines of soundings were taken across the Cyclops Reef with 5 fathoms being the least water, so that it is possible a clear channel may yet be found there; but the least depth on the reef was 2 fathoms, besides many patches of $2\frac{1}{2}$ and 3 fathoms.

Dædalus Reef is a small narrow patch of 15 feet water, lying N.N.W. $3\frac{1}{2}$ miles from the Little Bassas, and $1\frac{1}{2}$ mile off shore, with Chimney Hill bearing N.W. by W. In the course of the survey the *Cyclops* struck on this shoal heavily, and lifted her rudder several times, but from its being so narrow, was soon off it, and could not again find the exact place with the lead. The depth, therefore, was determined by the ship's draught of water, for on sounding around her there were no less than $4\frac{1}{2}$ fathoms at the bows, $4\frac{3}{4}$ in starboard chains, $3\frac{3}{4}$ in port chains, and $3\frac{3}{4}$ fathoms astern. From Horsburgh's description, this is evidently the shoal on which the *Dædalus* was wrecked; for it states, "she fell over and went down," the only spot where this could happen, from the deep water close around it. The *Cyclops* had 7 fathoms as soon as she was off.

DIRECTIONS.—There is a deep channel within all the before-mentioned dangers that may be taken in case of necessity, by keeping about midway between the Elephant, Potana, and Cyclops Shoals on the one hand, and the main land on the other, or a mile off shore. The *Dædalus* may be passed on either side. If passing inside from the westward, keep about a mile from the shore till up to Julius Nave Point, then edge farther from it; if passing outside, keep about half-way between the Little Bassas and the shore; but no stranger should attempt the inner passage unless in case of sheer necessity, as the coast does not permit of any leading or back mark being given.

There is deep water between the Great Bassas and the land, the shore of which is clear at the distance of 2 to 3 miles from it all the way to Galle.

Should a vessel, from unforeseen circumstances, find herself at night inside the line of the Bassas, it would be better to anchor and wait for daylight to obtain her exact position by cross bearings.

A vessel bound westward, after clearing the Little Bassas, and certain of daylight, if keeping a good look-out, may haul in and pass inside the Great Bassas; she may also do the same going eastward, but when clear of the Great Bassas she must haul to the southward to pass outside the Little Bassas, the light-vessel marking which will now be a good guide.

The coast is clear as far as Galle, and may be approached safely to 2 miles' distance, but, as a rule, only in daylight, as it is impossible to judge of distances accurately by night.

Caution.—In latitude $7^{\circ} 1' N.$, at 1 mile south of Saugheman-kande, the eastern point of Ceylon, the *Cyclops* sounded on the south end of a bank, which was found to extend 4 miles in a N.N.E. direction, with every appearance of a deep channel in shore. Four fathoms was the least water obtained, but the bottom was distinctly seen from the ship whilst skirting its outer edge in 8 and 10 fathoms, and it is probable that much less water exists. An offing of 4 miles is, therefore, recommended to strangers between the parallels of 7° and $7^{\circ} 5' N.$

Currents and Tides.—The currents in the vicinity of the Great and Little Bassas Reefs are alike remarkable for their rapidity and eccentricity. In the line of and between the two reefs, that is, about 6 miles off shore, the current, during the S.W. Monsoon, sets along the coast to the N.E., at the rate of 1 to 2 miles per hour, only diverging from this, its apparently natural course, when within the influence of the broken ground of the reefs.

The rate appears to be influenced by the strength of the wind, and is, consequently, most irregular; the only way, therefore, of avoiding danger is to give the rocks a wide berth, although it may incur a great loss of time. Instances are known where vessels, most providentially, only have escaped wreck, particularly the *Dalhousie*, on her way from Madras to Galle: to have seen the pole on the Great Bassas in a dark night must have placed her close to it.

The *Cyclops*, towards the close of July, running a meridian distance to the Great Bassas from Galle, passed Dondra Head at 6h. P.M.; her position was well ascertained just before dark, showing the distance of 57 miles to the western reef, bearing E. by N. $\frac{1}{2}$ N. The wind was aft, moderate, and a S.W. swell; sail was shortened, the fires had been banked, and wheels disconnected some time, so that the distance might not be overrun, and a large allowance made for current.

At 3h. 45m. the next morning the wind was somewhat fresher, and the vessel was rounded to, with head southerly, supposed to be 10 miles from the Bassas, after allowing fully 10 miles easterly current. At 4h. a cast of 45 fathoms was obtained, plainly showing from previous sounding the ship had drifted outside the line of the Bassas Reefs; and at daylight, instead of having them in sight, she was at least 10 miles to the S.E. of them, and no bottom with 100 fathoms of line; set by a current of $26\frac{1}{2}$ miles in 14 hours, or 1.85 the hour, on about a S. by E. course.

Had this current been more northerly, as might reasonably have been expected from former observations, serious consequences might have resulted. Nor was this the strongest current experienced, nor in the only place. About half-way between the two reefs a current of $2\frac{1}{2}$ knots, on an E. by N. course, was found.

Midway between the line of the reefs and the shore the direction of the current assumes a more northerly trend, and the rate is reduced, until it at length becomes absorbed in an in-shore eddy which was almost

invariably found setting along the coast to the S.W., at the rate of half a mile per hour.

Between Point de Galle and the Bassas the current sets along the line of coast, the rates varying at different times, without any apparent cause, from 1 to 2 miles per hour (it is said to attain sometimes the rate of even 4 knots); but to the northward of the Little Bassas, close in on the eastern shore, a decided southerly set was experienced, at the rate of nearly a mile an hour, which increased to a velocity of 2 knots near Trincomalie.

While lying under the Little Bassas, or within them, this set directly to windward was occasionally felt, the wind blowing strong enough at the time to keep the ship quite broadside on; but this seldom or never lasted more than a couple of hours. At the Great Bassas it was never felt, and only occasionally as far west as the anchorage off Potana Point, and the greatest strength found at the Little Bassas was three-quarters of a knot.

COAST BETWEEN THE LITTLE BASSAS AND TRINCOMALIE.—From the vicinity of the Dædalus and Atlas Rocks, northward, the coast is supposed to be clear of danger as far as latitude 7° N., and ships may safely approach it in fine weather to the distance of 3 or 4 miles, in 14 to 20 fathoms water. Between $7^{\circ} 1'$ N. and $7^{\circ} 5'$ N. there is a bank of shoaler soundings (4 fathoms or less) running N. by E., which must be avoided—the coastline opposite to it trending for a short distance to the N.W.-ward; ships should not go nearer to it than 5 or 6 miles, where the depth is 16 fathoms and upwards. Thence to latitude $7^{\circ} 20'$ the coast is again free from shoals; but beyond, and especially for the next 10 miles, ships are cautioned not to make bold with the shore, for there are several rocks and reefs in the vicinity—one of which, the *Alphee* (reported in July, 1864) lies 2 miles from shore, in latitude $7^{\circ} 24'$ N., longitude $81^{\circ} 50' 30''$ E.; it is from 100 to 150 yards in length (N. and S.), with about $19\frac{1}{2}$ feet water upon it, and 12 to 14 fathoms close-to; bottom, white, with black patches, distinctly visible.* Nearly all the projecting points of land thence to Trincomalie are dangerous to approach, on account of outlying foul ground, with rocks and shoals extending some distance seaward. Therefore to be safe, do not stand in under 22 to 30 fathoms, or 5 to 6 miles from the shore, unless provided with a chart on a large scale.

Although the coastline above described is generally low, there are several remarkable objects inland:—the Friar's Hood, 1,563 feet high, is in latitude $7^{\circ} 26\frac{1}{2}'$ N., and $6\frac{1}{4}$ leagues from the sea; when bearing S.W.-ly it has the appearance of a friar's hood, but seen to the N.W.-ward it has the form of a pyramid. Gunner's Quoin, 1,320 feet high, in latitude $7^{\circ} 52\frac{1}{2}'$ N., is frequently seen 40 miles off.

TRINCOMALIE, with its harbour and bay, is distinguished by the flagstaff near Fort Frederick (to the northward), and a lighthouse on Foul Point (to the southward); both are conspicuous objects from seaward.

Flagstaff Point, in latitude $8^{\circ} 35' 40''$ N., longitude $81^{\circ} 14' 30''$ E., is high, steep to seaward, and covered with trees; it is the extremity of a narrow strip of land, which, projecting about $\frac{3}{4}$ of a mile to the north-eastward, forms with Elizabeth Point a large open bay 3 miles wide and 1 mile deep,

* H.M.S. *Vigilant* searched for this shoal in December, 1864, and found 6, 8, and 10 fathoms, but did not come on the 19 feet, as reported by LIEUT. J. GEHENNE, of the French Imperial steamship *Alphee*, from which it was inferred the shoal is closer in-shore.



known as the *Back Bay* of Trincomalie. There is a conspicuous detached rock off Flagstaff Point. The peninsula which stretches to the southward and eastward from the town is steep and bluff on the seaward front, and is, therefore, easily recognised, as the coast north and south of it is low near the sea. The S.E. point of the peninsula has an islet off it, named Chapel Island, off which, to the N.E. $\frac{1}{2}$ E., distant $\frac{3}{4}$ of a mile, lies a reef of rocks; they are nearly on the edge of soundings, and have 20 to 30 fathoms very close to them on the east and south sides. Chapel Rock, on the inner part of the reef, is above water. At two spots on the east side of the peninsula projecting rocky points stretch from a $\frac{1}{4}$ to a $\frac{1}{2}$ of a mile seaward, and ought not to be approached under 15 fathoms. The detached rock open of Flagstaff Point clears all these dangers. The S.W. point of the peninsula (Elephant Point) has Elephant Island near it—to the S.E.—from which a reef, named Elephant Rock, projects to the westward, and has only 4 feet water on its shoalest part; this is marked by a white buoy.

Foul Point, the outer S.E. point of Trincomalie Inlet, is now marked by a lighthouse, and has a reef projecting from it to the northward for $\frac{3}{4}$ of a mile.

LIGHTS.—A *white* light, showing a *flash* every *half minute*, and visible 17 miles, is exhibited from a lighthouse 104 feet high, recently erected on Foul Point, the south-eastern point of approach to the great bay of Trincomalie. Beyond the distance of 7 miles the eclipses are total between the flashes, but within that distance there is a faint continuous light; the tower stands in latitude $8^{\circ} 32' 10''$ N., longitude $81^{\circ} 18' 50''$ E.

A *fixed white* light, visible 10 miles, is also exhibited from a lighthouse recently erected on Round Island, at the entrance to Trincomalie harbour.

The light on Flagstaff Point is now discontinued.

DIRECTIONS.—There is some difficulty in making a landfall about Trincomalie during October and November, from the strong current which sets to the southward at the rate of $2\frac{1}{2}$ or 3 knots, and from the light variable winds, with occasional squalls and thick weather, prevalent just before the N.E. Monsoon sets in. Endeavour, therefore, to make the land in about latitude 9° N., as, indeed, is advisable from the end of September to the end of March, if bound to Trincomalie during that period. The coast is clear on that parallel, and may be safely approached to the depth of 20 fathoms, even by night. If the land be made towards the close of the day, stand off to the N.N.E. or N.E., at the rate of 3 or 4 knots per hour during the night. Should the wind be N.E., keep working to windward, and when standing in shore keep the lead going *very frequently*, not failing to tack as soon as the water shoals to 22 or 20 fathoms.

At daylight, run in for the land on a N.W. or W.N.W. course, keeping outside Pigeon Island (in latitude $8^{\circ} 43\frac{1}{4}'$ N.), a rock 99 feet high, and about $1\frac{1}{2}$ mile from the shore. The coastline for 15 miles N.W.-ward of this island is, here and there, foul, but no rocks extend beyond a mile from the shore; but to the southward of the island, for the distance of $5\frac{1}{2}$ miles, the foul ground extends nearly 2 miles off shore in some places.

Pigeon Island, about N. by W. $\frac{3}{4}$ W., 8 miles from Flagstaff Point, and N.W. by N. 13 miles from the light-tower on Foul Point, is a rocky island with some shrubs on it: being encompassed by islets, and rocks (above and under water) especially between it and the shore,—there is no safe passage inside except for boats. When passing, it is advisable to

keep outside it at the distance of 2 miles *at least*, in soundings of 21 to 24 fathoms, although it may be approached to 18 fathoms.

Rocks.—*Diomede Rock*, on which H.M.S. *Diomede* struck, lies $1\frac{2}{3}$ mile S.E. $\frac{1}{2}$ S. from Pigeon Island, and $1\frac{1}{2}$ mile off shore; the depths close to it are 9, 10, and 11 fathoms. *Fairlie Rock*, on which the *Fairlie* struck, is $3\frac{1}{2}$ miles S.S.E. $\frac{1}{2}$ E. from Pigeon Island, and nearly a mile off shore; it is about 40 yards in diameter, with 16 feet water on it, and has 9 to 11 fathoms close to all round. *Lively Rocks* $\frac{1}{2}$ a mile nearly due East of Elizabeth Point, and *Heroine Rock* $\frac{3}{4}$ of a mile S.S.E. $\frac{1}{2}$ E. of the same Point, are about the size of a boat, and have 6 to 7 fathoms close to them.

In consequence of the foul ground in the locality just indicated, it is dangerous for ships to make too free with the shore, therefore do not haul in until 3 or 4 miles south of Pigeon Island, then steer direct for Flagstaff Point.

From March to September, during the S.W. Monsoon, there is no difficulty in making Trincomalie, for although the current in the offing sets to the northward, it seldom runs more than one knot near the shore. Between the parallels of $7^{\circ} 30'$ and $9^{\circ} 30' N.$, the coast may be safely approached to 22 fathoms at night, and to 15 fathoms by day.

Back Bay.—*Coming from the northward*, Pigeon Island (in lat. $8^{\circ} 43\frac{1}{4}' N.$) being rounded at the distance of about 2 miles, steer S. $\frac{1}{2}$ E., and having made out the flagstaff, approach it on that bearing, hauling more into the bay as soon as the Lively Rocks are passed; the anchorage is in the southern part of the bay to the north-eastward of the town of Trincomalie, with Flagstaff Point bearing S. by E. to S.E. by S., distant $\frac{1}{2}$ a mile, in 7 to 10 fathoms (according to the size of the ship), sandy bottom. The soundings decrease gradually to the sandy beach, except about a mile to the N.W. of the point where rocks stretch from the shore to 4 fathoms. *Coming from the southward*, as soon as the flagstaff is distinguished steer for it, rounding Flagstaff Point close, and bringing up as above. This anchorage is safe between the middle of March and the middle of October, the period of the S.W. Monsoon.

To enter the Harbour.—If the wind be fair keep in mid-channel, and when Round Island and Marble Point (beyond it) are made out, steer about W. by S. $\frac{1}{2}$ S., keeping the high land of the point open to the northward of the island until the entrance to the harbour is open; then steer midway between Round and Elephant Islands, and between Minden and Elephant Rocks, both of which are marked by buoys. When to the northward of these rocks, steer direct for the entrance of the harbour, which is about $\frac{1}{2}$ of a mile wide between Ostenberg Point and Small Sober Island,—either of which, however, may be approached within a vessel's length. On the hill of Ostenberg Point there is a battery. Inside the entrance above indicated a spacious harbour, completely land-locked, is opened out, with several coves convenient for heaving down ships. After rounding the shoal (*buoyed*) to the northward of Ostenberg Point, the anchorage off the dockyard is south of York Shoal (also *buoyed*); but intending to anchor off the town in the usual position for merchant ships, when through the entrance between Ostenberg Point and Small Sober Island, steer N.N.W. until past the buoy on York Shoal, then haul up to the N.E.-ward, and anchor abreast the Victualling store, and $\frac{1}{2}$ a mile from the wharf, in 6 fathoms water.

The shoal just inside Ostenberg Point has only 3 feet on its shoalest

part, and York Shoal only 5 feet. When making for the merchant anchorage, pass midway between Powder Rocks and York Island.

At night, when approaching Trincomalie harbour *from the southward*, bring Foul Point light to bear W. distant 2 miles; and then steer N. W. until Round Island light bears W. S. W.; then steer for this latter light until Chapel Hill, the high bluff eastern extreme of land on the northern side of entrance, and easily seen in the darkest night, bears N. distant about $1\frac{1}{2}$ mile: then steer W. by N. until Round Island light bears S. by E. $\frac{1}{4}$ E.: lastly steer N. by W. $\frac{1}{4}$ W., passing midway between Ostenberg Point and Sober Island, and anchor with the light bearing S. by E. $\frac{1}{4}$ E., in 12 fathoms water.

After passing Ostenberg Point the water shoals rapidly from 25 to 12 fathoms.

Approaching *from the northward at night*, when Foul Point light is seen, bring it to bear S. by E. $\frac{1}{2}$ E., and steer for it until Round Island light bears S. W. $\frac{1}{2}$ W.; then steer for Round Island light until the extreme point of Chapel Hill bears N. by E. $\frac{1}{2}$ E.; afterwards proceed as above.

Working In.—When the wind blows strong from the westward, a strong outset renders it difficult to work in (at times) during the S. W. Monsoon; ships then bound to Trincomalie generally fall in with the land to the southward of the port. Passing Foul Point, it is safe to stand into 14 fathoms, or go about when Marble Point just opens northward of Round Island. To avoid the outset from the inlet, it is recommended to work in abreast of Back Bay and Flagstaff Point, taking care when near Rocky and Chapel Points to keep the *detached* rock off Flagstaff Point well open of that point to clear Chapel Rock, and the dangers northward of it. When round the Rock, Chapel and Elephant Islands may be borrowed on, for they are steep-to; but in standing to the southward, do not borrow under 20 fathoms towards the dangers off Norway Point and Island. Being to the westward of Norway Island, do not stand too soon to the southward, towards the bottom of Great Bay, on account of the sandbank, with 3 fathoms on it, extending about a mile to the S. S. W. of that island, having 15 and 16 fathoms water within half a ship's length of it, and at a small distance no soundings. In approaching the bottom of Great Bay, the lead must be kept going; for although there are no soundings within a mile of the shore in some places, the first cast may be 35 or 40 fathoms, then 18 or 20, and the next cast probably 10 or 12 fathoms. It would be imprudent to go under 12 or 14 fathoms, as the distance from these depths is not more than 1 or 2 cables' length in some places to 4 fathoms, at the distance of $\frac{1}{4}$ or $\frac{1}{2}$ a mile off shore: but to the southward of the bank stretching from Norway Point, in the S. E. corner of Great Bay, the soundings are more regular, and extend farther out, and here ships may anchor. In standing to the northward for the entrance of the harbour, pass close to the eastern side of Round Island, which is steep-to, and you will probably reach the harbour's mouth without tacking, keeping the weather shore on board in entering.

N. E. COAST OF CEYLON.—Mæletivæ House in lat. $9^{\circ} 16\frac{1}{2}'$ N., long. $80^{\circ} 49\frac{1}{2}'$ E., stands close to the sea, and bears about N. W. by N. from Pigeon Island, distant $13\frac{1}{2}$ leagues; the coast between them is low, and safe to approach to 18 or 20 fathoms in the night, if the lead is kept going, or to 12 fathoms, occasionally, when working in daylight.

Mæletivæ Shoal.—From Mæletivæ House, a dangerous coral shoal, having only 6 to 12 feet water on it, called Mæletivæ Shoal, extends east-

ward and N.E. nearly 4 miles from the shore, which ought not to be approached nearer than 13 fathoms. As there are 20 and 21 fathoms about 6 miles from the shore, and 4 or 5 miles to the S.E. of the shoal, a ship should edge out a little when near it: but when abreast of its eastern extremity, she may with the land-wind borrow towards it to 13 or 14 fathoms. The north side of this shoal is not so steep, but is composed of detached knolls, the depths decreasing regularly to 9 or 10 fathoms close to its northern verge, and to 6 and 7 fathoms along the N.W. part, close to the shore. From this shoal the coast is low to the N.E. point of Ceylon, with 7 fathoms water near the sandy beach: but care is requisite to avoid the following danger.

Point Pedro Shoal encompasses the N.E. extremity of the island, and from thence stretches nearly parallel to the coast about 8 leagues to the S.E., having only $2\frac{1}{4}$ to 4 fathoms on it in many places, and $2\frac{1}{2}$ fathoms on two patches in lat. $9^{\circ} 50\frac{1}{2}'$ N. and $9^{\circ} 55\frac{1}{2}'$ N.: one of these bears nearly E. $\frac{3}{4}$ S. from Point Palmyra, the N.E. extreme of Ceylon, distant about 5 miles; the other N. $\frac{1}{4}$ E. from the same point, distant $\frac{1}{2}$ mile. Between this extensive narrow shoal and the coast there is a safe channel about $2\frac{1}{2}$ to 3 miles wide, with regular soundings, soft mud, 7 fathoms close to the shore, 7, 8, or 9 fathoms in mid channel, and 5 or 6 fathoms close to the inner edge of the shoal. To the eastward of it the bank of soundings is also flat, with regular depths, decreasing to 5 and 6 fathoms close to the S.E. and eastern parts of the shoal, and to 4 fathoms, coarse brown sand, close to its N.E. verge. Mark House (in lat. $9^{\circ} 32\frac{3}{4}'$ N.), bearing S.W. by W. $\frac{1}{4}$ W., clears the south end of Pedro Shoal.

WEST COAST OF THE BAY OF BENGAL.

CAPE COMORIN, the south extremity of the peninsula of India, is in lat. $8^{\circ} 4' 35''$ N., long. $77^{\circ} 32\frac{1}{2}'$ E. It is a low sandy point, having off it at a short distance a depth of 7 and 8 fathoms, which increases rapidly to 18 and 20 fathoms, the latter being 5 miles due South from the Cape. The Cape rises in a gradual slope, and is covered on the east side with palmyra trees; it may be easily distinguished by the reddish appearance of the soil and a large white Choultry, situated near the beach. Two large rocks, with a small one outside, on which the sea at all times breaks with much violence, stretch to the distance of a quarter of a mile from the shore; they are steep-to, and may with a fair wind be approached within a quarter of a mile in 8 or $8\frac{1}{2}$ fathoms, but with a scant wind caution is necessary, as the current sets rapidly round the point, and may drift a vessel into danger.

On the east side of Cape Comorin the coast suddenly turns northward for about 3 miles, forming a bay in which are soundings of 8 to 5 fathoms sand and rock; it then trends N.E. by E. $3\frac{1}{2}$ miles to Manapaud Point, a high sandy projection jutting out boldly into the sea, in lat. $8^{\circ} 22\frac{3}{4}'$ N., long. $78^{\circ} 3\frac{1}{4}'$ E. All this coast is fronted by a reef, which extends out generally about half a mile, excepting at Iddingekarry, 13 miles from the cape, where its edge is about a mile from the land. The depth off this coast at $2\frac{1}{2}$ miles' distance averages 12 fathoms so far as Iddingekarry, and afterwards 9 fathoms to Manapaud Point; it is believed to be clear of outlying reefs, although Captain Hcpe, of H.M.S. *Thalia*, when in lat.

$8^{\circ} 4\frac{1}{2}'$ N., longitude $77^{\circ} 50'$ E., is said to have seen breakers to the N.W. $\frac{1}{2}$ W. three-quarters of a mile—"extremes of the land W. by S. to N.E. by N.; conical peak of the Ghaut Mountains W. $\frac{1}{2}$ S. In standing in-shore, shoaled suddenly from 11 to $5\frac{1}{2}$ fathoms, when we saw breakers, and immediately tacked— $3\frac{1}{2}$ miles off the land."*

Manapaud Point has a small whitewashed church on its summit, visible in clear weather 12 to 13 miles off, and appearing when first seen like a ship under sail. Hence, in sailing down the coast to Cape Comorin, the land so far as Iddingekarry is low, but then commences to rise in undulating hills of 100 or 200 feet, and the tops of tall palmyra trees appear to emerge from them. The background is mostly of a reddish soil, covered with palmyra-trees and bushes, rising gradually to the foot of the Ghauts, which at the Cape approach to within two miles of the shore. Numerous fishermen's villages and small whitewashed churches line the coast; but there are no prominent points to afford shelter, and landing in ship's boats is at all times difficult and dangerous.

Fronting the coast in the vicinity of Manapaud Point (at distances from it of $3\frac{1}{2}$ miles to 10 miles between the bearings of S.W. $\frac{1}{2}$ S. and E.S.E. from the point) are some shoals having a general depth of 7 to $8\frac{1}{2}$ fathoms, but in two places of only $4\frac{1}{2}$ and 4 fathoms, sand. The first of these, $4\frac{1}{2}$ fathoms, lies with Manapaud Church bearing N. 54° W. distant 5 miles, and Trichendore Pagoda N. 1° W. $10\frac{1}{2}$ miles; and the second, 4 fathoms, with Manapaud Church N. 54° W. 8 miles, and Trichendore Pagoda N. 12° W. $12\frac{1}{2}$ miles. The average breadth of these shoals is one mile, and there are upon them many patches of $5\frac{1}{2}$ and 6 fathoms over which a vessel might pass; but the safest course when going between them and the point is not to bring the church westward of North till within two or three miles of it, and then steer E.N.E., as it will take the vessel out clear.

From Manapaud Point to Trichendore Point the distance is $8\frac{1}{2}$ miles in a N.N.E. $\frac{1}{4}$ E. direction. This point is in latitude $8^{\circ} 29' 55''$ N., and may be recognised by the high black pagoda at its extremity, which is visible from a distance of 12 to 15 miles. The shore between is bordered by an extensive shallow flat. Hence to Tuticorin the coast runs N. by E. (easterly) 18 miles.

"TUTICORIN.—This port is a place of resort for ships of the largest class to fill up with cocoa-nut oil, cotton, &c.; but being fronted with some extensive mud-banks, the anchorage is a considerable distance from the town.†

"Light.—On Hare Island, $2\frac{1}{2}$ miles east of Tuticorin, a *fixed white* light is exhibited on an obelisk, at an elevation of 43 feet above the sea; it is visible between the bearings of N. by E., round by W., to S. by E., or 202° open to the East; it may be seen at the distance of 12 miles: position, latitude $8^{\circ} 47' 17''$ N., longitude $78^{\circ} 11' 17''$ E. The following are the instructions relative to it:—

"Directions.—A vessel making the port at night may anchor with the light bearing from W.N.W. to W. by S. about $1\frac{3}{4}$ to 2 miles off shore, where good holding-ground will be found in 6 to $6\frac{1}{2}$ fathoms. At $3\frac{1}{2}$

* The meaning of this statement is not very clear. The locality in which we suppose the report to place the reef, appears from the Admiralty chart (No. 686) to have been well sounded, and no reef is inserted in that chart.

† The Directions for Tuticorin, Palks Strait, &c., as far as Point Calimere, are chiefly by Mr. John J. Franklin, R.N., who surveyed Palks Strait and the Gulf of Manaar, between the years 1838-45.

miles' distance with the same bearings, the ground is foul on pearl banks.

"Approaching from the *southward*, the light may be kept about N.N.W. till within 3 or 4 miles, when the above anchorage may be selected; but should a vessel suddenly deepen her water from 7 or 8 fathoms to 12, 15, or 20, she should immediately steer North till she makes the light, taking care to keep farther to seaward if it bears north of N.N.W. The outer part of this deep water lies a little to the north of the head of the Coil-napatam Reef, and bears S. by E. 10 miles from Tuticorin Light.

"Approaching from the *northward*, a vessel may keep the light about S.W. till within 3 or 4 miles, when she must steer more out for the anchorage; but in no instance ought the water to be shoaled under $6\frac{1}{2}$ fathoms, excepting with the bearings on for the anchorage, and then not under 6.

"During the N.E. Monsoon, vessels should lie with a good scope of cable out; as, although the seas are not heavy, they are sharp, and occasion a chain to jerk. The sea-breeze at this time blows on the reef, and a second anchor (with chain ranged) ought always to be kept ready for letting go.

"During the S.W. Monsoon, which usually lasts from the middle of May to the middle of August, the port may be made without fear, for, although the winds are very violent, they are invariably off shore (from W. to S.W.), accompanied by smooth water. At this time vessels may approach the reef to 5 fathoms, but should always have a stream anchor to seaward, as occasionally, during the lulls of the Monsoon, a light air comes in from the eastward.

"As a rule, large vessels ought not to approach the land above Tuticorin nearer than 6 or 7 miles, as $2\frac{1}{2}$ or 3 fathoms are found 5 miles off, in some places. When some large clumpy trees at Putnurmadoor, seen 10 miles off, bear north of West, no other object on shore being visible, the shoal water is to the northward.

"There are two channels for small craft into Tuticorin harbour, but that to the north is so intricate as to be seldom used. The Southern channel leads between the southernmost island and the main land, the reef connecting them being crossed in 12 to 14 feet at a distance of $\frac{1}{2}$ to $1\frac{1}{2}$ mile of the island. This being passed, a course may be steered for Devil's Point on the main, after closely rounding which a small vessel may stand direct for the town of Tuticorin, carrying 11 to 9 feet. Before passing Devil's Point $2\frac{1}{2}$ fathoms are found, sand and mud.

"At the distance of $2\frac{1}{2}$ miles due East of the Penacoil tope, a scanty tope to the south of a large ruined building, 9 miles from Devil's Point, is situated the inner edge of an extraordinary natural basin in the rocks, $4\frac{1}{2}$ miles east and west, and averaging $1\frac{1}{4}$ mile in breadth; the outer part being the broadest and deepest. The bottom is composed of fine sand and mud in 7 fathoms on the western to 18 and 20 fathoms on the eastern extreme, from which it suddenly shoals to 9, 8, and $7\frac{1}{2}$ fathoms on a pearl bank. In standing up the coast during the night with a scant wind, this is good ground for ascertaining a vessel's position, as no similar spot exists from Paumben to Comorin. From the outer part in 15 to 20 fathoms, the anchorage off Tuticorin bears N. by E. $9\frac{1}{2}$ miles.

"Good anchorage in 3 to 4 fathoms mud, with this tope bearing W. 1 to $1\frac{1}{2}$ mile, is to be found here during southerly winds under the lee of a reef which commences $2\frac{1}{2}$ miles N.E. by N. of the next point (Coil-

napatam), and continues with little exception to Cape Comorin. As far as Manapaud Point, this reef varies in its distance from the land from 1 to $2\frac{1}{2}$ miles, but thence to Comorin it seldom exceeds $\frac{1}{2}$ mile. The head of this reef lies S. by W. $10\frac{1}{2}$ miles from Tuticorin Light."

PAUMBEN PASS.—From Tuticorin the coast trends northward and eastward to Paumben Pass, in latitude $9^{\circ} 17' N.$ and longitude $79^{\circ} 12' E.$, and is throughout fronted by reefs, between and among which are channels frequented by native vessels. As the various towns and villages on this long line of coast can only be visited by those having an intimate knowledge of the navigation, it is useless to attempt a description of the passages through the reefs; we proceed, therefore, to give Mr. Franklin's instructions for Paumben Pass, premising that a small *fixed* light is now shown on the east side of the pass on the north-west extremity of Rameseram Island.

"*Eastern Entrance.*—The eastern entrance to Paumben is in latitude $9^{\circ} 15' 30'' N.$, longitude $79^{\circ} 13' 54'' E.$ Some small islets are situated at the east end of the reef, between which and the island of Rameseram the channel leads. A pole has lately (1845) been erected on the northern limit of the shoal water inside these islets, between which and Rameseram deep water is to be found. The south end of the cut through the Horse-shoe Bank, by which vessels have to pass in going through the Paumben Channel, bears from this pole E. by N.

"*Western Entrance.*—The western entrance to Paumben is situated in latitude $9^{\circ} 9' N.$, and longitude $78^{\circ} 36' 54'' E.$, passing between Valinookum Point on the main coast of India and the small island of Anapaar, which last must not be approached nearer than a mile, till the south end bears south of E. The passage will then be entered, when a straight course for Keelacarry at N.E. by E. may be kept, care being taken to avoid some reefs nearly awash which lie off Yerravaddy Point, the easternmost limit of the deep bay opposite the entrance just described. A depth of 5 and 6 fathoms will be found at this entrance, shoaling to 3 farther in, with an occasional cast of $2\frac{1}{2}$ sand. The best anchorage at Keelacarry is in $2\frac{1}{2}$ to 3 fathoms, stiff mud, with a detached ruin east of the town bearing N., and some large terraced houses N.W. Pilots here come on board to take vessels to Paumben, which lies 26 miles farther to the eastward; but should a vessel proceed without such assistance, the following directions must be followed.

D.T.F.F.R.

"Steer for a little outside the next point (Nanjumundel) till a small tope, between a hillock at the mouth of a rivulet and an old ruined temple, bears N. Then stand across about S.E. $\frac{1}{2}$ E. for a little outside the west end of the next island (Talliary). This leads over the deepest part of a spit in $2\frac{1}{2}$ fathoms with 7 feet on each side, where a buoy will shortly be moored to indicate the channel. Two bungalows at the next point on the main will now be seen, and when they bear N.E. $\frac{1}{2}$ E. steer E.N.E. till they are passed, when due E. will take a vessel to the buoys on each side of the passage at Ramasawmy's Choultry. To avoid a sandy knoll with only 7 feet over it, the southern of these buoys ought to bear E. by N. when about a quarter of a mile off; and after passing between them, steer about E. for a high beacon erected on a patch of rocks. Leaving this 50 to 100 yards to the southward, stand on for the north end of the next island, Palleetevo, and round it at about a quarter of a mile off, keeping E.N.E. till the opening between Palleetevo and the next island bears S.—then steer E., and anchor near the sandbank channel, which has

a buoy to mark its position. No vessel drawing more than $8\frac{1}{2}$ feet ought to attempt this navigation without a Keelacarry pilot."

Mr. Franklin says, "It was formerly considered a hazardous undertaking for a vessel of any size to proceed far up into the GULF OF MANAAR—more particularly during the S.W. Monsoon, when it was supposed to be impossible to beat out again. Later experience, however, has shown that no dangers exist that may not be avoided by ordinary care and attention; and that, as regards working to windward against the Monsoons, no difficulty will be experienced if the following instructions be attended to.

"*During the N.E. Monsoon*—that is, from November to March inclusive—fine weather, with land and sea breezes, will be found to prevail on the Ceylon side of the gulf, where good anchorage may always be selected between Colombo and Chilaw, at $1\frac{1}{2}$ to 3 miles off shore, in 6 to 9 fathoms sand. Vessels wishing to beat up during the first three months, ought therefore to keep over on that side till they have advanced sufficiently far to make certain of their port, if bound to the Indian coast, as the breezes there may be expected to blow steadily and strong from N.N.E. with a strong lee current. In rounding Cape Comorin at this time, the Indian shore may be kept on board till abreast of Manapaud Point, a high promontory with a small white church erected on its summit. A vessel may then stretch across with advantage, and probably in the next tack fetch Tuticorin, the only port on the Indian coast frequented by large vessels.

"Small vessels of light draught will also find this the easiest method of working up; and if bound to Paumben, had better keep the Ceylon shore till abreast of Calpentyn, which they may know by the three long hills of Kodramallai, the only ones near the coast. They can then stand across, and make Paumben either by the EASTERN CHANNEL between the island of Rameseram and the reef and islands south of that port, or by the WESTERN CHANNEL between Freshwater and Anapaar Islands at Valinookum Point.

"*During the S.W. Monsoon* a ship ought to keep over on the Indian side till near Manapaud Point, when she will generally be able to fetch to windward of Colombo, and be clear of all dangers. The only safe place for vessels of size to anchor in on the Ceylon coast during this Monsoon is at Colombo, where the current from the Kalany Gange or Mutwal River running to windward, takes much of the strain off the cables of vessels riding there. If obliged to slip, it is safe to stand across the gulf to Tuticorin, which being situated on the weather side affords good shelter and anchorage.

"Small craft working down from Paumben will do well to keep inside the islands till they reach the Western entrance of the inland navigation at Valinookum Point. They can now work down near the coast as far as Manapaud Point, when their fetching Colombo on the starboard tack may be considered certain.

"The breezes in the Gulf of Manaar are generally stronger than on the adjacent coasts, the only moderate months being April and October; yet if the instructions already given be attended to, no difficulty will be found in working up or down against them. The N.E. Monsoon sets in with force about the middle of November, and lasts till the end of January, bringing with it a current of from 20 to 30 miles a day to the S.W. It blows steadily from N.N.E. along the Indian shore, but on the opposite side is modified into land and sea breezes with very fine weather. In

February, land and sea breezes commence on the Indian side; and by April the general set of the wind in the gulf will be found to have drawn round to the southward, the sea breezes being from S.E. to S.W., according to the coast on which they prevail. These now increase in force till about the middle of May, when the regular S.W. Monsoon sets in, blowing with great violence from W.S.W. on the Indian coast, and S.W. on the coast of Ceylon, where it commences rather earlier, and is attended with heavy fall of rain, thunder, and lightning. In August the strength of the Monsoon abates, but strong Southerly winds are still experienced in this and the next month, becoming lighter as the season advances. Variable and gentle breezes, with smooth water, may usually be expected in October, lasting till the setting in of the N.E. Monsoon, which is ushered in on the Indian side by 15 or 20 days of heavy rain.

CURRENT.—The current will generally be found to set with the wind in the strength of the Monsoons; but this is not invariably the case. Care and attention must therefore be paid to the soundings, and unless a good pilot be on board, a vessel ought not to shoal her water during the night to less than 12 fathoms above, or 18 or 20 fathoms below Manapaud, on the coast of India, or to less than 10 fathoms above and 20 below Colombo, increasing the depth to 40 till abreast of Point de Galle, on the coast of Ceylon; excepting, of course, her position be ascertained by the bearing of the light at Tuticorin or Colombo.

TIDES.—The flood sets in about E.N.E. and the ebb about S.W., but their direction is greatly influenced by the wind."

PALKS BAY is terminated to the north-east by Point Calimere, upon the extremity of which is a column, a very useful land-mark for vessels passing through the channel between the point and the Middle Banks.

ADRAMPATAM.—At about 28 miles westward from Point Calimere is the town of Adrampatam, off which is good anchorage during the N.E. Monsoon. With southerly and south-easterly winds a heavy swell sets in, rendering it less secure at those seasons.

Mr. Franklin says of the anchorage of Adrampatam:—"A vessel after passing through the North Channel may steer about W. by N. She will make the Shallavenaikapatam Pagoda, which can be seen 15 miles off, ahead, and should anchor with the town of Adrampatam bearing North from 3 to 3½ miles, and the pagoda West about 6 miles; she will then be in 2½ to 3 fathoms, sand. Small craft drawing 6 or 7 feet water may approach to within 1½ mile of the town, bearing N.N.W., and anchor in 2 fathoms."

Palks Bay is fronted to eastward by some very dangerous banks, upon which in many places are patches of 2 and 2½ fathoms; hence, although the channel between Point Calimere and the north end of Ceylon is nearly 30 miles wide, vessels cannot traverse the whole of this space. Mr. Franklin has given the following instructions for the navigation of the bay:—"There are two good entrances into Palks Bay from the eastward: one between Point Calimere and the northern end of the Middle Banks, having 19 to 24 feet; the other between the southern end of the same banks and the north coast of Ceylon, with 5½ to 8 fathoms. Sailing directions were published some years back for the northern passage, but I would strongly recommend all commanders, with a vessel drawing 12 feet, to make use of that to the southward, except with a leading wind or with the aid of steam.

"Paumben bears from Point Calimere S. 31° W. 73 miles; and after rounding the spit that stretches off to rather more than a mile east of the latter place in about $3\frac{1}{2}$ fathoms, 3 miles off shore, a vessel may stand S.W. $\frac{1}{2}$ S., keeping in $3\frac{1}{2}$ to 4 fathoms, till two tall detached palmyra trees to the westward bear about North. She is then clear of the banks. This channel, through the centre of which the foregoing directions lead, is 3 miles wide, having a small sandy knoll, with only $2\frac{1}{2}$ fathoms on it, about a mile inside its southern boundary, and $\frac{1}{2}$ miles S.S.E. of the point. The depths on each side vary from 2 to 3 fathoms, with a bottom of hard sand, while that of the channel itself is mostly mud.

"The Middle Banks from this stretch in a southerly direction, to within 8 miles of the Ceylon coast, having an average breadth of 3 miles, with uneven soundings from 2 to $3\frac{1}{2}$ fathoms; and in one place only 9 feet. This is situated $8\frac{1}{2}$ miles S. 20° E. from Point Calimere, and $9\frac{1}{2}$ miles S. 44° E. from the two remarkable trees already noticed. It is composed of hard, fine sand, and should be carefully avoided. There is always what is called a swash over these banks, which renders it hazardous to be on them in an open boat during a breeze.

"In beating into the bay against the S.W. Monsoon, a vessel should stand over to the north coast of Ceylon, and work down to the island of Delft, or Nedoan Teevo, whence a stretch may be made across the bay to its western side, where land and sea breezes will be met with, accompanied by smooth water. In the N.E. Monsoon, a vessel bound against it should also work upon the Ceylon side as far as Kayts; when she may stand over to the coast of India, and creep to windward in smooth water. With the strong currents ever attendant on the Monsoons in the middle of the bay, it is impossible to contend against them without thus taking advantage of smooth water and weather shores.

"A well-known shoal extends from about 17 miles S.S.E. of Point Pedro to about 6 or 7 miles N.W. of it, having a good channel of $2\frac{1}{2}$ to 3 miles wide, with 7, 8, and 9 fathoms mud, between it and the shore. The most dangerous part on its northern end bears from the point due East, $4\frac{1}{2}$ miles off shore, to E. 28° S., 4 miles off shore. It has in some parts as little as $2\frac{1}{2}$ fathoms, and a vessel in passing it ought not to shoal her water on the bank to less than 6 fathoms, when she will be about 3 miles off shore, with deep water inside.

"To clear the north end of this bank, having $3\frac{3}{4}$ fathoms on it, the break in the trees at Tondimanaar, which is plainly perceptible some few miles at sea, ought not to bear west of S.S.W. till within 4 or 5 miles of the land. Inside this, a vessel working to the westward may approach the shore with safety to within half a mile, carrying from 6 to 8 fathoms sand and mud, till abreast of Kangasenthoray, which may be known from its two bungalows, each built on a rocky platform washed by the sea. To avoid some foul ground which, diverging from the beach at this place, reaches to a distance of 2 miles from the shore a little farther west, she must now be careful not to shoal her water to less than 6 fathoms on her in-shore tack, or to less than 5 fathoms on her seaboard; as the southern end of the Middle Banks, with $2\frac{3}{4}$ and 3 fathoms over it, lies to the north. The channel is 6 miles broad from the foul ground to the end of the banks, with $5\frac{1}{2}$ to 8 fathoms, sand and mud, in it. When the opening between Kara Teevo (Amsterdam Island) and the main leads due South the foul ground is passed; and when Fort Hammonhiel is well open of the N.W. point of Kara Teevo, the banks are to the eastward. A vessel can then

shape a course to any part of the bay, having good anchorage in 4 to 5 fathoms, $\frac{1}{2}$ to $\frac{3}{4}$ of a mile outside any of the islands. If bound to Jaffna, she should, after passing Kayts, stand southerly, rounding Elewa Teevo, Anella Teevo, and Naina Teevo, at a distance of 1 to 2 miles, till within 2 or 3 miles of Nedoan Teevo (Delft), which she will make ahead. She may then steer easterly, keeping about a mile off Poongree Teevo, and taking care not to haul to the north of East till that island has been left 4 or 5 miles behind; and anchor according to the directions about to be given. Following out these instructions, a vessel from Point Pedro ought not to shoal her water to less than $4\frac{1}{2}$ fathoms; but more generally have a depth of 5 to 6 fathoms.

Directions for Kayts.—No vessel drawing more than 8 feet should attempt to enter the harbour of Kayts; for, although there are $7\frac{1}{2}$ feet in the channel at low-water springs, the greatest rise is not more than 15 inches. To avoid the foul ground, extending $1\frac{1}{2}$ mile to the westward of the N.W. end of Kara Teevo, a vessel ought to keep in 5 fathoms till Elewa Teevo bears S. by W. She may then stand for that island, shoaling her water to 3 fathoms, till Fort Hammonhiel, built on a rock at the north side of the entrance, bears S.E. by S., when she can steer for it, keeping the Custom House Point, on which is a large clumpy tree, over the low sandy point of Kara Teevo till within a quarter of a mile. She will now be in 9 feet smooth water, and, keeping more to the south, may round the fort at a distance of from 200 to 700 yards, according to circumstances; care being taken, when inside, to borrow over on the north side of the harbour till past an old bungalow on that side. Any anchorage may then be selected, but the best is off the Custom House, in 11 or 12 feet mud.

“Outside, good anchorage is obtained in either Monsoon in 13 or 14 feet smooth water, with the fort bearing S.E. $1\frac{1}{2}$ mile; the north end of Elewa Teevo S.W. $1\frac{1}{4}$ mile; and the N.W. end of Amsterdam Island N.E. In the S.W. Monsoon the bank off Elewa Teevo may be approached a little closer; and in the N.E., the foul ground off Amsterdam, which will give a vessel a little more room for weighing. Large vessels should of course anchor farther out.

Directions for Jaffna.—A rock was supposed to exist in the approach to Jaffna from the westward; but after a careful examination no such danger could be discovered; and although some pilots declare that it is still there, they are unable to point out the precise spot. This, added to the testimony of some divers, who declare that they never met with it, although employed in the neighbourhood from childhood, may lead us safely to infer that the pilots are in error, and that no impediment is offered to the safe navigation of this part of the coast. A small vessel, having Calmoene Point E. by N. to N.E., may steer for it till she opens Jaffna Fort Church clear of the island of Mande Teevo; when she can stand freely for the opening, carrying from 4 to $2\frac{1}{2}$ fathoms over a rocky ledge to $2\frac{1}{4}$ and 3 fathoms inside on sand; and anchor with the following bearings:—Calmoene Point, E.; Fort Church, N. $\frac{1}{2}$ W. to N. by W. $\frac{1}{2}$ W. But care must be taken not to approach Calmoene Point within 600 or 700 yards, as there are some rocky heads some distance from it.

“The best anchorage for a large vessel is outside the rocky ledge, with the Fort Church bearing N. by E., over the centre of a small island, called ‘Small Pox Island,’ just clear of the small cocoa-nut tope on Mande Teevo, and Calmoene Point N.E. by E. She would then be in $4\frac{1}{2}$ fathoms, sand, about 2 miles off the island. It must be borne in mind, however, that

this anchorage ought not to be used from the middle of May to the middle of August, when the S.W. Monsoon, from which there is no shelter, blows with great violence.

"Dangers in Palks Bay.—1. The Middle Banks, already described.

"2. A long sandy spit, with from 1 to 2 fathoms over it, stretching E. by S., 13 miles from a low point above Kotipatnam, on the coast of India. It has generally a heavy swash of a sea over it, and should not be approached from the eastward nearer than 6 fathoms. CAPTAIN POWELL places its eastern extremity in latitude $9^{\circ} 59' N.$, and longitude $79^{\circ} 29\frac{1}{2}' E.$ Its bearing from Paumben is $N. 22^{\circ} E.$ 45 miles; and from Point Calimere $S. 49^{\circ} W.$ 29 miles.

"3. The foul ground off the N.W. end of Ceylon, to the eastward of the opening between that and Kara Teevo, where the coast ought not to be approached nearer than 2 miles, for although at present there are 12 to 15 feet over the knolls, the depths may decrease, as they are composed of coral.

"4. A detached rock, about the size of a ship's boat, with only 2 feet water over it, between Paale Teevo and the Devil's Point, having the following bearings:—Devil's Point, South 3 miles; South end of Paale Teevo, E.S.E. $2\frac{1}{2}$ miles.

"Lastly.—Some rocks awash which lie about $1\frac{1}{2}$ mile off the N.E. end of Rameseram Island, where the soundings ought not to be shoaled to less than 5 fathoms. Care should be taken in the N.E. Monsoon not to get into the bay to the east of this island, as it becomes a difficult matter to work out again."

Calimere Point, in latitude $16^{\circ} 18' N.$, longitude $79^{\circ} 51' E.$, is low, and covered with cocoa-nut trees; off it a shoal flat projects some distance seaward, in consequence of which it should not be approached in passing, under 7 to 6 fathoms; upon it is a beacon. Two pagodas, near each other, at about a mile from the shore, and $5\frac{1}{2}$ miles northward of the point, are in latitude $10^{\circ} 22\frac{1}{2}' N.$

Negapatam Shoal, the centre of which is in latitude $10^{\circ} 35' N.$, is about 7 miles long, but only a few cables wide, having on it 24 feet water at its S. extremity, and 19 feet at its N. end; it consists chiefly of hard sand and stones: between the shoal and the main the channel is from 3 to 4 miles in width, having $3\frac{1}{2}$ to 5 fathoms in its deepest parts, near the inner edge of the shoal; outside, there are 6 to 7 fathoms close-to, consequently it ought not to be approached under 8 fathoms; some knolls near the N. part of the shoal have overfalls of 7 to 5 fathoms on them.

NEGAPATAM is a place of considerable trade for small coasting vessels. A *fixed white* light, visible between the bearings of N.N.W. to S.S.W., by the westward, is exhibited south of the town from the bastion of the fort, on a flagstaff 100 feet above the sea, and may be seen 12 miles; during the N.E. Monsoon it is lowered to 88 feet. Position—latitude $10^{\circ} 45' 30'' N.$, longitude $79^{\circ} 50' E.$

The coast being very low, a *black* pagoda $1\frac{1}{2}$ mile N.N.W. of the fort is a conspicuous object on approaching it.

The anchorage during the fine season is $1\frac{1}{2}$ to 2 miles off shore in 5 to $5\frac{1}{2}$ fathoms, with the flagstaff bearing W. to W. by S., soft bottom; but ships must keep farther out in unsettled weather, at which time, in 6 to 7 fathoms, with the flagstaff W. $\frac{1}{2}$ S., and the highest of the five *white* pagodas N.W., there is good holding ground.

Water, fresh provisions, fruit, vegetables, rice, &c., may be procured here; but firewood is scarce.

Coming from the *southward* during the S.W. Monsoon, keep in soundings, otherwise it will be difficult to make the coast between Calimere Point and Negapatam, owing to the prevalent westerly winds and strong northerly current. Negapatam Shoal is cleared by keeping in 8 fathoms, and when a *white house* (5 miles south of Negapatam) bears W. (southerly) you may haul in with safety towards the anchorage.

Nagore, in latitude $10^{\circ} 49'$ N., and 4 miles northward of Negapatam, has a large trade carried on by natives, with the ports on the east side of the Bay of Bengal, and with Sumatra; it is readily distinguished by five *white pagodas*; the coast is low and swampy, and at times inundated near the mouth of the river.

The anchorage in the roadstead is $2\frac{1}{2}$ miles off the entrance to the river, in 5 to 6 fathoms, with the five *white pagodas* bearing W.S.W. or W. by S.

Carricall.—Ships anchor abreast the river in 5 to 6 fathoms. Here a *fixed white light* is exhibited from a flagstaff at 65 feet above the sea, visible 8 miles. Position—latitude $10^{\circ} 55'$ N., longitude $79^{\circ} 49' 36''$ E.

At **Tranquebar**, in latitude $11^{\circ} 1' 30''$ N., there is said to be a shoal opposite the mouth of the river, 10 miles off shore, but it is unknown to the fishermen of Carricall.

Coleroon River is in latitude $11^{\circ} 23'$ N.; Coleroon Shoal fringes the coast for several miles, and projects seaward 5 or 6 miles from the entrance of the river: here a large ship should not come under 14 or 12 fathoms by day, nor 20 to 16 fathoms by night. The south end of the shoal is marked by the southernmost of the Chalambaram Pagoda on with the south part of Coleroon wood; the two pagodas in one (W.S.W.), and Porto Novo flagstaff, bearing W. by N. $\frac{1}{2}$ N., marks the north end of the shoal.

Porto Novo, in lat. $11^{\circ} 29' 30''$ N., is sheltered to the S.E. by the Coleroon Shoal. Ships anchor here in 6 fathoms, 2 miles off shore—the flagstaff bearing W. $\frac{1}{2}$ N., and the southernmost of the Chalambaram pagodas S.W. $\frac{1}{4}$ W.; rounding Coleroon Shoal bring the flagstaff to bear W. by N. $\frac{1}{4}$ N., or if in 18 to 20 fathoms water, haul in when the flagstaff bears W.N.W.

Cuddalore is in latitude $11^{\circ} 44' 15''$ N.; the anchorage is in 5 to 6 fathoms, with the flagstaff N.W. by N. to N.W. $\frac{1}{2}$ N.; the river is small and barred. Supplies of all kinds may be procured. Off the ruins of Fort St. David, 2 miles northward of Cuddalore, a bank projects from $\frac{1}{2}$ to $\frac{3}{4}$ of a mile seawards.

PONDICHERY, in latitude $11^{\circ} 56'$ N., is a French town standing on a flat, sandy plain, close to the sea. The first conspicuous object on making the coast hereabouts is a grove of trees on a flat hill, N.W. of the town; the river is small, and can only be entered by small country vessels.

A *fixed white light* is exhibited from the square in the town, at an elevation of 130 feet above the sea, and visible 15 miles on all points of the sea horizon. Position.—Latitude $11^{\circ} 55' 40''$ N., longitude $79^{\circ} 49'$ E. Take care not to confound this light with that from the chimney of the foundry at Porto Novo.

Anchorage.—During the S.W. Monsoon, and in fine weather, the anchorage is in 7 to 8 fathoms, abreast of and $\frac{3}{4}$ of a mile from the town; but small ships come into $5\frac{1}{2}$ or 6 fathoms; at night, bring the lights bearing West to W. by N. before anchoring. During the stormy period of the N.E. Monsoon, the anchorage is in the outer roadstead in 12 to 14 fathoms. During the night, there is convenient anchorage in 10 to 12 fathoms, with the light bearing W. to W.N.W.

Directions.—When coasting along from Point Calimere to Pondicherry, a depth of 14 to 10 fathoms may be kept, except when approaching Coleroon Shoal, where it is not safe to come under 15 or 14 fathoms, since the water shoals very suddenly in places thereabouts. Between Cuddalore and Pondicherry there are 7 fathoms at 1 to 1½ mile off shore, and 40 to 45 fathoms 18 to 20 miles off; the bank thence becoming very rapidly steep.

The coast between Pondicherry and Sadras is generally low, with sand-hills here and there fronting the sea. Off Conjimeer, in latitude 12° 8' to 12° 11', a bank of 5 fathoms is stated to exist at about 5 miles from the shore.

Sadras is in latitude 12° 32' N. The coast may be known by an irregular ridge of hills (Sadras Hills) inland, at the back of the town; some of these are very rugged, and when the highest bears N.W. the ship is nearly abreast of Sadras.

About 7 miles northward of Sadras are the seven Moolivaram pagodas, two of which are now close to the sea, though it is stated that at one time they were some distance inland; they are not clearly discernible unless well in with the land.

• **Tripaloor Shoal.**—To the northward of the seven Moolivaram pagodas, between them and Covelong, the rocky shoal of Tripaloor, with very foul ground near it, stretches from 1 to 3 miles off shore; the *Rockingham* was wrecked on it in latitude 12° 43' N.

Soundings of 5 to 7 fathoms were also reported in 1820, by CAPT. BARCLAY, of the *Bulmer*, stated to be on a bank in latitude 12° 26' N., 10 miles off shore; and another bank of 4 to 6 fathoms, in latitude 12° 45' to 12° 47' N., about 40 to 45 miles off shore; neither of these seem probable.

The distance from Point Calimere to Pondicherry is about 97 miles, and the course nearly due North, except northward of the Coleroon Shoal, where the coast curves slightly inwards. From Pondicherry to Sadras the distance is about 43 miles, and the direction of the coast nearly N.N.E.; thence to Madras the distance is about 34 miles, and the coast line first N. by E. and then N. ½ E. The shore is generally low and sandy—with occasional sand-hills—and the surf at all times beats heavily on the shore, so that there are few spots where a landing can be effected from the ship's boats; hence the peculiar boats of the natives, called "Masoolah" boats, are everywhere in requisition. Although the shores are low, they are generally well wooded, generally with palmyra and cocoa-nut trees, and the aspect of the country is fertile. Northward of the parallel of 12° N., the country inland becomes mountainous—the eastern Ghauts, with several offshoots, stretching towards the sea-shore.

St. Thomas, or Milapore, is a small town close to the sea, in latitude 13° 1' N.; the country inland is hilly; the northernmost hill, 4½ miles from the sea, in latitude 13° 0½' N., has a church on it, by which it may be distinguished when sailing along.

MADRAS is the seat of Government of the Madras Presidency, and the principal town on the Coromandel coast. Fort St. George, in which is the Governor's house and the Government offices, stands close to the sea, and is strongly fortified. The native town is north of the fort, separated from it by the esplanade, and though extensive is not well built. Madras is a place of extensive trade—both the exports and imports being large. The limits of Madras roadstead (in 8 or 9 fathoms) are comprised within the following bearings—viz., from the northward, the lighthouse will bear

S. 56° W.; and from the southward, N. 81° W., or from S.W. by W. to W. $\frac{3}{4}$ N.*

A lighthouse, 125 feet high, stands on the esplanade, north of the fort, and exhibits a *fixed white* light, varied by a *flash* every two minutes, visible² from 17 to 24 miles. Position—latitude $13^{\circ} 5' 10''$ N., longitude $80^{\circ} 16' 29''$ E.

Pulicat Shoals.—With the original light notice the following *caution* was issued respecting the Pulicat shoals northward of the roadstead:—From the S.E. extremity of the Pulicat shoals the new lighthouse bears S. 23° W., distant 13 miles; but no ship, when hauling in from the northward for Madras roadstead, should bring the light to bear to the southward of S. 28° W., or S.S.W. $\frac{1}{2}$ W., unless her position is well ascertained. Commanders are warned of the serious risk they incur by incautiously approaching the dangerous vicinity of the Pulicat shoals, as hazy weather, or other causes, may obscure the light; true soundings, therefore, and a vigilant look-out are imperatively called for.

The MASTER ATTENDANT'S *Instructions* are to the following effect:—

All ships, other than native vessels, are to anchor with the following bearings—viz., the Master Attendant's flagstaff from N.W. to W. $\frac{1}{2}$ N., which will be found convenient anchorage for merchant vessels, and the southern limits of the roadstead usually resorted to by men-of-war may be ascertained as within the position denoted by bringing the lighthouse to bear from W. by N. to W., in from 9 to 7 fathoms—which is the range of soundings throughout. Ships should take up such a berth as will enable them to wear clear of all danger in the event of casting in shore when they weigh or part from their anchors—especially as the groundswell, so prevalent here, tends (against all precaution) to cast a vessel in shore.

Bringing-up in Madras roads, a buoy should always be attached to the anchor, whereby giving foul berths may be avoided, and the position of lost anchors will be indicated. Ships have frequently parted, and accidents have happened by riding with too short a scope; no vessel, therefore, is safe with less than 60 fathoms of cable in moderate weather, and 80 fathoms or more when there is a swell. Also, to those who are not acquainted with the roadstead, should any jerk be felt when riding with a chain (from the heavy swell that rolls in at times), either on the windlass or bitts, cable should be veered until the jerk is no longer felt; and a second anchor should always be ready. Efficient ground tackling is essential to the safety of vessels in Madras roads.

SIGNALS.—When the surf is so high as in the opinion of the Master Attendant, or his assistant, to render communication with the shore dangerous, a *red* and *white chequered* flag will be hoisted at the Master Attendant's flagstaff; when the surf is impassable, the *first distinguishing pendant* will be displayed *under* that flag; when the current is too strong, the *rendezvous* flag will be hoisted.

Should the weather assume such a threatening appearance as may in the opinion of the Master Attendant indicate an approaching gale, and render it advisable that ships should put to sea, the following signals will be

* Madras Observatory has been determined by a great number of observations to be in latitude $13^{\circ} 4' 8''$ N., longitude $80^{\circ} 14' 19''$ E. This is considered a well determined position, and upon it the longitudes of Ceylon and of many of the ports in the Bay of Bengal, depend.

hoisted at the Master Attendant's flagstaff, but the commander is not to wait the display of signals if he deems it prudent to put to sea :—

1. The weather is suspicious, prepare to put to sea—*White* flag, with *blue* cross.

2. Cut, or slip—*Red* flag, with swallow-tail.

Upon the indication of an approaching gale of wind after sunset, three good lights will be hoisted at the Master Attendant's flagstaff—one at the mast-head, and one at each yard-arm; and a gun will be fired from the ramparts of Fort St. George every five minutes for an hour, or such time as may be deemed necessary; these signals are to be acknowledged by hoisting a good light at the peak, or other conspicuous place.

Commanders are warned of their own extreme responsibility if these signals do not receive timely attention; and they are also advised to have their ships always prepared to put to sea, especially on or about the change of each Monsoon, and to pay strict attention to the necessity of having good sails bent, which, in the event of being driven to sea, or compelled to slip, is of the utmost consequence. Their first object should be to gain a good offing, under treble or close-reefed topsails and reefed courses, carefully attending to the lead and soundings, and guarding against a strong current, which generally varies its course according to the strength and direction of the wind. When the weather is threatening or doubtful, commanders should repair on board their respective ships before sunset.

ANCHORAGE.—The roadstead of Madras is open to all winds, except those from the westward (or off the land); and the prevalent swell causes vessels to labour and roll considerably at times. Vessels discharging cargo often moor in $8\frac{1}{2}$ to 9 fathoms abreast the flagstaff, with it bearing W., or W. by N. A good position for large vessels is with the flagstaff bearing N.W. $\frac{1}{2}$ W. to W.N.W. in 9 fathoms, 2 miles from the shore. In many parts the bottom is stiff mud, from which the anchor is extricated with difficulty.

The caution to anchor well out, and to be always prepared to proceed to sea, is essentially requisite, for the gales generally commence at N.W., blowing strong from the land, with which an offing can be gained before the wind veers to N.E. and E., when it would be impossible to do so. The most dangerous season for all the ports on this coast is from the beginning of October to the middle of December; heavy gales have occurred in April and May, but not frequently. If a vessel is ready to weigh or slip, and gets to sea at the approach of the gale, little danger is likely to befall her, and it often happens that the wind is not so strong as near the land; but if she remain, she may possibly be driven on shore, with very little chance of saving even the lives of those on board.

CURRENTS.—At the beginning and during the strength of the N.E. Monsoon, the current sets to the southward along the coast at the rate of $1\frac{1}{2}$ to 2 miles, consequently the land should be made to the northward of Madras at that season; this current slackens towards January. During the S.W. Monsoon, and generally after the beginning of February, the current frequently sets as strongly to the northward, therefore the land should be made direct if possible, or even to the south of the port—say on a N.W. bearing—never to the northward of the port, at this period.

Both the strength and direction of the current on this side of the Bay of Bengal are however variable, and liable to uncertain changes. **COMMANDER R. HOBSON**, H.M.S. *Vigilant*, in a letter from Madras, dated August 1864, reports, that during a passage from Cuddalore to that place, an

unusually strong N.E.-ly current of at least 3 knots an hour was experienced.

A breakwater, commenced some time since at Madras, is now completed, and ships' boats land passengers there.

PULICAT SHOALS.—From Madras the coast trends N. by E. $\frac{1}{2}$ E. 9 miles to a conspicuous house, named Enore House, situated close to the sea and $1\frac{1}{2}$ mile southward from a village. At a short distance northward from this, a bank, upon the shoalest part of which is a depth of only 6 feet, begins to run out from the coast, attaining at 4 miles northward from the house, a distance from the land of about 2 miles. As the outer edge of this bank is steep, with soundings of 7 fathoms close to it, it should have a wide berth, more especially as the soundings from it seaward rapidly increase to 14 and 26 fathoms, the latter being at not more than 5 miles from the land.

At 3 miles northward from the bank just mentioned, and at 2 miles from the coast, is a patch of $3\frac{1}{2}$ fathoms, the southernmost of what is generally understood as the Pulicat Shoals, although that name should properly include the bank. From this patch (in latitude $13^{\circ} 20\frac{3}{4}'$ N., longitude $80^{\circ} 22\frac{3}{4}'$ E) a series of shoals of $2\frac{1}{4}$ and $3\frac{1}{4}$ fathoms extends in a N.N.E. direction as far as lat. $13^{\circ} 23\frac{3}{4}'$ N., long. $80^{\circ} 24\frac{1}{4}'$ E. These patches are all included within the 10-fathom line, and they are all extremely dangerous as they are steep, and the soundings at one to two miles eastward from them are 14 to 20 fathoms. The northern shoal ($3\frac{1}{4}$ fathoms) lies with Pulicat Lighthouse bearing N. W. by W. $\frac{3}{4}$ W. $4\frac{1}{2}$ miles (1851); hence while northwards of the line of that building bearing W. by N. (nearer than which the shoals should not be approached) a vessel will be clear of danger. Their outer edge ought to be marked by buoys.

PULICAT LIGHT.—This is a *fixed red* light, in latitude $13^{\circ} 25' 10''$ N., longitude $80^{\circ} 19' 19''$ E. It is 56 feet above the sea, and visible 6 or 7 miles.

Approaching Pulicat, when the light bears W. $\frac{1}{2}$ N., you are northward of all the shoals. The anchorage is in 7 to 8 fathoms abreast of the lighthouse, $1\frac{1}{2}$ to 2 miles off shore.

The chain of mountains inland, known as Pulicat Hills, has, near the southern end, a piece of flat table-land, usually called the Kettle Bottom, which bears West from Pulicat flagstaff; W. $\frac{1}{2}$ N. from the middle of Pulicat Bank; and W.N.W. from Enore House. Naggery Nose, in latitude $13^{\circ} 22'$ N., is another remarkable hill to the southward of the Kettle Bottom.

From Pulicat to Poondy Point, in latitude $13^{\circ} 47'$ N., the distance is 22 miles, and the coast is slightly concave. From the point, shoal ground of 1 to 3 fathoms stretches to the S.E.-ward for the distance of 2 miles.

Armogham Shoal.—Immediately northward (N.N.E. 2 miles) of Poondy Point, commences a bank which in some parts has not more than $1\frac{1}{2}$ to $2\frac{1}{2}$ fathoms water on it. This is the Armogham Bank, extending from latitude $13^{\circ} 48\frac{1}{2}'$ to $14^{\circ} 2'$ N. It does not exactly follow the line of the coast, being $6\frac{1}{2}$ miles off it at its northern end, while at its southern extremity it approaches within $1\frac{1}{2}$ mile, nearly joining the shoal off Poondy Point: its shoalest parts lie between latitudes $13^{\circ} 48\frac{1}{2}'$ and $13^{\circ} 57'$ N.

Light.—Near the village of Moona or Moonapolium, 1 mile from the shore, there is a lighthouse, 95 feet high, showing a *fixed white* light, visible 15 miles. Position.—Latitude $13^{\circ} 52' 50''$ N., longitude $80^{\circ} 12'$ E.

This light is almost due West from the shoalest part (9 feet) of the

Armogham Shoal, which is 6 miles off shore, and where it occasionally breaks. On the outer edge of the Armogham Shoal there are from 7 to 10 fathoms, deepening to 28 or 30 fathoms 3 or 4 miles off.

Blackwood Harbour is the name given to the space included between the inner edge of the Armogham Shoal and the coast; it is from 3 to 4 miles wide, with depths varying from $4\frac{1}{2}$ fathoms near the shore to 6 or 7 fathoms contiguous to the edge of the shoal. The entrance is by the north end of the shoal, in not less than 6 fathoms, with Armogham Hill bearing W. $\frac{1}{4}$ S.; and there is safe anchorage in the fine Monsoon off the entrance to Armogham River, with the hill bearing W. $\frac{1}{4}$ S. There is often a haze on this part of the coast, partially obscuring it, and making it appear more distant than it really is. The channel between the south end of the shoal and the coast should not be attempted.

Bound northward from Madras, do not approach the Armogham Shoal under 14 or 12 fathoms. Armogham Hill is in latitude $14^{\circ} 3' N.$

Shoals.—Northward of the Middy River, in latitude $14^{\circ} 15\frac{1}{2}' N.$, and thence to latitude $14^{\circ} 24' N.$, a bank of $2\frac{1}{2}$ fathoms stretches to the north-eastward,—in some places $2\frac{1}{2}$ miles off shore.

Mootapolli Bank.—From the parallel of $15^{\circ} N.$, and to False Divy Point (in latitude $15^{\circ} 45' N.$), where the coast forms an extensive bight, there are several shoal spots inside the line of 10 fathoms soundings, on what is known as the Mootapolli Bank. The most dangerous spot is the Mootapolli Shoal, opposite Kuttowputtum, on the parallel of $15^{\circ} 25' N.$, and 8 miles off the coast, having on it only $2\frac{1}{2}$ fathoms water; inside this patch there are others of $2\frac{1}{2}$ to 3 fathoms at 3 miles from shore.

The Mootapolli Bank, which extends many miles around these shoals, is generally of coarse sand and broken shells, and has on it overfalls in places. Passing here at night do not come under 20 to 24 fathoms, nor under 15 fathoms during the day. Immediately outside this bank the depths shelve to 18 or 20 fathoms within a short distance, and to 60 fathoms 6 miles off.

False Divy Point is in latitude $15^{\circ} 45' N.$, longitude $80^{\circ} 51' E.$; it is a low, projecting flat, with an extensive mangrove jungle, through which the Kistna River discharges its waters into the ocean. The bank, of $3\frac{1}{2}$ to 4 fathoms soundings, extends 4 and $4\frac{1}{2}$ miles off the coast hereabouts; thence the increase of depth is rapid to seaward, there being 15 fathoms at 8 miles from the shore—consequently the bank is very dangerous, as a ship approaching the land shoals her water very suddenly. The coast is also frequently enveloped in haze, which gives a false appearance as to distance.

POINT DIVY is low, and bears N.E. by E., distant 20 miles from False Divy Point.

At 2 miles to the N.W. of Point Divy, in latitude $15^{\circ} 58' 55'' N.$, longitude $81^{\circ} 8' 15'' E.$, there is a lighthouse 90 feet high, which exhibits a *fixed white* light, visible from eastward when bearing North to S.W., from a distance of 12 miles.

The shoal flat which has been described in connection with False Divy Point extends to Divy Point, and thence northward beyond Masulipatam and Narsapoor Point.

MASULIPATAM was at one time the principal place on the Coromandel coast; it is still a populous town, with a very considerable trade. The fort is $1\frac{1}{2}$ mile from the seashore. The coast is very flat all round the bay, and liable to inundation when the cyclone winds of the Bay of Bengal make it a dead lee shore.

A *red* light is exhibited from a flagstaff on the fort, at an elevation of 95 feet, visible from all parts of the sea horizon, to the distance of 7 or 8 miles. Position.—Latitude $16^{\circ} 9' 6''$ N., longitude $81^{\circ} 8' 12''$ E.

The PORT INSTRUCTIONS (dated 1860) are to the following effect:—Two first-class buoys have been laid down to mark the anchorage in Masulipatam Roads; a *red* buoy is placed in $3\frac{1}{2}$ fathoms, with the flagstaff on the fort bearing West (northerly); and in-shore, due West from the red buoy, is a *white* one, placed in 3 fathoms low water. The best anchorage at all times of the year will be in a line with the buoys; but when strong westerly winds prevail, in May and June, ships should anchor to the southward of the buoys.

Anchorage.—The best anchorage in Masulipatam Roads is with the flagstaff bearing W. $\frac{1}{2}$ N. to W.N.W.,—the ship's draught of water being the guide as to how close she may approach; with the above bearings a vessel in $3\frac{1}{2}$ fathoms will be about $3\frac{1}{2}$ miles from the mouth of the river. Commanders should bear in mind that with these bearings the water shoals very gradually, and that coming in as close as the ship's draught admits will go far to expedite the loading or discharging of cargo, and lessen the cost of boat-hire. The holding ground in the roads is good, and with good ground-tackle a vessel may ride out very heavy weather.

No cargo can be landed in ships' boats; any attempt to do so is attended by a penalty of 50 rupees and confiscation of boat.

No ballast is to be thrown overboard in less than 10 fathoms; nor is any to be discharged on the beach or elsewhere, from which it might be washed into the port; the penalty for infringing this is 200 rupees.

Signals.—When the surf is so high as to render communication with the shore dangerous, a *red* and *white* chequered flag will be hoisted at the Master Attendant's flagstaff; when the surf is impassable the *first distinguishing pendant* will be displayed under that flag. Should a boat be urgently required during the night, three lights should be hoisted horizontally; and in case of danger from fire or other causes, blue lights should be burnt and guns fired.

Directions.—A ship from the southward rounding Divy Point in 6 to 8 fathoms (according to draught of vessel), after bringing Divy Light to bear West, should make a northerly course, when she will carry regular soundings, shoaling gradually as she approaches Masulipatam; great care, however, is necessary, as the currents between Point Narsapoor and Point Divy are at times very strong, and the lead is the only sure guide. Vessels shoaling to 4 fathoms should haul to the eastward during the daytime; as a ship approaches Masulipatam the flagstaff and buildings will be seen if the weather is at all clear. At night the light at Masulipatam will not be seen until 4 or 5 miles north of Divy Light. Coming to Masulipatam from Madras, although a ship should keep in soundings, yet when passing Armogham and Mootapolli shoals during the night, these should not be approached under 20 fathoms.

A memorandum by MR. W. BLOW mentions that the light on Divy Point is very bad at times; that the lead is the only guide for any vessel approaching this part of the coast, and that its indications ought to receive careful attention, as the sandbank off the point extends much further out than laid down on any chart; also, Masulipatam Light can scarcely be seen from the shipping, especially if the atmosphere is thick.

Narsapoor Point is in latitude $16^{\circ} 19' N.$, longitude $81^{\circ} 42' 19'' E.$; it bears N.E. by E., 36 miles from Point Divy. Masulipatam is situated in

the bight between these two points and the bank of shoal soundings, which commences south of the parallel of 15° N., terminates 12 miles to the N.E. ward from Narsapoor Point. There is anchorage in Narsapoor Roads in $4\frac{1}{2}$ to $5\frac{1}{2}$ fathoms westward of the shoal that projects off the mouth of the river,—but the river itself is barred.

The coast from Narsapoor Point to Gordeware Point, in latitude $16^{\circ} 49'$ N., longitude $82^{\circ} 20'$ E., is first N.E. by E., for the distance of about 27 miles, then N.E. for 14 miles, and lastly N. by E. for 9 miles. Round Gordeware Point and Hope Island, to the westward, is Coringa or Cocanada Bay.

CORINGA AND COCANADA.—The principal mouths of the Godavery River enter the Bay of Bengal between latitudes $16^{\circ} 15'$ and $16^{\circ} 50'$ N., the latter being in Coringa Bay; here there is an accumulation of sand-banks and mud-flats, a large proportion of which is flooded at high water. Having made Gordeware Point or Hope Island lighthouse, great caution is necessary in approaching the coast if bound to either Coringa or Cocanada; for not only are the banks and shoals dangerous, but it is quite possible hereabouts to misjudge distance from the land, owing to its being so very low. If not bound to either port, a ship in passing ought not to come under 30 to 20 fathoms.

LIGHTS.—The Gordeware or Godavery Point lighthouse stands on the south side of Hope Island; it exhibits a *fixed white* light at an elevation of 73 feet above the sea, and is visible when bearing from South round by the westward to N.N.W. to the distance of 15 miles. Position.—Latitude $16^{\circ} 49' 5''$ N., longitude $82^{\circ} 18' 35''$ E. The lighthouse is painted in horizontal black and white bands to distinguish it during the day from that on Point Divy, which is white.

A lighthouse has also been erected at Cocanada, as a guide for the anchorage; it exhibits a *fixed white* light.

Buoys have also been placed as a guide to Cocanada anchorage. Their position is as follows:—

1. The *Outer*, or *Bell* buoy bears from Hope Island lighthouse N.E. $\frac{3}{4}$ N. about 6 miles, and lies in 6 fathoms.
2. The *Middle* buoy bears from Hope Island lighthouse N. by E. about 8 miles, and lies in 5 fathoms.
3. The *Inner* buoy bears from Hope Island lighthouse N. $\frac{1}{2}$ W. about 9 miles, in 3 fathoms.

Vessels should on no account attempt to go inside, or to the southward and westward of any of these buoys.

On approaching the Godavery or N.E. point of Hope Island from the southward by night in the S.W. Monsoon, vessels should on no account attempt to round the point till the lighthouse on Hope Island bears S.W. by S., and the Bell buoy S. by W. $\frac{1}{4}$ W.; and not come under 8 fathoms. They can then haul in N.W. $\frac{1}{2}$ N. in about 7 to 8 fathoms, and when Hope Island lighthouse and Middle buoy bear S. by W. in about 7 fathoms, they can haul in N.W. by W. $\frac{1}{2}$ W., which will bring them past the Inner buoy—the lighthouse bearing S. $\frac{1}{2}$ E. The shipping in Cocanada Roadstead will then be distinctly seen, and they can anchor with Hope Island lighthouse from S. by E. $\frac{1}{2}$ E. to S.S.E., according to the vessel's draught.

It is advisable for ships in the N.E. Monsoon to take up a position in the S.E. quarter of the anchorage, with the lighthouse on Hope Island bearing S. by E. to S. by E. $\frac{1}{2}$ E., and the tower of the new lighthouse at Cocanada S.W. by W., in about 5 fathoms; and in the S.W. Monsoon, a little further to the N.W. in about 4 fathoms, with the lighthouse on Hope

Island bearing S. by E. $\frac{1}{2}$ E. to S.S.E. and tower of the new lighthouse S.W. $\frac{1}{4}$ S.

If captains would adhere to the above suggestions, communication with the shore and the shipping would be more readily obtained, and ships would be in a better position for getting under way when required, than they usually now are, and would be in smoother water for loading and discharging.

Ships coming in the N.E. Monsoon during the night must pay great attention to their lead and look-out; and they are recommended, when approaching the shipping, to anchor in 8 or 10 fathoms till daylight, when they can run in and pick up a berth as above recommended.

Commanders should on no account throw ballast of any kind out of their vessels to the westward of a line with the Middle or large *black* buoy on with the lighthouse on Hope Island bearing S. by W., and in not less than 10 fathoms, or they will incur a penalty for so doing.

The Coringa River cannot be entered without a pilot; indeed, it is now closed for large vessels, and these generally bring up opposite Cocanada.

Bound to either place from the northward, during the S.W. Monsoon, haul in towards the land when just south of the Dolphin's Nose, off Vizagapatam, and beat to windward as close along shore as possible; not, however, coming under 12 to 14 fathoms, until past Wattara and Pentacotta (latitude $17^{\circ} 19' N.$)—the latter known by a conical hill a short distance inland. Here the coast may be approached to 9 or 10 fathoms; and when approaching Cocanada (within 10 or 12 miles), stand in-shore to 5 fathoms. During the N.E. Monsoon, there is a strong southerly current along this coast.

Bound from the southward, during the S.W. Monsoon, the land may be made about Narsapoor Point, but do not come under 9 fathoms; after which haul out, and do not make Hope Island lighthouse under 12 or 14 fathoms.

The coast is very dangerous hereabout, and must be approached with caution.

During the N.E. Monsoon, work well to the northward of your port.

The bay is only open from N.E. to S.E. by S., and the anchorage is on good holding ground.

Coringa is 10 miles southward of the anchorage off Cocanada.

Pillar Rock.—In lat. $17^{\circ} 26' N.$, long. $82^{\circ} 52' E.$, is the small town of WATTARA, near the entrance to a small river;—N.E. by E. $\frac{1}{2}$ E., and distant 9 miles from that place, is the Pillar Rock, about $\frac{3}{4}$ of a mile from the shore; it is also 20 miles S.W.-ward of Vizagapatam; its position is, lat. $17^{\circ} 29\frac{3}{4}' N.$, long. $83^{\circ} 0\frac{1}{4}' E.$

Pigeon Island, in a small bight on the coast, is in lat. $17^{\circ} 38' N.$, long. $83^{\circ} 13\frac{3}{4}' E.$; being low, it is not seen until near it.

VIZAGAPATAM, in lat. $17^{\circ} 42' N.$, long. $83^{\circ} 17' E.$, is distant 74 miles from Cocanada roadstead in a N.E. by E. direction. The river is barred, and the sand shifting. From seaward, Vizagapatam may be known by the bluff promontory S.W. of the roadstead, called the Dolphin's Nose. The village of Waltair is 3 miles to the N.E.-ward of the flagstaff.

Anchorage.—In the N.E. Monsoon there is anchorage in 8 fathoms $1\frac{1}{2}$ to 2 miles off shore, with Waltair House on with the west side of Sugar-loaf Hill; and the top of Green Hill, open with the Dolphin's Nose. During

the S.W. Monsoon, the anchorage for large vessels is in 8 to 9 fathoms, with the Bar Battery bearing N.W. by W.; the Sugar-loaf Hill in one with Waltair House; and Green Hill to the southward of the Dolphin's Nose; small vessels may go into 6 fathoms. The anchorage further out in 11 to 12 fathoms cannot be recommended, for the bottom in those depths is stiff mud, and there is danger of losing the anchors.

Between Cocanada roadstead and Vizagapatam the coast is safe to approach to 14 or 16 fathoms, within 2 or 3 miles of the shore; but approaching Vizagapatam anchorage, the water shoals very rapidly. The land is higher in the vicinity of Wattara and Vizagapatam than at Coringa and Cocanada, but at a short distance inland there is a conspicuous ridge of mountains nearly parallel with the coast.

Bimlipatam is in lat. $17^{\circ} 53' N.$, long. $83^{\circ} 27' E.$, and lies 16 miles N.E.-ward of Vizagapatam; the anchorage is off the mouth of the river, in 6 to 9 fathoms.

During the N.E. Monsoon, it is advisable to anchor a little to the northward of the usual place of bring-up in the S.W. Monsoon.

Santipilly Rocks.—About E.N.E. $\frac{1}{2}$ N., distant 15 miles from the anchorage of Bimlipatam, and 5 miles from the nearest point of the coast, are the dangerous Santipilly Rocks, having $1\frac{3}{4}$ fathoms least water on them.

Light.—To mark the position of these rocks, a lighthouse has been erected on Conada Hill, $\frac{3}{4}$ of a mile from the coast; it exhibits a *fixed white light*, at an elevation of 150 feet above the sea, and is visible 14 miles; its position is lat. $18^{\circ} 3\frac{1}{2}' N.$, long. $83^{\circ} 36\frac{1}{2}' E.$,—N.W. by W. $\frac{1}{2}$ W. $6\frac{1}{2}$ miles from the rocks.

The centre of these rocks is in lat. $18^{\circ} 0\frac{1}{2}' N.$, long. $83^{\circ} 42\frac{1}{2}' E.$; they are steep on all sides, and their extent is not above 200 yards in length. When there is but little wind, and the sea is smooth, this shoal presents no indication by broken or discoloured water; as LIEUTENANT FELL, when in search of it during very fine weather, brought the surveying brig *Kristna* to anchor within 100 yards of the rocks before he could observe the slightest appearance of a shoal. Proceeding in a boat over the rocks, $10\frac{1}{2}$ feet was found on the shoalest part, 7 and 10 fathoms on the eastern side, and on the western limit $10\frac{1}{2}$ fathoms, rocky bottom.

Subsequently (1846) the Master Attendant of Madras (CAPTAIN BIDEN) surveyed the Santipilly Rocks during fine weather, having a moderate breeze from S.W., with a ground swell; the breakers were clearly discerned from the masthead at the distance of 6 or 7 miles, bearing due South. When in 7 fathoms, about 2 miles off shore, Santipilly Peak bearing W. by N., the breakers were soon after seen from the deck. Approaching the reef, which broke with considerable force, the vessel was anchored in $9\frac{1}{2}$ fathoms, coarse sand and shells, distant from the coast 3 miles, the reef bearing from S. $56^{\circ} E.$ to S. $57^{\circ} E.$, and distant 2 miles, Santipilly Peak bearing N. $43^{\circ} W.$;—latitude, by an indifferent observation, $18^{\circ} 1' N.$

Two boats, under CAPTAIN CRAWFORD, went to examine the reef, and from the vessel they carried regular soundings of 9 and $9\frac{1}{2}$ fathoms, until within a quarter of a mile; at less than 100 yards from the breakers, found $10\frac{1}{4}$ and $10\frac{1}{2}$ fathoms rocky bottom. The breakers being too high to admit of the boats crossing the reef, CAPTAIN CRAWFORD pulled round it, and gave as his opinion that the shoal, which lies N.N.W. and S.S.E., is in circumference about a quarter of a mile, with 10 fathoms close-to all round; from the surveying vessel the breakers seemed to extend the length of 200 yards.

The Inner channel is 4 miles wide and safe for ships of every class; it has soundings of 5 fathoms within a mile of the coast, and $9\frac{1}{2}$ fathoms within a $\frac{1}{4}$ of a mile of the rocks.

In fair weather, when Santipilly Peak is visible, that lofty and remarkable landmark affords an infallible guide to the true position of the Santipilly Rocks; this peak is at least 2,000 feet above the level of the sea, and presents a striking contrast to all the hills in its vicinity; it bears N.W. from the rocks, and the base of the mountain is not more than 7 or 8 miles inland. In cloudy weather, when the peak may be obscured, there are two remarkable hillocks close to the beach, which are named the Great and Little Conada, appearing like a saddle-hill at 3 miles S.W. from the anchorage already mentioned as near the rocks. The northernmost, or Little Conada Hill, on which is the lighthouse, is not more than $\frac{1}{2}$ a mile from the beach, and 150 feet above the level of the sea; when it bore N. $\frac{1}{4}$ W., the Santipilly Reef was then plainly visible from the deck bearing E. $\frac{1}{4}$ N., distant 4 miles; at the same time, Santipilly Peak bore N. 29° W., the vessel being in 8 fathoms about 2 miles off-shore. But in thick weather, when no defined landmark is discernible, great care and caution become absolutely necessary in approaching the coast between Ganjam and Vizagapatam. Change of current, and the absence of all means by night or day of obtaining a single observation, may, without strict and unremitting attention to soundings, place a vessel in imminent peril close to or upon the Santipilly Rocks, which should not be approached from the eastward by day or night, under 17 to 20 fathoms.

Later observations have not added to the information given above, with the exception that the patch is rather larger than was supposed, and that it carries 7 to 8 feet least water; its limits are lat. $17^{\circ} 59\frac{1}{4}'$ to $18^{\circ} 1\frac{1}{4}'$ N., long. $83^{\circ} 41\frac{1}{2}'$ to $83^{\circ} 43' E.$

The following Notes on MADRAS, COCANADA, VIZAGAPATAM, BIMLIPATAM, and PONDICHERRY, are by CAPT. LEWIS BILTON, R.N.R. (1862):—

“**MADRAS**, with the bright sun above, and the blue sea dashing in thunder on the beach, was delightful after the burning ghaut at Calcutta; every one felt a sense of life and enjoyment he had long been a stranger to—a feeling which was experienced, more or less, all the time we were on the coast. Madras, with its park, museum, and many pleasant drives, is a place to remember; there is more resemblance to home than in any other place I have seen in India. A railway is now in full operation, running to Beypur, on the west coast. The station at Madras is equal, if not superior to some of the best in England; the pier, which has been run out to facilitate landing, is nearly finished. I got all my cargo out by the 8th of May, and fixed my ship again to load a cargo on the coast at Cocanada, Vizagapatam, Bimlipatam, and Pondicherry, for London. I took the sand off the beach for ballast, which is supplied at about 3s. per ton, including boat-hire; the sea being very rough I had great difficulty in getting the boatmen to bring it off, but at length resolved to give no rice to any who did not bring ballast, otherwise I should have been detained an indefinite time. The sailing directions recommend anchoring in 9 fathoms; a ship, however, would lose much time by doing so; I went into 6 fathoms—close to the pier—and found my advantage in doing so, by getting discharged quickly, as the boatmen will always flock to the nearest vessel—being paid by the trip. With one day's exception we had tolerable weather. The surf was high on the beach at times, but generally we could land cargo at

some pier during the day. On the one day mentioned, the wind set in from the East and N.E., and after blowing a few hours and knocking up a terrible dust on shore, it veered round to the old quarter,—viz., S.W.-ward.

"I left Madras on the 9th of May, for **Cocanada**, arriving there on the evening of the 11th, and was obliged to anchor in the offing in 9 fathoms, on account of a heavy north-wester, which came on as I was nearly in with the shipping. There is a good *fixed* light on Hope Island, near Coringa, to guide ships clear of the dangers off Cape Gordeware and the entrance of the river Godavery—which is one mass of sandbanks and breakers. This is the only safe port on the extensive line of coast, during the S.W. Monsoon, and the anchorage is completely protected from the heavy sea which constantly rolls along it at that season; but in the N.E. Monsoon it must be equally bad. The harbour of Coringa is fast filling up, and no loaded vessel (of any size) can go there; they have docks, however, and continue to build and repair ships; and numbers of large native craft are owned and lie up there during the S.W. Monsoon.

"A lighthouse has been built at Cocanada, as a guide for the anchorage off that port. I found Mr. THOMPSON, the Master Attendant, very obliging. He informed me that Cocanada harbour is also rapidly filling up. Two piers have been built along the entrance of that branch of the river on which Cocanada stands, and every effort is made, by dredging, to keep the navigation open; none but small vessels, however, enter the river. The shipping lie a long way from Cocanada, which is very inconvenient. There are no streets, that can be called such, in the place, nor, with the exception of about half a mile, is there a road on which a carriage of any description can drive. The town consists for the most part of native huts, and, indeed, the bulk of the trade is in native hands; there are, however, a few European merchants (so called). There are two very indifferent hotels, and a small, neat church, but no parson, the collector (as at Karachi) being everything, and in addition to his regular duties acts as parson and notary public. I was detained at this place from sheer neglect and carelessness on the part of those who ought to have facilitated my despatch. The shipper was a native, who seems to rule the place, and no one dared interfere with him; to save a few rupees he was allowed to detain the ship in a most shameful manner.

"I left Cocanada gladly, on the evening of the 26th, about 9 P.M., for **Vizagapatam**, where I arrived next day about noon. The high mountainous coast of Orissa commences a little to the north of Cocanada, and is a good guide, from the offing, to make the port—in the absence of observations. I found but one ship here—a Frenchman—loading seeds. I anchored in 9 fathoms outside of him—the land south of the Dolphin's Nose just open to the eastward of it, and the centre of Green Hill bearing W. $\frac{1}{2}$ N.; a heavy swell was running along shore, and the ship rolling, gunwales under. The entrance to the inner harbour is by a small river, with a very bad bar. Here we had the Masoolah boats, each of which, as at Madras, brings off 35 bags, and other goods in proportion, as established by a regular tariff, by the Master Attendant, who is expected to see that they are kept in repair, and a sufficient number allotted to each vessel. The boatmen are the same merry, reckless fellows as at Madras, and their occupation is a hard and dangerous one. Finding the ship too far out, and detention in loading likely to occur therefrom, I got under way, and stood out under easy sail to enable me to go further in shore ahead of the

Frenchman; when I had got off about 4 or 5 miles, the wind fell light and variable, and I was unable to reach the anchorage again till 9h. next morning, bringing up in 7 fathoms with 60 fathoms of cable—Dolphin's Nose S.W. $\frac{1}{2}$ S., and centre of Green Hill W.N.W. This is undoubtedly the best berth for a large ship during S.W. Monsoon; but no part of the road is protected, consequently a ship rolls fearfully, and much of the cargo gets very wet. Inside the bar there are about 4 fathoms in the river, and numbers of large native vessels were laid up there during the Monsoon, completely land-locked. The town is prettily situated. It is a military station, clean, and well-built, and the native houses had not that generally ruinous look so common in the East. There is but one hotel here, kept by a native Christian, named David; he and his brother are also Dubashes, and are very decent, honest, obliging men. The scenery around is magnificent, and I have seldom seen a finer view than is visible from the anchorage.

"I had good despatch at Vizagapatam, and sailed again on June 2nd, for **Bimlipatam**, which I reached in 2 $\frac{1}{2}$ hours, anchoring in 6 fathoms (with 50 fathoms of cable to the water's edge), the flagstaff in one with the Master Attendant's office, bearing about W.N.W., and well to windward of all the other ships, of which I found four there. I found my advantage in every case on this coast in taking up a berth to windward of all the shipping, as the boatmen prefer coming to the ship in that position; they can pull easily to windward when loaded, and get back easily after discharging; generally they are awfully afraid of falling to leeward. Also, should a cyclone set in, you are *then* to leeward of all the shipping, and can get to sea without danger of collision, as the wind generally blows from a direction opposite to that of the prevailing wind. Here they have about 40 Masoolah boats—too few for the number of ships frequenting the port. I think the landing at Bimlipatam much better than that at Vizagapatam, as a projecting reef of rocks protects the landing-place, and a small outlay would make the port good in both Monsoons, by running out a short pier on the before-mentioned reef. I found the Master Attendant, Mr. MEPPIN, very obliging.

"There is no light either at Vizagapatam, or Bimlipatam, and ships occasionally run past them, causing a tedious beat to windward again, with an adverse current. Both are easily recognised, however, during the day: the former by the Dolphin's Nose and Pigeon Island, and the latter by a detached round hill, close to the beach, having a large and very old pagoda on the face of it, and a few scattered trees on the summit. Bimlipatam is built between the beach and this hill, on an inclined plane, and is very picturesque, though small and insignificant. The merchants, however, are effecting great reforms, draining and making good roads, and they are building a small church, capable of containing about 150 sitters. There are two sugar refineries here, one belonging to MESSRS. ARBUTHNOT and Co., of Madras, the other established by a Frenchman, but now stopped for want of funds. Bimlipatam is a place of considerable trade in sugar, seeds, hides, and horns. There are two hotels here, one French, the other English; the latter, a very good one, is kept by a native, and is well frequented. I got quick despatch here, notwithstanding that the weather was extremely unfavourable, with a heavy sea. Away again on the 11th June, bound to Pondicherry. I must here certify a matter which ought to be made known to ship-masters; the Dubashes at Madras, and all the other ports, will tell them that a ship can get no bazaar at Vizagapatam or

Bimlipatam, and advise them to carry bullocks, sheep, potatoes, &c. with them, having a view to their own emolument in supplying them. This, however, is nonsense; every description of fresh provisions, except, perhaps, potatoes, are to be procured at both places, and at reasonable prices.

"June 11th I sailed for Pondicherry, finding it a tough job working along the coast against the Monsoon and an adverse current, which ran about 36 miles a day to the N.E., and had in addition heavy squalls at night, requiring constant close attention. A ship working to windward along this coast, should not approach the land till near her destination, but keep about a degree off. By so doing, better weather is experienced, the current is weaker, and advantage can be taken of the shifts, to tack as the wind favours her. I reached Pondicherry on the 22nd at daybreak, and followed my usual custom of anchoring to windward, and well in, and found the advantage of doing so by getting off boats when no other ship could. Here we have Masoolah boats again,—and a heavy S.E. sea constantly rolling in on our port bow, rendering the ship very uneasy. Pondicherry is a pretty clean town, and well laid out; the streets all at right angles, wide, and kept in beautiful order, with an avenue of trees shading the side walks, and even the centre in some of the wider ones; the houses are spacious and well built. There is a good light here; indeed, the lights along all this coast are good. Supplies, however, are neither so good nor so reasonable as at the British ports; and many articles required not to be got at all. A steamer from Calcutta touches here, and at all the other principal ports on the coast, and stores can be got down by her from Madras, every fortnight. There are two passably good hotels, which are generally well filled. This was the first time in my life I ever had business with Frenchmen; I found them very pleasant and agreeable. There are seldom less than 14 or 15 ships in the roads, and trade seems to be carried on with all parts of the world. They ship extensively indigo, blue cloths, rice, seeds, oil, ground nuts, hides, skins, horns, &c.; they also send coolies to Mauritius and the West Indies.

"I finished loading on the 8th July, having in two months, since leaving Madras, visited four ports, with awkward passages between them; discharged about 500 tons of ballast, and loaded about 2,000 tons of cargo, weight and measurement, in the face of many difficulties. A heavy thunder squall came on the evening previous to my sailing, in which the ship dragged her anchor, which afterwards turned out to be foul, and we narrowly escaped falling athwart a country ship, just bringing up in her hawse with a second anchor; I was therefore obliged, next morning, to drop through the whole fleet, not having room to pass to windward, and the wind was very faint, with a high swell on our port bow, as usual; I, however, got away safely, and out in the offing, when it fell dead calm till noon. The S.W. Monsoon was moderate at the bottom of the bay, but with the usual amount of squalls and rain."

N.E.-ward from Conada Point, distant about 18 miles, is **Chicacole** River; the coast between is high, and may be approached to 10 or 12 fathoms at about 2 or 3 miles off shore.

Calingapatam is, E.N.E.-ly, distant about 14 miles from Chicacole; the sandy point, at the southern entrance of the river, is in latitude 18° 19' N. It may be recognised in clear weather by Garah Hill, having a pagoda on its declivity, near which is a single tree; a stone beacon, 64 feet high, has also been erected on the sandy point,—which is long and

low, having a reef of rocks extending $\frac{1}{2}$ a mile seaward. There is anchorage in $6\frac{1}{2}$ to $7\frac{1}{2}$ fathoms, with the extremity of the sandy point bearing S.W. by S., distant 2 to 3 miles, and the highest upper-roomed house near the shore bearing from W.N.W. to N.W. by W., distant $1\frac{1}{2}$ to 2 miles.

Bapanapadoo, in latitude $18^{\circ} 34' N.$, is a small port 23 miles N.E. of Calingapatam; the coast is low,—with a succession of sand drifts; the village, consisting principally of fishermen's huts and godowns, is marked by a column 50 feet high, standing near the beach, coloured black and white; the usual anchorage is S.E. of the column.

Poondy, in latitude $18^{\circ} 40' N.$, is 7 miles N.E. of Bapanapadoo; it is marked by a white obelisk 50 feet high, to the eastward of which is a flagstaff 75 feet high; also to the northward of the obelisk stands the traveller's bungalow. The three objects close together form good marks for the usual anchorage, which is S.E. by E. of the obelisk; hereabouts several rocks project a considerable distance seaward.

Barwah, in latitude $18^{\circ} 52\frac{1}{2}' N.$, is a small port 16 miles N.N.E. of Poondy; to the S. and W. of Barwah are large topes of cocoa-nut trees; to the northward is a plain of sand drifts. It is marked by two columns, coloured black and white, 50 feet high, and bearing N.W. from the usual anchorage.

Soonapoor.—This place, in latitude $19^{\circ} 5\frac{1}{2}' N.$, is marked by a white obelisk and a white column, each 50 feet high, built nearly at sea-level; at 120 feet from the column, and N.E. of it, stands the flagstaff, 75 feet high, and between the column and flagstaff is the Custom-house, all nearly at sea-level. The flagstaff bears W.N.W. from the anchorage.

Monsoorcottah, or **Gopaulpore**, in latitude $19^{\circ} 13' N.$; the anchorage, $1\frac{1}{2}$ mile off the shore, is in $9\frac{1}{2}$ fathoms, bottom of sand and mud, with the flagstaff on the beach bearing about N.W. by W., and Saddle Hill S.W. by W. $\frac{1}{2}$ W.; closer in (in 7 fathoms) the bottom is sand, and the holding-ground not so good, and, in fact, too near the shore. In December, 1857, the *Alwick Castle* (1200 tons) anchored in $9\frac{1}{4}$ fathoms with the flagstaff bearing W.N.W. $\frac{1}{2}$ W. During the S.W. Monsoon the anchorage is a little further out (in $9\frac{3}{4}$ fathoms), with the flagstaff about N.W. by W. In March the S.E.-ly winds are often very strong, and send in a heavy sea towards the shore; the S.W. Monsoon blows *along* the land. At the periods of change—in October or November, and again in May or June—there is always bad weather here.

Ganjam is in latitude $19^{\circ} 22' N.$ It is much frequented, and carries on a considerable trade by means of coasting vessels, many of which can enter the river. The anchorage in the roadstead is abreast the fort or river's entrance, in 8 to 9 fathoms, 2 miles off shore. Between Calingapatam and Ganjam the coast may be approached to 3 miles in 12 to 14 fathoms.

When *coasting* between Vizagapatam and Ganjam, a depth of 20 to 30 fathoms may be preserved with advantage when the wind is fair; at 12 to 15 miles off shore the bank of soundings gives 40 to 45 fathoms, speedily deepening to no bottom. Though the coast is generally low, it is backed by a chain of high hills, which gradually approach the sea towards the north, near Lake Chilka.

Manikpatam, in latitude $19^{\circ} 45' N.$, is distant about 42 miles N.E. by E. from Ganjam. The inlet leads to the north end of Chilka Lake; a sandbank is said to project 2 miles off the coast, the water shoaling suddenly from 10 to 4 fathoms. In passing do not come under 12 fathoms.

The **Juggernaut Pagodas** are the most celebrated in India. At a distance, and when bearing W. by N., they appear as one building; seen to N.N.W. and N.W. they show as three distinct buildings; the ground is low and well clothed with trees. Latitude $19^{\circ} 48\frac{1}{2}'$ N., longitude $85^{\circ} 48' 29''$ E.

The **Black Pagoda**, in latitude $19^{\circ} 52' N.$, longitude $86^{\circ} 6' E.$, stands by itself near the sea; it is on low ground destitute of trees, though there are three clumps to the N.E. and one to the S.W. Coasting along, do not come under 16 to 18 fathoms, about 4 or 5 miles off shore, though the steep sandy beach between the Juggernaut Pagodas and the Black Pagoda *may be* approached to 12 fathoms; but the land being low, the lead must be used even with the greater depths, as the first indication of danger during the night will be the noise of the surf on the beach. All these pagodas, when viewed from a distance, appear as a ship under sail,—in some directions as a large black rock.

False Point bears N.E. $\frac{1}{2}$ E., distant 48 miles from the Black Pagoda; it is low and wooded, with many outlying dangers near it, and several small sandy islets,—one of which, following the line of coast in a curved form, extends 8 miles.

About 2 miles S.W. of False Point, in latitude $20^{\circ} 20' N.$, longitude $86^{\circ} 43' 29'' E.$, a lighthouse 120 feet high has been erected, having a large white star in the centre; it exhibits a *fixed white* light visible 18 miles; to verify their position, vessels should never come under 8 fathoms when making the light or lighthouse, after which they should haul out into 13 to 18 fathoms.

In **False Bay**, to the north of False Point, the bottom is of soft green mud, shoaling very gradually to the shore.

Palmyra Point, in latitude $20^{\circ} 44' N.$, is fronted by shoals (Palmyra Shoals) to the distance of 12 miles; the lighthouse has been long washed away, being undermined by the sea; on the shoals the depth varies from 1 to 4 fathoms, suddenly deepening to 10 fathoms. Bound to Balasore Roads from False Point, do not come under 12 to 14 fathoms; when Palmyra Shoals are rounded, if the wind be strong from S. or S.W. there is anchorage to the north of them in 10 fathoms, with good shelter.

Kunka River.—To the N.W.-ward of Palmyra Point is Kunka River, which is wide at its entrance, and navigable for vessels drawing 12 or 13 feet water; but it is necessary to employ a pilot. It is much frequented by the coasting vessels belonging to the natives, who carry rice and various articles of trade hence to Madras and other parts of the coast, during the favourable Monsoon. Latterly, vessels belonging to European residents at Calcutta have been employed in conveying stores from Fort William to the Kunka, returning with salt, corn, and rice. Some native vessels from the Maldivhs trade to the Kunka.

N.N.W. of the Kunka, distant 24 miles, is **Churinga River**, or **CHURRIMOON CREEK**, situated in a bay affording good anchorage to small vessels in the S.W. Monsoon.

Balasore, in latitude about $21^{\circ} 30' N.$, was formerly a considerable town, but at present is only a mile long, and half a mile broad in the widest part. It is built along the river Boorabullung, the entrance to which is in latitude $21^{\circ} 28' N.$ Boats from the Maldivh Islands arrive in fleets of twenty or thirty, in the months of June and July, bringing with them the produce of their islands, consisting of corn, cocoa-nuts, cowries, salt-fish, tortoise-shell, &c., and return in December, laden with broad-

cloths, coarse cottons, cutlery, hardware, looking-glasses, rice, silk goods, sugar, tobacco, and other commodities,—the produce of Europe, India, and China.

Pipley is about 18 miles E.N.E. from the entrance of Balasore River. It is situated on the banks of a river, and is known by a pagoda to the west, and a thicket of trees very near it. Pipley was once the mart of this country; but the waters washing away a great part of the town, at the same time that a dangerous bar was formed at the mouth of the river, the merchants removed to Balasore.

The **SUNDERBUNDS**.—The province of Bengal is intersected by the Ganges, which in its lower course joins the Brahmapootra. About 500 miles from the sea, the Ganges is deep and rapid, but in its progress seaward it widens, becomes more sluggish, and separates into a vast number of streams—all which causes combined, deprive it of the force necessary to sweep away the banks of sand and mud thrown across its mouth by strong southerly winds. The delta of the Ganges commences about 300 miles from the sea, reckoning the windings of the river, and the Hoogly, on which is the port of Calcutta, is formed by the union of two of its westerly branches. That part of the delta bordering on the sea is composed of a labyrinth of rivers, creeks, and inlets, all of which are salt except those that immediately communicate with the principal arm of the Ganges. This tract, which presents a sea-front of 250 miles in a direct line nearly East and West, is known as the **Sunderbunds**: it consists of a multitude of low islands covered with jungle, from which project the low and dangerous banks which make the navigation hereabouts so precarious.

It would be a work of supererogation to minutely describe either the banks or channels of the Ganges, or any of its branches; they are subject to such great and rapid changes that a good chart and accurate local knowledge are at all times necessary for their navigation. A pilot is required for the Calcutta River.

ENTRANCE TO THE HOOGLY OR CALCUTTA RIVER.

Lights.—Five lights mark the entrance to the Hoogly:—

1. The **PILOT RIDGE LIGHTVESSEL**, a brig, is moored in $21\frac{1}{2}$ fathoms during the S.W. Monsoon, from March 15th to September 15th: it exhibits a *fixed white* light from the fore-yardarm; a blue light is burnt every hour, and a maroon at the intermediate half-hours; a gun is fired when a vessel is visible. Position.—Latitude $20^{\circ} 49' 30''$ N., longitude $87^{\circ} 40' E.$

2. The **LOWER LIGHTVESSEL**, at the entrance to the eastern channel of the Hoogly, is moored in $7\frac{1}{2}$ fathoms, and exhibits a *fixed white* light; a blue light is burnt every half-hour, and a maroon every quarter of an hour, commencing at 7h. P.M. during the S.W. Monsoon, from March 15th to September 15th; during the N.E. Monsoon, from October to March, a maroon or torch is burnt every half hour, and a blue light every hour. Position.—Latitude $21^{\circ} 3' 30''$ N., longitude $88^{\circ} 12' E.$;—but during the S.W. Monsoon, the vessel is moored in latitude $21^{\circ} N.$

3. The **UPPER LIGHTVESSEL** in Gaspar Channel, N. by W. 25 miles from the Lower Lightvessel, and S. $16^{\circ} E.$ 12 miles from Saugor light, is moored in $3\frac{1}{4}$ fathoms; it exhibits a *fixed white* light, and blue lights and

maroons are burnt at intervals throughout the night. Position.—About lat. $21^{\circ} 26' 15''$ N., long. $88^{\circ} 5' 20''$ E., but it is slightly altered as the channel shifts.

4. SAUGOR ISLAND Lighthouse is on Middleton Point, the S.W. extremity of Saugor Island, 200 yards from low-water mark; it exhibits a *fixed white* light, *flashing* every 20 seconds, at an elevation of 88 feet above the sea, and visible 15 miles. Position.—Latitude $21^{\circ} 38' 43''$ N., longitude $88^{\circ} 2' 10''$ E.

5. COWCOLLY, or KAOKALI Lighthouse is 2 miles S.W. of Kedgere Point; it exhibits a *fixed white* light at an elevation of 62 feet above the sea, visible 15 miles; it is now used as an anchoring light. Position.—Latitude $21^{\circ} 50' 12''$ N., longitude $87^{\circ} 57' 47''$ E.

For a description of the lightvessel at the entrance to the Mutlah River, see page 78.

Tides.—The tides in the channels have a rotatory movement with the sun: first-quarter flood W.N.W., round by North to the last quarter E.N.E.; first-quarter ebb E.S.E. round by South to the last quarter W.S.W. The strength of the tide runs in the direction of the channels N.N.W. and S.S.E., about 3 knots at springs, and $1\frac{1}{2}$ at neaps.

The PILOT'S RIDGE is the bank of soundings—shelly sand and gravel—varying from 15 to 20 fathoms, lying to the S.W.-ward of the Pilot's Ridge Lightvessel.

The WESTERN CHANNEL lies between the WESTERN and the EASTERN SEA REEFS; southward of the entrance is the principal pilot's station.

The EASTERN CHANNEL is between the EASTERN SEA REEF and SAUGOR SAND; at the entrance is the Eastern Channel Lightvessel.

**Caution.—Hoisting of Signals by Vessels passing
Signal Stations:—**

1. The master of every inward or outward-bound vessel, on arriving within signal distance of any signal station established within the limits of the river Hoogly, or within the limits of any channel which may be made subject to the provisions of Act XXII. of 1855, shall, on the requisition of the pilot who may be in charge of the vessel, signify the name of the vessel by hoisting the number by which she is known, or by adopting such other means to this end as may be practicable and usual, and shall keep the signal flying until it be answered from the signal station.

2. Any master of a vessel arriving as aforesaid, who shall refuse or neglect to conform to the above rule, shall be liable on conviction, for each instance of refusal or neglect, to a fine not exceeding 1,000 rupees.

3. Every pilot in charge of a vessel shall require the number of the vessel of which he is in charge to be duly signalled as provided under section 1 of this Act. When, on a requisition from the pilot to that effect, the master of a vessel, not employed in the service of Government, shall refuse to hoist the number of a vessel, or to adopt such other means of making her name known as may be practicable and usual, the pilot in charge of such vessel may, on arrival at the first place of safe anchorage, anchor the vessel in question, and refuse to proceed on his course until the requisition shall have been complied with.

4. Any pilot in charge of a vessel, who may be proved guilty of neglect to obey or of connivance with the master of such vessel in disobeying the provisions of this Act, shall be liable to a penalty not exceeding 500 rupees

for each instance of neglect or connivance, and in addition shall be liable to dismissal from his appointment.

5. This Act shall be taken and read as part of Act XXII. of 1855, and the penalties provided by this Act shall be recoverable under section 55 of that Act.

The Pilot's Station is a little to the southward of the *south buoy*, which lies in 12 fathoms at the entrance to the Western Channel into the Hoogly, and bears from False Point Lighthouse N.E. by E. $\frac{1}{4}$ E., distant 83 miles. Vessels approaching the station during the day must show the usual signal for a pilot, and by night fire guns, burn blue lights, and exhibit two lights in a vertical position where best seen; but avoid as much as possible running for the station at night, or in threatening bad weather; under such circumstances put the vessel under snug canvas while well out in deep water, and keep the sea. To mark the station one of the pilot-vessels will show during the day a large flag (*white with red cross*) at the maintop-gallant masthead, and a good masthead light at night, and will burn a blue light and torch alternately every half-hour, and fire a gun at 8 P.M., at midnight, and at 4 A.M.

In the N.E. Monsoon the pilot-vessels are found at the entrance of the Eastern Channel, and they generally anchor on the Eastern Sea Reef at night, or during the flood in the day.

Directions.—With the lighthouse on False Point, bearing W.S.W. 12 or 15 miles, steer E.N.E. so as to increase the soundings from 13 to 23 fathoms, when some of the pilot-vessels are sure to be met with. If a vessel gets accidentally on the tail of any of the Sea Reefs, she ought to tack or haul off immediately into deep water, or anchor until the ebb tide enables her to work to the southward; the sea runs high upon the reefs in the S.W. Monsoon.

MR. D. ROBERTSON, the Master Attendant at Calcutta, gives the following directions:—A vessel after making the lighthouse on False Point (in passing which she ought not to go into less than 12 fathoms), should bring it to bear about W.S.W., 10 or 15 miles distant, when she will be in 11 or 12 fathoms; and then steer E.N.E., when the soundings will gradually increase to 23 fathoms on the eastern edge of the Pilot's Ridge. She should then regulate her course so as to keep between the ridge and the depth of 27 fathoms; when, by attention to the lead and to the nature of the soundings, as well as to the course and distance run, it will be almost impossible to avoid making the pilot-vessels, as their cruising ground is immediately to the N.E. of the lightvessel, which, during the S.W. Monsoon, is stationed close to the buoy on the ridge. The soundings to seaward of the ridge are, in general, a greenish or olive-coloured mud, with (occasionally) a few bits of broken shells among it; while those on the ridge are of a shelly sand, or minute gravel, of a reddish or rusty-brown colour. Vessels approaching the station are warned to be careful in avoiding collision, when either communicating with the lightvessel, or the supplying pilot-vessel; and on making the former at night they are recommended to heave-to, at a proper distance, till daylight, by which they will avoid the probability of passing the supplying pilot-vessel in the darkness of the night.

Directions for Approaching the Mouth of the River Hoogly.

Bound to Calcutta in the strength of the S.W. Monsoon the land should be made about Poondy, latitude $18\frac{3}{4}^{\circ}$, or between it and Ganjam, where it

is high, for in the latter part of March, or early in April, the weather is generally hazy, from which cause the land cannot be discerned, unless it is very near; a vessel certainly ought not to get to the northward of the Juggernaut Pagodas before getting in with the coast.

When to the northward of 18° N. and the vessel's position is not correctly known, haul in and sight the coast. In the night or in thick weather the lead will be a good guide if attended to with care; for although the bank of soundings extends but a few leagues from the coast, there is generally from 30 to 35 fathoms about 6 or 9 miles off, between Poondy and the Black Pagoda; about Ganjam the water shoals fast under 20 fathoms towards the shore. When the position is known, steer along the coast (keeping in 18 or 20 fathoms in the night, or with unsettled weather), until abreast of Manikapatam; then if it be daylight and the wind favourable, haul into 14 or 15 fathoms to sight Juggernaut and the Black Pagodas in passing: they will be seen in hazy weather when in 17 or 18 fathoms, but with a commanding breeze the coast may be approached with safety to 12 or 13 fathoms, about 3 or 4 miles from the shore. At night do not come under 15 fathoms, nor deepen above 17 or 18 fathoms, for the coast is low and sandy close to the sea, and it will not be seen unless close to it, and in hazy weather the noise of the surf on the beach would probably be the first indication.

When about 10 miles past the Black Pagoda, steer so as to obtain proper soundings off False Point. The depths decrease gradually towards the bank surrounding False Point, but keep in 14 or 15 fathoms at night when passing it, or in 16 fathoms if the wind is S.E. As the flood inclines towards the shore, and the ebb from it, 14 and 15 fathoms are good depths to preserve with a fair wind when steering from False Point. (For the description of the light on False Point, see p. 72.)

When False Point bears W.N.W. and the vessel in 14 or 15 fathoms, steer N.E. 30 miles to pass outside Palmiras Reef, keeping in 14 or 15 fathoms with a commanding breeze, or in 16 fathoms if the wind is S.E. If blowing strong from the S.W. in rounding Palmiras Reef in daylight, a vessel may steer along the edge of it in 12 or 14 fathoms, taking care not to approach the north-east part under 12 or 13 fathoms, where it is dangerous and steep-to under 10 or 11 fathoms. When past the reef she may haul to the N.W. and anchor to the northward of the Mypurra Sand, where she will be sheltered from the sea by the reef. False Point has sometimes been mistaken for Palmiras Point, and the latter sometimes for the former, whereby several vessels in the first case have been wrecked by hauling into False Bay instead of Balasore Bay, and others have got to the eastward of the Sea Reefs by keeping too far off shore. A lighthouse being now on False Point, this can rarely be the case.

If the coast or the pagodas have not been seen, and in steering along in 14 or 15 fathoms, the bottom is sand, shells, and black specks, which are thought to be those off False Point, but uncertain whether they may not be those off Palmiras Point, then bear in mind that the water will not deepen in steering N.E. from the depth of 15 fathoms off False Point, but in steering that course from the depth of 15 fathoms on the edge of the bank off Palmiras Reef it will deepen gradually to 17 and 18 fathoms; a vessel ought then to steer N.N.W. or N.W. until the soundings are 16 or 17 fathoms, in which depths the pilot-vessels generally anchor at night in Balasore Roads during the S.W. Monsoon.

The above directions are given while the Monsoon prevails steady from

the S.W. and westward; but towards the close of the Monsoon, or in September, this route is likely to cause inconvenience and delay, for the wind then often hangs to the eastward, and the current sets strong to the S.W. through False Bay. During that month, if the latitude can be observed, or the lighthouse or light on False Point can be recognised, there can be little occasion for making the land so far to the southward.

During the *N.E. Monsoon* a vessel will generally have to beat up the Bay. After passing about 100 or 150 miles to the westward of the north-west coast of Sumatra, the west side of the Nicobar Islands may be approached. If the wind inclines to keep to the westward, give the islands a good berth; if at E.N.E. or N.E. steer up the bay, close hauled, to the westward of the islands. On the parallel of 16° or 17° N. the wind often veers to the northward, and favourable tacks may then be made to the eastward, at times, to keep from the western coast of the bay. Neither should the eastern coast be approached, but vessels should work to the northward in the open sea, where there is smooth water and moderate breezes, which will enable them speedily to reach the Sea Reefs, at the entrance of the Hoogly.

It has frequently happened in the strength of the N.E. Monsoon, that vessels, by passing close along the western coasts of the Nicobar Islands, have reached the Sea Reefs without making a tack. If the equator is crossed late in February or in March, keep well to the westward in passing up the bay, for the current at that time runs to the northward along the Coromandel coast, and the winds will be found between S.W. and S.E.; in the middle of the Bay they are light and variable from N.W. to N.E. during these months, with a drain of current at times setting to the southward.

The **MUTLAH RIVER**.—Within the last few years a new port (PORT CANNING) has sprung up in the Mutlah branch of the Ganges. It is thus spoken of by CAPT. W. S. FITZSIMONS, of the *Fulwood* :—

“I will now point out to you the advantages which I experienced there last year (1858), and what they are as compared with those of the Hoogly. When I arrived at the Sand Heads I found a pilot brig doing duty as a lightvessel; on speaking her, it appeared they had no pilots on board for the river. Seeing that was the case, I immediately made sail, and proceeded upwards by the Bulcherry Channel; while proceeding through the channel, made the buoys out distinctly, and after passing through between the Western Spit buoy of the Roymutlah Sand and the Bulcherry Sand, we anchored for the night a little northward of No. 3 Bulcherry buoy. At daylight the following morning weighed anchor and proceeded northward for the entrance of the river. When abreast of Halliday Island we got a pilot on board, and continued on all day with a light wind, and in the evening passed the Cattalee, and anchored for the night off Ward's Point. Now, one thing I would point out to you in our progress upwards was the absence of any obstruction in the shape of bars or shoal places in any portion of the channel, and the facility with which we entered the river. Take the entrances of the Hoogly and compare them—where you most probably would not have got over the Gaspar Sand until you very likely would have had to anchor (for the flood-tide coming in to allow you to pass over), obstruction first, in one of the most exposed anchorages known to seamen; then, again, you have Lloyd's Channel, another stopping-place, if you had not a strong favourable wind, or a powerful

steamer to assist. Next in turn comes the Rangafulla, most probably another stoppage. In all of these places a ship is lying much exposed, and very likely sheering about in a strong tideway. All these places are a much less distance from sea than we got during our first day's progress with very light winds. See the delay which has already taken place in a ship's progress thus far up the Hoogly, where a ship will have had the assistance of an experienced pilot all the time. Then, again, see the advantages which ships have in hard weather during the S.W. Monsoon on arriving at the Sand Heads. Where, when bound to the Hoogly, a ship comes on the pilot station, and no pilots out (which is a frequent occurrence), she is signalled to from a pilot vessel that they cannot put a pilot on board, or that there are none on the station, and the vessel is recommended to stand to sea again, probably continuing that way for several days, or until the weather moderates sufficiently to enable them to place a pilot on board; and it frequently occurs that ships have to proceed to sea even with a pilot on board. Compare all these with the channels leading to the Mutlah, and you will see that it will not often occur, in which a perfect stranger to the place may, with common prudence, proceed upwards, and be able in a few hours to have his ship in safety.

"Then, again, without particularizing the upper parts of either, if you take the chart of the Mutlah, you will nowhere find less than $4\frac{1}{2}$ fathoms water in the proper channel, even at dead low water spring tides, as high up as Ellengunge. Although I acknowledge it to be necessary, when proceeding up or down from Cattalee in a large ship deeply laden, to have the assistance of a steam-tug, yet as she will be able to proceed with all safety from morning to evening without stopping, a vast expense of time and money is saved. Then, again, the tides run with little more than half the velocity which they do in the Hoogly; you will be able to acknowledge it to be a much safer navigation; you will be able to recollect that I had a steamer round from Calcutta to tow the *Fulwood* to sea, and I believe her to have been one of the poorest boats belonging to Calcutta, yet she took the ship to sea in much less than two days, although the wind was blowing strong from the southward nearly all the time. I can with all confidence assure you that there are few such navigable rivers as the Mutlah without having some great drawback to their safe navigation."

LIGHT.—A temporary lightvessel has been moored in 9 fathoms; it exhibits a *fixed white* light, visible 7 miles. A red flag is shown at the mainmast-head by day; and if in her position, a rocket is fired from March 16th to October 16th, at 8 P.M., at midnight, and at 4 A.M.

The following Sailing Instructions for entering the River Mutlah from sea, are by MR. T. HILL, Assistant Master Attendant, 1856:—

"The channels leading from sea into the river Mutlah having been buoyed off, the following notice is published for general information:—

"The WESTERN (OR WARD'S) CHANNEL is bounded on the west by the Bulcherry Reef, or Sand, extending southerly from the island of that name, and on the east by the Roymutlah Sand, part of which dries at low water. This channel is from 2 to 5 miles wide, and is marked off by six buoys, four *red* or western, and two *black* or eastern.

"The outermost or Reef buoy is a first-class spire buoy, with two baskets on it; it is painted *red* and marked with the letter M; it lies in $4\frac{1}{2}$ fathoms low water spring tides; lat. $21^{\circ} 11' N.$, long. $88^{\circ} 42' 45'' E.$, and bears from the eastern channel floating light buoy, E. by N. $\frac{1}{2} N.$, distant 32 miles.

"The centre Bulcherry buoy is a second-class spire buoy, with one basket on it; it is painted *red*, and marked Mutlah in full; it lies in 4 fathoms low water, about 7 miles N.N.W. from the outer or Reef buoy.

"The Bulcherry Spit buoy is also a spire buoy, painted *red*; it lies in 4 fathoms low water on a spit of the sand, about 9 miles N. $\frac{1}{2}$ W. from the centre buoy.

"The upper Bulcherry buoy is also a spire buoy, painted *red*; it lies in $\frac{1}{4}$ less 4 fathoms, about 6 miles N. by W. from the Spit buoy, and W. by S. $\frac{3}{4}$ S. from the flag-staff on Dalhousie Point.

"The outer Easternmost buoy of this channel is a second-class spire buoy, painted *black*, with one basket on it; it lies in 4 $\frac{1}{2}$ fathoms low water, on the S.W. verge of the Roymutlah Sand, N.E. by N. from the Reef buoy distant about 5 $\frac{1}{2}$ miles.

"The Roymutlah Western Spit buoy is a second-class spire buoy, painted *black*; it lies in 4 fathoms low water N.W. $\frac{1}{2}$ N. from the outer black buoy, distant about 10 miles, and North about 6 miles from the centre Bulcherry buoy.

"The mid-channel course from sea to abreast of the Bulcherry Spit buoy is N.N.W. $\frac{1}{2}$ W. 15 miles. From that point, North 15 miles will carry a vessel up to Halliday Island.

"The EASTERN OR ROYMUTLAH CHANNEL is bounded by the Roymutlah Sand to the westward, and the Bangadon or Dalhousie Sand or Reef to the eastward, and is marked off with four buoys, three *red* or western, one *black* or eastern.*

"The outermost buoy is a second-class spire buoy, with one basket upon it; it is painted *red*, marked ^R MUTLAH; it lies in 5 fathoms low water, on the S.E. verge of the Roymutlah Sand, N.E. by E., about 10 miles from the Bulcherry Reef buoy.

"The Roymutlah Eastern Spit buoy is painted *red*; it lies in 5 fathoms low water, N.N.W. $\frac{1}{2}$ W., about 6 miles from the outer buoy.

"The upper Roymutlah buoy is painted *red*; it lies in 4 $\frac{1}{2}$ fathoms low water N.W. of the Spit buoy, distant about 5 $\frac{1}{2}$ miles.

"The innermost buoy of this channel is painted *black*; it lies in 5 fathoms low water on the south verge of a flat extending from Dalhousie Point to the S.S.E.; it bears from the upper Roymutlah buoy N. by W., distant about 4 miles.

"The mid-channel course in the Roymutlah Channel is N.W. $\frac{1}{2}$ N. to the black buoy, and from that point N.N.W. to N. by W. to Halliday Island.

"Vessels resorting to the river Mutlah during the S.W. Monsoon should adopt a similar route, and conform to the directions for making the pilot station at the entrance to the river Hoogly, taking their departure from the Eastern Channel floating light, steering E. by N. $\frac{1}{2}$ N. to cross the tail of the eastern prong of Saugor Sand in 5 fathoms, off which they would deepen into 7 fathoms, shoaling again on the light-house sand to 5 $\frac{1}{2}$ or 6 fathoms, deepening off into 6 $\frac{1}{2}$ or 7, and crossing the Bulcherry Reef in 4 $\frac{1}{2}$ to 5 fathoms a little south of the Reef buoy.

"Commanders of vessels doubtful about crossing the tails of sands in a heavy swell, could steer more to the southward, and keep in 8 or 9

* We believe that this channel is now (1865) marked by four red buoys on its western side, and four black buoys on its eastern side. See the Admiralty charts of the Mutlah River (Nos. 138 a, b, c, and 82).

fathoms soft ground ; but great care would be requisite not to overrun the distance.

"During the N.E. Monsoon, commanders of vessels confident of the correctness of their reckoning, should work up direct for the Bulcherry Reef buoy ; but during cloudy or thick weather, crossing the swatch of no ground in about the latitude of the buoy, and running down upon it, would be advisable.

"It is high water full and change about 9h. 15m. ; at the Bulcherry Reef buoy the tides set round, as in the channels to the Hoogly ; the floods making to the west, the ebbs to the eastward, having a velocity during the springs from $2\frac{1}{2}$ to 3 miles per hour, and a rise of 9 feet.

"The bottom throughout the channels is mud ; the sands exceedingly hard, and the lead an excellent and safe guide towards them. The least water in the Western or Ward's Channel is 4 fathoms ; in the Roy-mutlah 5 fathoms, low water springs.

"From Halliday Island the course continues North, up to the 'Cattalee,' where the river takes a sharp turn to the westward, and the channel contracts. Up to this point a stranger, with Ward's chart and ordinary care, could, without a pilot, conduct his ship with safety, attending to the set of the tides, leaving the red buoys to the westward, and black buoys to eastward of his course."

Houses of Refuge.—Houses of Refuge for shipwrecked mariners, cast ashore on the sea face of the Sunderbunds, have been put up as follows :—

No. 1.—*Painted Red.* Just to the northward of Jackson's Grove on Seyers' Point, forming the eastern entrance to Channel Creek. It is on an extensive plain, covered with short grass, inside or to the eastward of some high sand-hills that here line the shore.

No. 2.—*Painted White.* At the eastern entrance to the Subtermookey Channel, 400 yards to the northward of the point that forms from Bulcherry Island, and 200 yards from high-water mark. It is in the midst of thick low jungle.

No. 3.—*Painted Black.* At the eastern entrance to the Jumera Channel, 400 yards to the north of the point that forms from the entrance of the Subtermookey Channel, and 200 yards from high-water mark.

No. 4.—*Painted White.* On the south-east part of Dalhousie Island, at the eastern entrance of the Mutlah River, on a sandy patch, about five feet above high-water mark, and about 100 feet in shore, distinguishable by a White Flag from a long spar and bamboo, which have been put up close alongside of the house, visible above the surrounding trees.

No. 5.—*Painted White.* On Bangadoonee Island, about seven miles eastward of No. 4. It stands on the south-eastern part of the island, above a small sandy beach about 100 feet from high-water mark. A long spar and bamboo, with a flag, have been put up alongside, and may be seen considerably above the trees.

In each house there is a supply of water and biscuit, a catamaran and paddles, a letter of instructions, and a chart of the Sunderbunds.

Persons cast away, reaching land to the east of Saugor, should make search for the Houses of Refuge ; and it should be borne in mind, that when a vessel is lost with a pilot on board, the fact would soon become known at the Pilot Station, and in Calcutta. Parties, therefore, finding their way to the houses, should remain there, and husband the means of

subsistence, in the assurance that succour will speedily reach them; or if compelled to leave, endeavour to travel westward to Saugor Island, and travel along the beach until they arrive at the lighthouse; or make their way to a large fishing village, situated on the south-east side of Saugor Island, using the catamaran as far as practicable.

EAST COAST OF THE BAY OF BENGAL.

CHITTAGONG RIVER.—The entrance to this river is in latitude $22^{\circ} 14' 24''$ N., and longitude $91^{\circ} 50'$ E. It is less than a mile in width, and (according to the survey of 1840) has soundings over the deepest part of the bar of 6 to 10 feet at low water spring tides, this deepest part being close under the north point of the river. Inside the bar the depth increases to $3\frac{1}{2}$, 4, and in some places 5 and 6 fathoms. The town is 8 miles from the sea, following the course of the river, and is situated on its north shore. We believe that two white buoys mark the north side of the bar, and two black ones the south side.

Owing to frequent changes in the banks of the Chittagong river, instructions for entering are useless; the assistance of a pilot is therefore indispensable.

Between the Chittagong River and the north end of Kootubdeah Island, a distance of 17 miles, the bottom is represented to be stiff and good for holding. When waiting for a pilot to take the vessel into the river, it used to be customary to anchor abreast of the Fakir's tree in about $4\frac{1}{2}$ fathoms, at 2 miles from the shore, and then to fire a gun, which could be heard in the river, when a pilot would come out; this custom may still be followed, although the recommendation to anchor does not appear to be good, as there is a very heavy, short, breaking sea, dangerous to small vessels when the wind blows with any strength. The Fakir's tree, thick and bushy, is situated at about 3 miles southward of the entrance to the Chittagong, and is easily recognised, being close to the shore.

Kootubdeah Island.—At about 18 miles southward from the Chittagong River is the north end of Kootubdeah, a low wooded island, which extends southward 13 miles in a direction parallel to the coast from which it is separated by a narrow but difficult channel of 8 fathoms to 9 feet.

LIGHT.—A lighthouse near the north end of the island shows a *fixed* light, visible from a distance of about 15 miles.

Following the coast southward from Kootubdeah Island, we pass Matrabari and Muscal Islands, which are also separated from the shore by a narrow channel sufficiently deep to be navigated by native vessels.

The west and south coasts of Kootubdeah Island are dangerous to approach, as foul ground extends from them a considerable distance. These reefs are rendered the more dangerous by the circumstance that there is a depth of so much as 10 and 8 fathoms close to their outer edges, decreasing seaward to 5 and 6 fathoms at about 7 leagues westward from them. From the south end of Kootubdeah Island, the south extremity of the Kootubdeah Reef (10 feet) bears S. by W. $\frac{1}{2}$ W. 12 miles. The reef surrounding Muscal Islands extends from the south end of the southernmost and largest island about 7 miles.

In latitude $21^{\circ} 20'$ there are some white sandy cliffs, which are valuable as a landmark in fine weather when the sun shines brightly upon them, as

although they have not much elevation, they can then be seen from a distance of 15 to 18 miles.

AKYAB.—The principal mouth of the Aracan River, that which forms the port of Akyab, is in latitude $20^{\circ} 5' N.$, and longitude $92^{\circ} 52' E.$ It is here $2\frac{1}{2}$ miles wide, reckoning from Fakir Point, on the north shore, to Hodge Point, the north end of Borongo Island, on the south shore; but the navigable channel has a breadth of less than a mile, being narrowed by reefs from each shore. On the edge of the southern reef, and in nearly the middle of the river, there is a small islet, named Savage Island, upon which is a lighthouse.

The bar of Aracan River, according to the survey of 1858, has soundings upon it of 12 feet to 6 fathoms at low tide. Having crossed this, the depth increases to 10 and 20 fathoms, the last being in the middle of the stream, immediately opposite Savage Island; thence it rapidly decreases to 3 and $4\frac{1}{2}$ fathoms off the town of Akyab, which is situated on the western bank at about 2 miles from the sea.

Aracan River, like other barred rivers on this coast, brings down large quantities of soil in the rainy season, and the banks at the entrance are subject to frequent changes: hence *strangers must obtain a pilot's assistance when bound in.*

LIGHT.—The lighthouse on Savage Island, on the south side of the entrance to the river, shows a *fixed* light of 106 feet above the sea, visible 12 to 14 miles.

When approaching the port of Akyab from north-westward there are some dangerous reefs, situated at various distances from the coast, which require great care to avoid. These are named St. Martin's, Asseergurh, Oyster Island, and Oyster Reef: the two last-mentioned reefs lie about 9 miles from the shore, and in the immediate vicinity of the port.

St. Martin's Reef.—This reef is in latitude $20^{\circ} 37\frac{1}{2}' N.$, and longitude $92^{\circ} 14' E.$ It has not been thoroughly examined, but is believed to be of considerable extent in a N. by W. and S. by E. direction. The depth close to its western edge is about 10 fathoms, and close to its eastern edge about 8 fathoms, which thence gradually decreases to the reef surrounding the shore of St. Martin's Island, about 5 miles distant. Its position is usually indicated by breakers. When in the vicinity of this reef the ship should be put about immediately the soundings become less than 20 fathoms.

Asseergurh Reef.—Upon this reef there is a depth of only 8 feet at low tide; it is consequently sufficiently shallow to endanger even a small vessel. It is situated 6 miles from the shore, in latitude $20^{\circ} 28' N.$, and longitude $92^{\circ} 30' E.$, at about 9 miles south-eastward from the south end of St. Martin's Island. Close to its western edge are soundings of 7 and 8 fathoms, and there are soundings of 7 fathoms immediately off its eastern side, which thence gradually decrease to the bank bordering the shore. Breakers generally indicate the position of this reef.

A bank of $3\frac{1}{2}$ to 6 fathoms exists between the Asseergurh Reef and St. Martin's Island, upon the northern end of which there is a rock,—we believe, awash.

Oyster Island and Reef.—Oyster Island is a small islet situated in latitude $20^{\circ} 12' N.$ and longitude $92^{\circ} 32\frac{1}{2}' E.$,* and distant about 10 miles

* A flagstaff-beacon with ball at top-mast head has been erected on this island (1865). Its height above the sea level is 82 feet, and from it the lighthouse on Savage Island bears S. $69^{\circ} E.$, distant 21 miles.

from the mainland. It is, or was, covered with brushwood, and is said to be visible only from a distance of 5 or 6 miles. Vessels can pass between this island and the coast, as there is a deep channel of 5 to 6 fathoms, but a shallow flat extends off from the land at least 4 miles: hence the passage inside the island is not recommended, and vessels bound to Akyab *always* keep outside, passing the island on its west side. The shallow flat fronts the entrance of the river Myou, and forms the bar to that river; thence it continues south-eastward along the shore, and fronts also the Aracan River.

The shoal or reef surrounding Oyster Island extends from its east, north, and west sides about a mile, but on its south-east side about $3\frac{1}{2}$ miles; its direction, therefore, corresponds with the coast-line. The depth on the shoal is 4 to 12 and 18 feet, and its edge is steep on all sides except the south-east, where the soundings probably increase gradually to $4\frac{1}{2}$ and 5 fathoms. To avoid this reef vessels should not approach its west side nearer than a depth of 15 fathoms.

Oyster Reef.—This is a dangerous reef of $4\frac{1}{2}$ to 10 feet at low tide, situated in latitude $20^{\circ} 5\frac{1}{2}'$ N. and longitude $92^{\circ} 38\frac{1}{2}'$ E., or about 14 miles west from the lighthouse on Savage Island at the entrance to Aracan River. It is probably not more than $1\frac{1}{2}$ miles in extent N.N.W. and S.S.E., and has soundings of 6 fathoms almost close to it; at 2 miles westward from it the depth is 12 fathoms. Its position is generally indicated by breakers except in fine weather during the N.E. Monsoon. So formidable is this reef to vessels approaching or leaving Akyab, that it should always have a wide berth.*

Heckford Shoal.—This shoal is inserted in charts on the authority of Mr. N. HECKFORD, of the Mercantile Marine, who discovered it in 1855, and described it as follows:—

“Heckford’s Shoal (composed of rock, coral, and pebbles) is 13 miles S.W. $\frac{1}{2}$ W. from Savage Island Lighthouse; W. by S. $\frac{1}{2}$ S. from the table-land of Borongo Island, and W.N.W. from the south extremity of that island. It has $4\frac{1}{2}$ fathoms upon it (probably less), is in the direct track of vessels, and is surrounded by the following (mud and mixed) soundings—viz., 20 fathoms $1\frac{1}{2}$ miles to the westward and southward of it, 15 to 13 fathoms to the eastward, and 12 to 13 fathoms 2 miles from its north-east end; shoaling towards Oyster Reef. Commanders of vessels of heavy draught are therefore advised to be particular in the bearing of the table-land when approaching it from the westward, and warned not to pass over the shoal, as the lighthouse is not visible when you are close to the south-west of it.”

Although it has been mentioned that Aracan River should be entered only with a pilot’s assistance, the changes of the bar being frequent, we add the following instructions (copied from the Admiralty chart of the River, No. 1884, ed. 1865), as they may be useful in an emergency:—

“Ships of heavy draught coming from the westward in the south-west Monsoon, should steer East for the Table Lighthouse† until Savage Island Lighthouse bears N. by W., then haul up for it, and when abreast of the

* It has been proposed to moor a lightvessel off the south end, or to erect an iron pile lighthouse on the southern edge of this reef. If neither are found practicable, the light in Savage Lighthouse will probably be greatly increased in power.

† This was only experimentally placed, and has been removed. The table-land alluded to was formed by the tops of the trees, some of which were cut away to enable the lighthouse to be erected; it is, we are informed, no longer conspicuous, and should properly be termed the highest part of the western Borongo Island (October, 1865).

Bar buoy steer N.N.W. $\frac{1}{2}$ W. until Passage Rock bears E.N.E., when haul over to the north-eastward for the anchorage. A vessel may anchor with the Savage Light S.S.W., or the North and South Hummocks in one, in 5 fathoms. The deepest water for large ships is off the Cherogea Creek, within 70 yards of the shore.

"An excellent and safe passage for boats and small schooners is found between Savage Island and the north end of Borongo Island, sheltered from all seas in the south-west Monsoon.

"*Caution.*—When coming in with the flood, great care is required in allowing for it, as it sets right on to the White Rocks. In coming out with the ebb tide, keep as close to these rocks as prudence will allow, in order to prevent being set on the western bank."

A reef projects from Fakir Point, the north side of the river, some distance in a south-easterly direction, the extremity of which is, we believe, marked by a buoy; upon it are some rocks above water. The official instructions for entering the river, issued in 1844, say:—

"Ships sailing for Akyab during the south-west Monsoon should steer for the south end of the western Borongo, in latitude $19^{\circ} 50' N.$, longitude $93^{\circ} 1' E.$, and then stand along the coast northward and westward at 5 or 6 miles off shore until the light on Savage Island at the entrance of Aracca River is sighted." (Here follow instructions for entering, which are superseded by those just given.) "Having entered the river, Fakir Point should be brought to bear N.W. by N. to N.W., when you may anchor. A stranger should not attempt to run in at night, particularly in the rains, except at high or low water, as the ebb tide runs very rapidly in strong eddies off the Passage Rock, over the dangerous flat to the westward, and the flood in strong eddies upon the rocks.

"During the north-east Monsoon ships bound to Akyab from northward, should endeavour to make the table-land of the western Borongo in latitude $20^{\circ} 1' N.$, then by steering due East they will avoid the Oyster Reef in latitude $20^{\circ} 5' N.$, longitude $92^{\circ} 38\frac{1}{2}' E.$, which is distant from the Savage Light 15 miles due West. This course is recommended, as, although in favourable weather, Savage Light is seen outside the reef in 16 to 17 fathoms water, the depth suddenly decreases, and the probability of hazy or rainy weather would prevent the light being seen; and steering boldly in to sight it, to the northward of latitude $20^{\circ} 1'$, would endanger the safety of the vessel by suddenly falling upon Oyster Rock or Reef before sighting the lighthouse.

"Strangers are advised never to make use of the channel inside of Oyster Rock or Reef."

The south end of western Borongo Island has a reef extending from it about 3 miles in a southerly direction, upon parts of which the sea breaks when there is a swell. The water is very deep close to the edge of this reef, soundings having been obtained there of 15 and 18 fathoms.

Terrible Rocks.—This very dangerous group of rocks extends from latitude $19^{\circ} 21\frac{1}{2}' N.$, and longitude $93^{\circ} 17\frac{1}{2}' E.$, to latitude $19^{\circ} 28\frac{3}{4}' N.$, and longitude $93^{\circ} 20' E.$ It is distant from the nearest shore (north end of Ramree Island) about 11 miles, and at about midway between there is a shoal of 2 to 4 fathoms, named Irawaddy. At a mile westward of the rocks the depth is not less than 18 fathoms; hence they require the utmost care to avoid when sailing down the coast. It has been proposed to erect a lighthouse on the south rock.

The Terribles consists of three groups of rocks, extending in a N.N.E.

and S.S.W. direction, some of which are about 14 feet above the water at low tide; between and around them, or scattered about in their vicinity, are many rocks under water. The northernmost reef is probably at $1\frac{3}{4}$ miles northward from the northern rock, and the southernmost reef at about the same distance S. by E. from the southern rock. From the north rock the high peak of Nondogee Island (Combermere Bay) bears N. 49° E. (*true*) $19\frac{1}{2}$ miles.

The Terribles were partially examined in 1841 by COMMANDER HALSTEAD, R.N., by whom soundings of 18 and 19 fathoms were obtained at $1\frac{3}{4}$ miles westward from the south rock; this depth is believed to increase gradually seaward, bottom having been obtained in 20 fathoms at 9 miles West from the same rock. Until there is a more complete survey of the rocks, a nearer approach to them than 30 or 28 fathoms should not be made at night.

KYOUK PHYOU.—This is an important harbour at the north end of Ramree Island, eastward of the Terribles. It lies between Ramree Island and a group of islets north of it, bearing the names of Quoin, Crooked,* Tangaroo, Laws, Fitzwilliam, &c. The depth is 18 to 9 fathoms, the latter being at the usual anchorage a little eastward of Fort Dalhousie; here the shelter is from all winds but those from north-westward, towards which direction the harbour is open. Some reefs in the immediate vicinity of the entrance to the harbour, are, we believe, marked by buoys, notwithstanding which *it will not be prudent for a shipmaster to attempt to run for it without a pilot*; and the charts Nos. 831 and 141 (published at the Hydrographic Office, Admiralty) should be at hand for reference.

At about $2\frac{3}{4}$ miles westward from the north-west shore of Ramree Island, there is a small islet of moderate height named Saddle, from the circumstance that it rises into two hills, which give it the appearance of a saddle. The northern of these hills is 190 feet, and the southern 175 feet high.† This island is surrounded by a reef, which extends southerly from its south end about $1\frac{1}{4}$ mile, and N. by W. from its north end a similar distance; in the latter instance the reef is prolonged one-third of a mile farther in a north-easterly direction by a detached reef, named Dicey Shoal, which is separated from its extremity by a narrow channel of 9 and 10 fathoms. As these reefs are very dangerous, there being at a very short distance from them a depth of 6 to 10 fathoms, and the channel eastward of the island, between it and the reefs lining the shore of Ramree Island, although deep enough for large vessels, cannot be navigated by strangers, shipmasters are cautioned to give Saddle Island a wide berth, yet not so wide as to endanger their striking on the Irawaddy Shoal (already mentioned), situated in nearly mid-channel between it and the Terribles. The channel between the Terribles and Ramree Island has not been thoroughly surveyed; a prudent shipmaster will therefore avoid attempting this passage, except in an emergency.

From the preceding paragraph it will be seen that the usual approach to Kyouk Phyou Harbour is northward of the Terribles. According to the Admiralty chart (No. 831) an E.S.E. $\frac{1}{4}$ E. course, from a position nearly 3 miles northward of Saddle Island, will carry a vessel into the harbour

* At a mile westward from this island is Pagoda Rock, 96 feet high, which is a good mark for the approach to Kyouk Phyou harbour. It is visible from a considerable distance, and, we believe, coloured white.

† It is said that there is sometimes a difficulty in distinguishing Saddle Island, when viewed from north-westward.

midway between the buoy marking North Shoal (on the north side of the channel), and that on the Bombay Shoal (a reef stretching out from Ramree Island, on the south side of the channel). At rather more than a mile eastward of Bombay Shoal is Reliance Shoal, a patch of 9 feet, usually marked by a buoy, which should, we believe, be passed on its north side. When eastward of Reliance Shoal, the harbour is entered, and a berth off Fort Dalhousie may be selected at convenience.

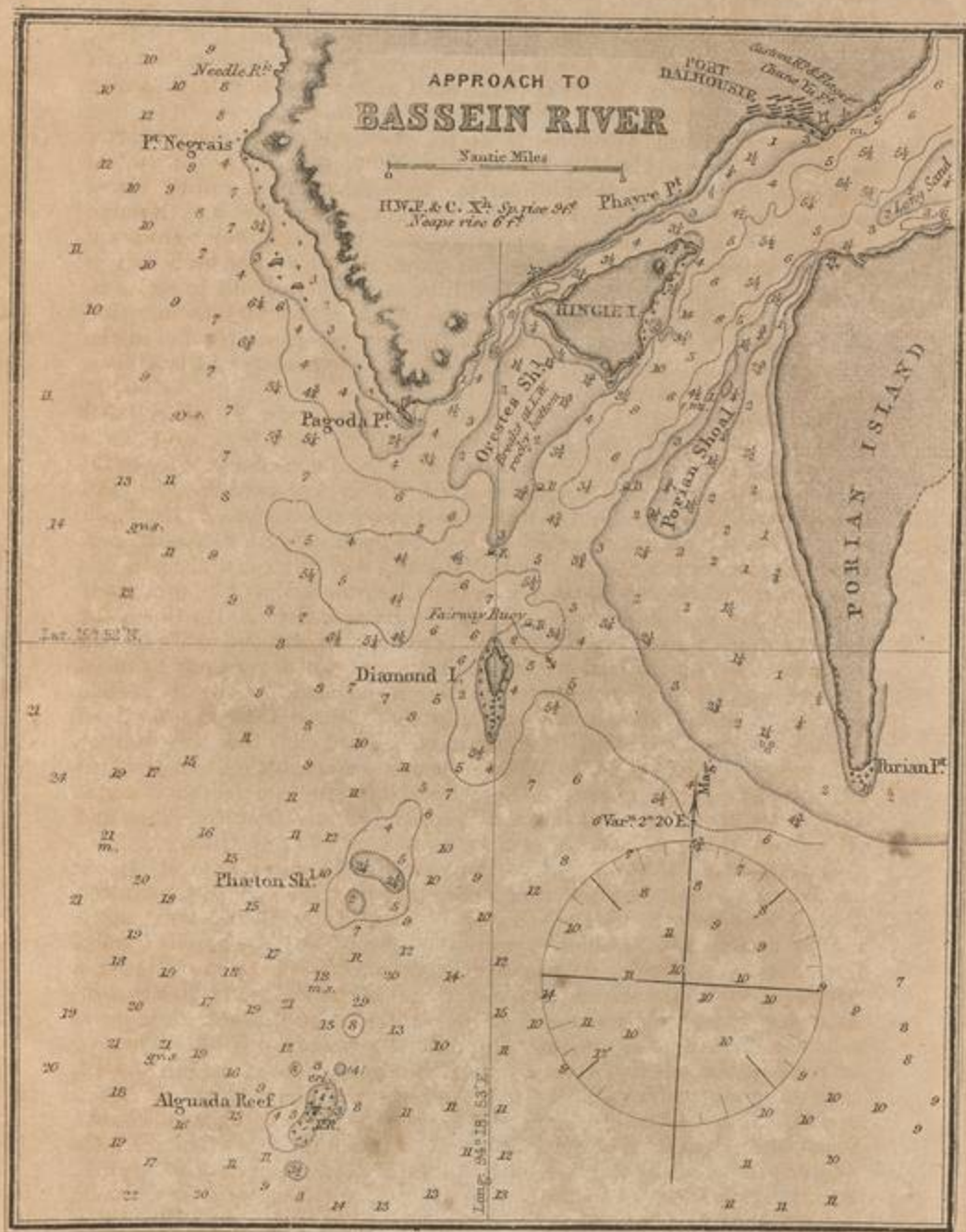
Captain Heckford recommends shipmasters not to attempt to run for Kyouk Phyou Harbour during the South-west Monsoon unless they have daylight for their whole passage in, and in a sailing vessel to avoid at all times the channel between the Terribles and Ramree Island. He observes that the soundings close to Flagstaff Point are deep, and that shipmasters approaching this point should reduce their sail in time, more particularly during a flood-tide, as the best berth in which to anchor is just abreast the wharf inside the point, in about 9 fathoms, good holding ground. If unable to reach the harbour before sunset, and in the vicinity of Saddle Island, they should anchor, as their safety will be endangered by keeping under way.

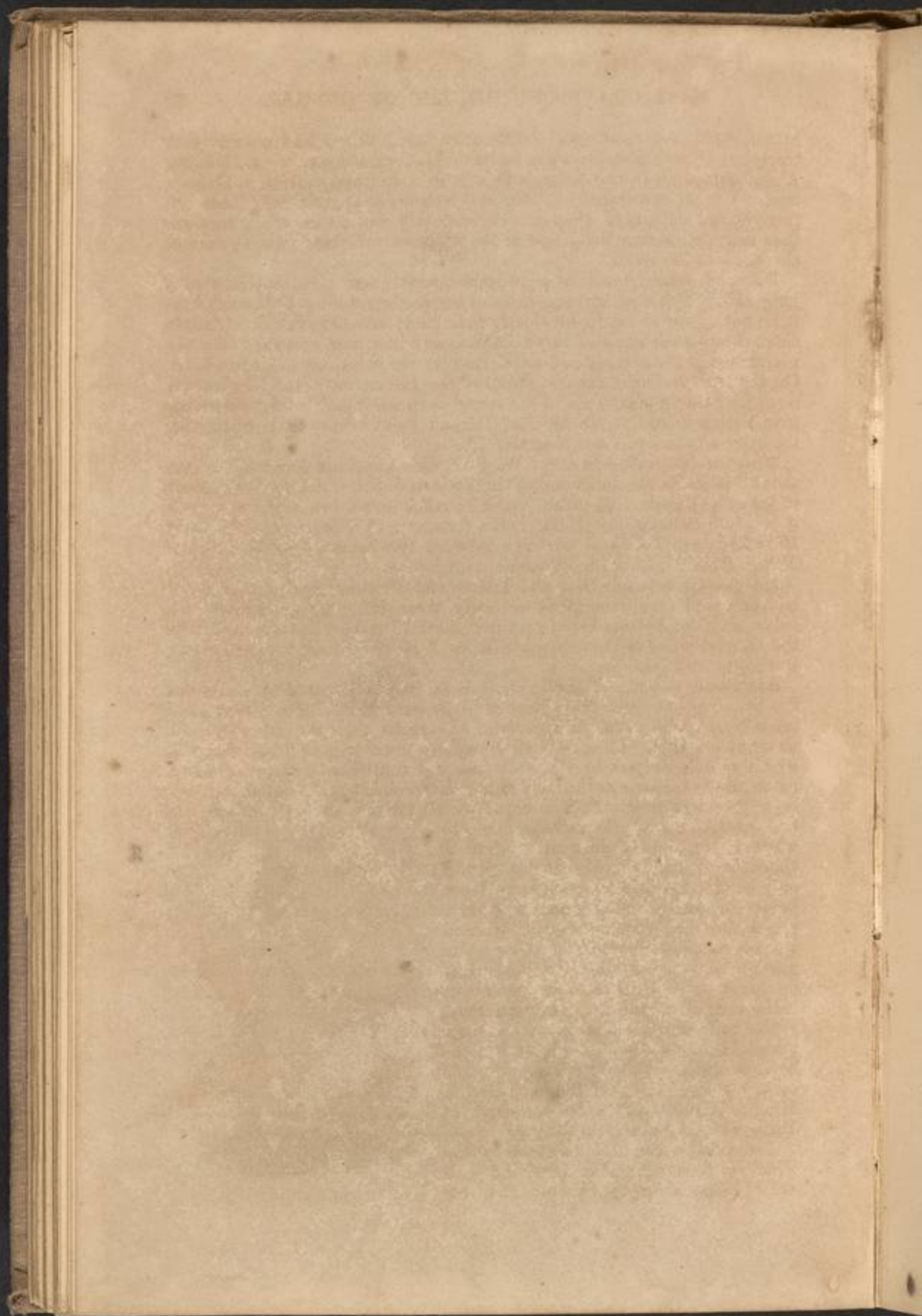
CAPE NEGRAIS, the S.W. extremity of the coast of Ava, is situated in latitude $16^{\circ} 1\frac{1}{2}'$ N., and longitude $94^{\circ} 13\frac{1}{2}'$ E. The high land in the vicinity and northward of the cape is visible from a distance of 27 or 30 miles. No part of this coast has been thoroughly examined, hence it will be prudent when running down it from northward to keep outside the depth of 12 fathoms, by adopting which course, a ship (according to the chart of CAPTAIN CRAWFORD, of the Bombay Marine) will go clear of danger.

At about 6 miles S.S.E.-ward from Cape Negrais is Thay-gin, or Pagoda Point, on the west side of the entrance to Bassein River. On this point there is a pagoda—hence its name. From this point red cliffs extend towards Cape Negrais, and are fronted by a reef, which runs out $1\frac{3}{4}$ miles seaward. This reef terminates at the north end of the red cliffs near the cape, and should not be approached nearer than the depth of 10 fathoms in a large ship. Northward of the red cliffs the shore is more bold, there being from 11 to 12 fathoms soft ground within two or three miles of the cape; but between the latter and the Brother Hills, a distance of $6\frac{1}{2}$ miles, straggling rocks or reefs project $1\frac{1}{2}$ miles from the shore, and should not be approached nearer than a depth of 12 or 11 fathoms.

BASSEIN RIVER.—This large river is 12 miles wide at its entrance, Pagoda and Porian Points, its seaward boundaries, being that much distant from each other on a N.W. by W. and S.E. by E. direction; but it rapidly decreases to $2\frac{1}{2}$ miles opposite the town of Dalhousie, only 9 miles from the sea. Hingie, an island of considerable size, just within the entrance, divides the stream into two navigable channels, of which that on its eastern side, being wider and deeper than that on its western, is generally used by sea-going vessels. Opposite the town the depth is 6 to 4 fathoms in the middle of the river. The edges of the shoals are buoyed, notwithstanding which it will not be prudent to attempt to enter without a pilot. Outside the river are the following—Diamond Island, Phaeton Shoal, and Alguada Reef; and at 36 miles from the latter, in a south-westerly direction, Thalia Reef, in latitude $15^{\circ} 15'$ N., longitude $93^{\circ} 48\frac{1}{2}'$ E. As these are met with in the approach from westward, we describe them before offering remarks upon the navigation of the river.

Diamond Island faces the entrance of Bassein River, and its position is latitude $15^{\circ} 52'$ N., longitude $94^{\circ} 18' 53''$ E. It is about a mile in





extent North and South, and half a mile broad, is low, and covered with trees, but of sufficient elevation to be visible from a distance of 15 miles. A reef surrounds it, and extends from it in a southerly direction about a mile. Vessels occasionally anchor in 5 fathoms at about a mile eastward from it, and wait until they can conveniently enter the river; they are then near the fairway buoy, and in the immediate vicinity of the principal channel into the river.

Diamond Island must be approached with great care, especially in a large ship. The west and east sides of the reef extending southward from it, do not appear to have been closely examined; and LIEUTENANT WARD'S chart shows a sounding of only 2 fathoms at half a mile westward from the island; hence the necessity of extra caution when in its near neighbourhood. On the authority of CAPTAIN FELL, of the Indian navy, the best leading mark for passing northward of the island between it and the flat extending from Porian Island, is the bluff of Pagoda Point, a very little open with the extreme point of Cape Negrais.

Phæton Shoal.—In a S.S.W. $\frac{1}{4}$ W. direction from Diamond Island about 3 miles, is the north end of the Phæton Shoal, which thence extends in the same direction $3\frac{1}{2}$ miles. It is $1\frac{1}{2}$ miles broad, has soundings upon it of 4 to 8 fathoms, but in its centre, for about $1\frac{1}{2}$ miles, a depth of only 12 to 15 feet; this shoal part lies between the bearings of N. $\frac{1}{2}$ E. and N.N.E. from Alguada Lighthouse.

The passage between Diamond Island and Phæton Shoal should never be attempted except in great necessity, there being no good mark as a guide, and the bottom being very irregular. The best mark is said to be the extreme point of Cape Negrais, N. by W. $\frac{2}{3}$ W.;—keep the lead going, and maintain a good look-out.

Alguada Reef.—This very dangerous reef is situated 15 miles in a S.S.W. direction from the entrance to Bassein River. Its extent is $1\frac{1}{2}$ miles North and South, and many of the rocks are only just above the water at low tide. Close to it all round are soundings of 3 to 8 fathoms, which rapidly deepen to the westward and southward; there is also a patch of $3\frac{1}{2}$ fathoms at nearly a mile from its south end. It should not be approached nearer than a depth of 15 fathoms on its southern and eastern sides, and 20 fathoms on its western side, and the channel north of it (between it and Phæton Shoal) should only be attempted in an emergency, there being no good leading marks to carry a vessel through; should, however, circumstances compel a vessel to go through this northern channel, it will be well to borrow on the Alguada Reef side, passing about half a mile from the north-eastern most visible rock, and not lessening the water under 11 fathoms,—if at high water the breakers will show the rocks. On the eastern side of the reef the high land of Hingie Island well open eastward of Diamond Island clears all danger.

The tides, when uninfluenced by the wind, set across Alguada Reef, and with considerable strength between the reef



ALGUADA LIGHTHOUSE.

and Phaeton Shoal. It is chiefly for this reason that vessels are recommended not to approach its north-western side nearer than a depth of 20 fathoms; moreover, the soundings decrease suddenly on this side, especially towards the south-west part of the rocks.

LIGHT.—A lighthouse, 160 feet high, has been erected on Alguada Reef; it shows a light revolving every minute at 147 feet above high water level, visible 18 or 20 miles. Its position is latitude $15^{\circ} 42' N.$, longitude $94^{\circ} 14' E.$, and from it Cape Negrais bears $N. \frac{1}{2} W.$; the pagoda on Pagoda Point $N. \frac{1}{2} E.$; extremity of Porian Point $N.E. \frac{3}{4} E.$; and the centre of Diamond Island $N. by E. \frac{3}{4} E.$

In Horsburgh's Directory, vol. i., is the following:—

"The bottom is chiefly uneven and rocky between Diamond Island and Alguada Reef, with a heavy turbulent swell, occasioned by the sea beating on the reefs, and the strong tides, about 2 knots per hour, which here set—the flood to the E. by S., and the ebb to the W. by N. The rise of tide is about 9 to 12 feet on the springs; high water about $10\frac{1}{2}$ hours on full and change of the moon, in the entrance of the river. From the heavy confused swell that generally prevails in this dangerous channel, even during calm weather, it is often called the Race of Negrais, and certainly should be avoided by ships; for by rounding the south end of Alguada Reef, they are but a few miles farther out in a safe and spacious channel, about 17 leagues wide, between it and Preparis Island.

"When the sea is smooth in the North-east Monsoon, the breakers on Alguada Reef are not high; but when the weather is clear, the approach to it may always be known by the bearing of the land; for when the west end of Diamond Island is coming into contact with the east end of the hill on Hingie Island, Alguada Reef is then in the same direction, bearing $N.N.E.$, and the western extreme of Cape Negrais will bear nearly North. At 4 or 5 miles' distance from Alguada Reef, both eastward and westward, the depths are generally from 15 to 18 fathoms, blue mud, and southward from it at the same distance, 19 and 20 fathoms. It is prudent not to approach Alguada Reef nearer than 2 leagues on the east side, nor under 3 leagues on the N.W. side, on account of the rock situated to the S.W. of Diamond Island. Soundings extend from Alguada Reef to Preparis Island, and the depths increase to 40 and 50 fathoms in the track between them; near to Preparis Island they are irregular in some places, but on the east side of the island decrease to 8 fathoms within less than a mile of the shore."

CAPTAIN N. HECKFORD says: * "If, on approaching Alguada Reef from the N.W. in thick weather, and without observations, you try for soundings and find 36 to 40 fathoms, mud, broken shells, and specks, steer to the southward until the nature of them are shells, stones, and rotten coral. You may then shape a course to the S.E., provided your depth of water is above 25 fathoms, or you have no means of ascertaining the nature of your soundings, to know when you are in the fair track for passing the reef in thick weather. If in steering to the south-east you do not shoal, you may proceed with safety; but if from 40 to 35 you decrease to 30 and 25 fathoms, haul to the southward until you deepen, then keep away to the south-east as requisite.

"The nature of the soundings west, south-west, and south of the Al-

* "Sailing Direction, and Coasting Guide from the Sand Heads to Rangoon, Maulmain and Akyab, and *vice versa*," by N. HECKFORD. A work that should be in the hands of all shipmasters bound to the ports on the east coast of the Bay of Bengal.

guada Reef, is so various that it is impossible to particularise them with any degree of clearness; they may be summed up in the fact, that with the reef bearing from E. to N.E., and N. by E., little or no mud will be found mixed with them. But it must be borne in mind that, with it bearing S.E. by E., you have mud and mixed soundings, and these extend northward until you are clear to westward of Cape Negrais; moreover, you will not find two casts alike, although the lead be constantly hove. In mid-channel, or nearer the reef, they consist of stones, small broken shells, and sand with black specks, in from 26 to 24 fathoms. The nearer the reef the coarser the bottom. When it bears due North in 22 fathoms, you will have coarse sand, stones, broken shells, and black and white specks; and when it bears N. by W. in 23 fathoms, a slight mixture of green mud; and N.N.W. in 23 fathoms, you will have dark green mud mixed with black and white specks. From this position until off the southwest limit of Baragu Sand in 16 fathoms they will be the same, excepting that the mud shades lighter as you proceed eastward from the reef; these remarks are applicable to north of latitude $15^{\circ} 16' N.$ And it is deserving of particular notice, that there are no pure mud soundings in the direct track until you are eastward of Baragu Sand."

Thalia Reef.—This small coral patch is situated, as noticed (p. 86), in latitude $15^{\circ} 15' N.$, and longitude $93^{\circ} 48\frac{1}{2}' E.$ Its extent is $1\frac{3}{4}$ miles N.N.W. and S.S.E., and close to its western side are soundings of 37 and 50 fathoms, and to its eastern side 23 to 28 fathoms.

THE RIVER.—In the entrance to the river is Hingie, a triangular-shaped island, having its apex to the north-eastward; it is about 3 miles in extent, and is easily recognised from seaward by a hill on its north-east end, the easternmost high land on the coast. A shallow flat of 6 to 18 and 21 feet, named Orestes Shoal, extends out $4\frac{1}{2}$ miles in a south-westerly direction from this island, and leaves between it and the northern shore of the river a narrow channel of $3\frac{1}{2}$ to 6 fathoms depth, *or less*; but which is considered unsafe for vessels drawing more than 14 feet. The navigable channel on the east side of Orestes Shoal and Hingie Island is $1\frac{1}{2}$ miles wide, and $4\frac{1}{2}$ to 9 and 7 fathoms deep (reckoning from seaward), its eastern boundary being the extensive Porian Shoal, a flat of 6 to 15 feet, which lines the eastern side of the entrance to the river; this eastern shore is low land, terminating in Point Porian, a headland formed of white cliffs, sufficiently elevated to be visible from a distance of about 6 leagues. This eastern channel was buoyed in the following manner in 1859: a *red* buoy on the extreme south end of the Orestes Shoal, and another on its extreme eastern limit; a *black* buoy on the extreme edge of the flat extending from the Porian shore; and a *red* buoy, marked "Fairway," in white letters, north-eastward from Diamond Island. With the assistance of these buoys and LIEUT. WARD'S chart,* the river is not difficult to enter; still, strangers are recommended to obtain a pilot.

When the buoys were moored at the entrance to the river in 1859, the following information was officially issued by LIEUTENANT T. W. AYLESBURY, Master-Attendant:—

"Vessels coming from the southward should bring Diamond Island to bear N.W., then steer for it until the *fairway* buoy is visible, which is situated $1\frac{1}{2}$ miles N.E. of the island. From this buoy steer N.N.E. until the *black* buoy bears East, then N.E. by N.

* Published by the Hydrographic Office, Admiralty. No. 834.

"Vessels entering from the westward, in latitude N. of Diamond Island, should bring it to bear S.E., and steer in for it until the *fairway buoy* is made, then proceed as above directed for vessels entering from the southward. This passage, however, should be attempted by sailing vessels only in the N.E. Monsoon.

"Vessels unable from stress of weather to distinguish the different marks, should anchor under Diamond Island, where good anchorage and smooth water is to be found.

"**Hingie Island to Bassein.**—A vessel should proceed up the river about half a mile from the shore, until up to Yeajoue Creek; thence she should sheer over to the eastern bank, gradually, until the *black buoy* on the south end of the Ridge Shoal is seen, which is to be passed, keeping it on the port hand about two cables' length, and keep the eastern bank until after passing the *red* and *white* buoys in the same manner as the *black*; then stand up mid-channel, passing Sesostris Rocks, which are marked by a *red* buoy. *The rocks lie inshore of the buoy.* Keep on mid-channel until close up to Enterprise Island, taking care to give the spit that extends a little way down from the south end of the island a good berth. There is a passage on each side of the island—one to the east and another to the west. The passage to the left is preferable for a ship of light draught, as it is wide, and there is more room to work.*

"The passage to the eastward is taken by vessels of large draught. Vessels should keep close to the eastern shore, in order to avoid the Pariah Rock.

"In sailing up the passage to the left of Enterprise Island, care must be taken not to approach too close to the spit that extends north of the island. Proceed up as far as the village of Tumam-Dewa, that lies in a creek on the port hand; then steer across to the eastern bank between the *red* buoy and Elephant Island, *going nearer to the island than the buoy*, until you get into 7 fathoms; then steer up on the eastern shore, until abreast of the Pamawaddie River; from this steer over towards Ashby Rocks *buoy*, giving the Cackatoo Rocks a berth of at least two cables' length. These rocks are seen above water, except at spring tides, when they are covered. There are three patches: two of them show above water half ebb to half flood; one is sunken, and extends to 138 yards outside the others; the least water on it at dead-low water spring tides is 16 feet. Keep the port shore until you reach the second creek, when the channel becomes much wider.

"The 'junction' is so called from being at the top or north end of Napoota Reach, where two branches of the river meet, the one from the east being the way to Bassein.

"At Napoota Reach you may steer up until approaching the 'junction,' where, on the eastern shore, a mud bank extends a quarter of a cable's length from the bushes; there is also a bank extending from the port side. These can be avoided by keeping in nearly mid-channel. In the third reach there is a bank of mud, which will be known by a *white board* in the bushes. On the port hand this shoal extends nearly halfway over and the whole length of the reach in which it is, so that vessels must keep the starboard bank going up, and *vice versa* coming down. The remainder of the passage upwards is without danger, and easy of navigation.

"There is deep water close to the bank, and the ground chiefly very

* It is possible that the buoys alluded to in this notice of the navigation above Dalhousie may have been removed.

soft mud. Vessels should have a small warp anchor in readiness to run out if required, and should use a light working anchor for dropping; this will relieve the crew of much labour.

"Vessels should show their numbers before arriving at the village of Takion, and Masters should report their arrival at the Master-Attendant's Office and Custom-house, as soon as possible."

CAPTAIN HECKFORD says of Dalhousie:—"The port is not safe in bad weather, nor during the change of the Monsoons, as the fearful loss of shipping will fully testify. Commanders are cautioned not to remain at this anchorage longer than is actually necessary in arriving at it from sea, and not to attempt to resort to it when bound out, without they are prepared to depart and the weather suited to this object."

COAST OF PEGU.—The coast of Pegu, from Bassein River to the Gulf of Martaban, is generally low and woody; it comprises, in fact, the delta of the great river Irawaddy. Fronting it to a considerable distance seaward are reefs and shallow flats; hence it requires considerable care to approach, especially when the wind is from southward. The land is seldom visible from any distance, which renders precaution when approaching the more necessary. An examination of this sea-board was made in 1850 by LIEUTENANT FELL, of the Indian Navy, and the following is his description of the soundings off it:—

"From Porian Point, which forms the south-east extreme of the eastern shore of Bassein River, and which bears E. $\frac{1}{2}$ S. from Diamond Island, a bank extends off it to the distance of about $2\frac{1}{2}$ miles, and continues in an E.S.E. direction, 52 or 53 miles, from whence it runs in an easterly direction, and gradually trends to E.N.E., then to N.E., on towards Rangoon. The southern extreme of the Baragu Flat is in latitude $15^{\circ} 29\frac{1}{2}'$ N., longitude $95^{\circ} 12'$ E., from whence the land is seldom visible, except in very clear weather.

"A vessel passing north of Diamond Island, and bound eastward with a fair wind, ought to keep the large pagoda on with, or a very little open with, the north end of Diamond Island, until she deepens to $10\frac{1}{2}$ or 11 fathoms; she may then stand to the E.S.E., keeping in a line of $9\frac{1}{2}$ or 10 fathoms, and altering her course so as to keep in this depth until abreast the south extreme of Baragu Flat, when to keep in this water she will steer an east course, on which line she will (when eastward of Baragu Point) deepen her water to 12, 15, and 16 fathoms. She may then, if bound to Rangoon, stand to the N.E., taking care not to come under 10 fathoms until northward of the Krishna Shoal. If bound to Maulmain, she ought to steer E. by N. $\frac{1}{2}$ N. or E.N.E. (altering her course according to the time of tide), when she will again shoal her water to 10 and 9 fathoms, which depth is the best line to keep in until sighting the eastern coast; but during the South-west Monsoon it would be advisable to keep more to the southward, in 14 or 15 fathoms, making the land near to Kalégouk Island.

"**Krishna Shoal** extends from latitude $15^{\circ} 36'$ N. in a N.E. direction to latitude $15^{\circ} 47'$ N., and is a bank of hard sand situated to the E.S.E. of Baragu Point, distant from the nearest shore 10 miles. It is a narrow ridge about 1 mile wide, having a channel between it and the shore, with $3\frac{1}{2}$ and 3 fathoms in it, bottom of soft mud. When to the N.E. of the Krishna Shoal, a vessel ought not to come under $4\frac{1}{2}$ fathoms until in latitude $16^{\circ} 13'$ N.; she will then be abreast of China Buckeer.*

* Rangoon River is 18 miles N.E.-ward from China Buckeer River. In HORSBURGH'S Directory, China Buckeer is mentioned as appearing like a low island when viewed

"During the N.E. Monsoon, vessels from Bengal should make Cape Negrais, and ought to endeavour to pass northward of Diamond Island, by doing which they will save much time, as during the months of November, December, and January, there is little or no flood-tide south of Alguada Reef, except during the springs. At other times there is a strong set to the W.N.W.

"The soundings westward of Alguada Reef are generally even, with fine grey sand and mud, with 30 fathoms, 18 miles to the westward; to the S. and S.S.W., when near to the reef, the bottom is very uneven, coarse sand and mud alternately, until 8 or 10 miles to the S.S.W., when the soundings become more regular, with coarse sand, shells, and rotten coral, which bottom continues the same nearly on to Preparis Island. This bottom is a good guide for vessels during the S.W. Monsoon, when it is not advisable to approach the Alguada Reef. To the E.S.E. about 12 miles the bottom is all mud, and continues on to the Tenasserim coast. Vessels proceeding eastward with a working wind ought to be guided entirely by the lead, which should be kept going when approaching the Baragu Flat, and ought not to stand under 7 fathoms, from which the soundings decrease quickly to 3 fathoms.

"The tides on the coast of Pegu are very irregular during the N.E. Monsoon, when there is scarcely any perceptible flood during the neaps off the Baragu Flat, and during the springs not running more than three hours at the rate of 1 to 1½ miles per hour. When to the N.E. of Baragu Point, the tides become stronger—on the springs, running 3½ and 4 knots, and during the neaps, 2 to 2½ knots. The rise and fall of tide at Alguada Reef is about 12 feet. H. W. on the days of F. and C. at 10h. 45m. Off Baragu Flat the rise is only 7 feet, high water at 11h. A little northward of the Krishna Shoal the rise is 12 feet, high water at 11h. Eastward of Rangoon River the tides run very strong during the springs, greatest velocity being upwards of 7 knots, and the rise and fall from 25 to 27 feet.

"Vessels from Amherst bound to Rangoon ought to endeavour to keep in a line of 5½ to 6 fathoms low water, until they sight the land near China Buckeer, and then stand to the northward, as before directed."

CAPTAIN N. HECKFORD says:—"When approaching Baragu Sand from westward (the vicinity of which in fine weather is ascertained by the eddies that prevail in this particular part of the gulf only), the best depths to preserve are from 15 to 16 fathoms, not less, and you will cross over the tail of it in 10 and 11 fathoms; the soundings will be of dark brown-coloured mud, mixed with very small *entire* shells, and this is the only spot throughout the track from outside the Alguada Reef to the coast of Martaban, where this description of shell is to be found. In steering to the eastward, you will deepen again to 14 or 15 fathoms. After getting eastward of Baragu Sand, which will be easily known by the nature of the soundings; if they be pure mud, of a light brown colour, you can steer to the N.E. and N.E. by N.

"If bound to Maulmain, after passing Baragu Sand, and when about

from soundings of not more than 6 fathoms. CAPTAIN HECKFORD says:—"China Buckeer appears like a low detached island; being covered with dense jungle, makes it very conspicuous, and there is no land like it on this part of the coast; an opening between it and the main appears at its north-east end when just visible from the southward above the horizon. This is the only distinguishing mark south-westward of Elephant Point."

half way between the tail of that sand and the north end of Kalegouk Island, you will have much deeper water. But the $10\frac{1}{2}$ fathoms soundings extend across the gulf to Double Island, and from the north end of Kalegouk the $12\frac{1}{2}$ fathoms extend about 40 miles to the westward. These soundings, after getting well to the north-eastward of Baragu Sand in 7 or 8 fathoms, consist of soft ooze; with the Rangoon River N.W., stiff mud; eastward of this, and towards the Martaban coast, they are of dark olive-coloured mud.

"I have never found any mixed soundings or sand eastward of Baragu Sand in the Gulf of Martaban—clear of danger. And safety requires that you should find your mud soundings mixed; at the same time convinced that you are eastward of Baragu Sand (with a flood tide), anchor without loss of time, as you are not far from danger. And, as all dangers must be N. or N.W. of you, a S. or S.E. course will enable you to get clear of them, should you be in their vicinity; except you are in the mouth of the Sittang River, which is ascertained by the overfalls, set and strength of the tide, and the high land to the N.E.-ward. Should you, through some extraordinary circumstance, get in the mouth of this river, and can ride out one flood-tide (although I have never heard of but two vessels escaping from it), weigh at high water, and work to the S.S.W., keeping the lead constantly going, as the channels between the sands are deep, though narrow, and anchor when the flood is in."

RANGOON RIVER.—This river is about 2 miles wide at the entrance, whence, to the town of Rangoon, a distance of 20 miles in a N.W. by N. direction, it gradually decreases in width, till opposite the town it is only one-third of a mile across. The shore on each side of the entrance is low, and can be seen only from a moderate distance; but a beacon, coloured *black* and *white*, has been erected on the eastern or Grove Point, and another, *red* and *white*, on the western or Elephant Point, as marks to show the position of the river from seaward. Shallow flats extend out a considerable distance from the shore on each side of the river, and the edges of these, in the immediate vicinity of the entrance, are marked by buoys, to indicate the channel-way in. The soundings in the entrance are 5 to 7 fathoms; thence up the river is a general depth of 5 fathoms, excepting at about 2 miles eastward of the town, where is a bar of 6 to 10 feet.

Spring tides rise 21 feet, and neaps 14 feet.

LIGHT.—The entrance to the Rangoon is now (December 1865) indicated by a light-vessel, which shows a *fixed* light, visible from a distance of about 8 miles; a blue light is burnt every hour from 7h. P.M. to 4h. A.M.* The vessel is moored outside the river in a position due East from China Buckeer River, and nearly South from the mouth of the river (1866).

In 1859, the following instructions for entering the river were issued by MR. HAROLD LEWIS, the Master-Attendant of the port:—

"Commanders of vessels bound to the port of Rangoon should endeavour to make the coast well to the southward about the China Buckeer River, as many ships have been lost in consequence of having been swept by the strong flood-tide on to the extensive sands to the northward and eastward, and into the Sittang River, in which direction the spring flood sets with

* The construction of a lighthouse on Elephant Point, the west point of the river, is in contemplation.

dangerous velocity. Pilots are usually cruising well to the southward of the light-vessel stationed at the entrance to the river.

"With the beacons on Elephant and Grove Points bearing to the northward, steer for the light-vessel.* Flood sets N.E. by N.; ebb S.W. by S. $3\frac{1}{2}$ to 4 knots. From the light-vessel, with a fair wind, steer N. by E. $\frac{1}{4}$ E., about 5 miles for the outer *black* buoy, passing it to the westward a good cable's length; thence steer North for the upper *black* buoy till the upper *red* buoy is in sight, bearing N.N.W., pass to the eastward of this, with the western beacon bearing N.W., and steer in for Elephant Point, which bearing from W.S.W. to S.S.W., distant half a mile, will give good anchorage. Care must be taken not to bring the *black* buoy to the westward of N. $\frac{1}{2}$ E., nor the *red* buoy to the eastward of North.

"From Elephant Point to Rangoon steer along the right bank of the river, about a cable's length from shore, until close to Bassein Creek, then cross over to the left bank, along which steer at a distance of $1\frac{1}{2}$ cable's length from the shore, until Dagon Pagoda bears about N.W., then steer in mid-channel, between the *red* and *black* buoys on the Hastings Shoal, for the flagstaff in the town, and anchor opposite the dockyard."

SITTANG RIVER.—The coast eastward of Grove Point is low, and fronted for a considerable distance seaward by a shallow flat, hence it cannot be approached in a large ship. Sittang River is 25 or 40 miles from Rangoon River: it is shallow at its entrance, but a survey of it might possibly discover some channels among its banks sufficiently deep for a ship of ordinary size. The river is quite unknown, as foreign vessels never enter it. On its eastern shore the country rises into hills, named the Zingaat or Martaban Hills.

Tides.—The tides on the coast of Pegu generally run very strong; the flood sets East and E. by N., and the ebb in the contrary direction to the westward of Baragu Point; but from that point to Rangoon Bar the flood sets N.E. and N.E. by N., and the ebb to the S.W. Farther east, between Rangoon River and the coast of Martaban, the flood runs strongly N.N.E. and N. by E. into the bottom of the gulf, and the ebb with equal strength out of it, in the opposite direction. When the rivers are swollen, and the low country inundated by the rains at the end of the South-west Monsoon, the ebb tides run much stronger and run longer than the flood tides, occasioned by freshes from the rivers; the water then is very thick and muddy at a considerable distance from the land, which is more or less the case on this coast at all times, opposite to the numerous rivers that disembogue into the sea.

Abreast of Baragu Point, and farther westward, the velocity of the tides

* The light-vessel was moved southward of the position referred to in these instructions, in December 1865, with a view to materially facilitate the making of the river;—to what extent the instructions are affected by this new position of the vessel we are unable to say. Mr. Lewis, in his communication to us announcing the intended shifting of the light-vessel, says:—"I would recommend all vessels making the port of Rangoon from southward, to strike the coast in latitude $15^{\circ} 50'$ N., longitude 96° E., as it will give them soundings of 6 fathoms, mud, at low water, spring-tides, when if they make a due N.E. by N. course (allowing for the tides) they cannot miss the light-vessel.

"Particular care must be taken not to shoal under 5 fathoms, low water, and *not to go from mud into sand*. Sand is only found eastward of the Rangoon River. A vessel north of latitude $15^{\circ} 50'$ N. striking soundings in sand, should at once haul westward till a depth of 6 fathoms, mud, be obtained. By close attention to the lead, and the foregoing rules, a vessel cannot get into danger on this coast."

s not nearly so great as off Rangoon River and in the bottom of the gulf; for here it is frequently in the springs 4 and 5 miles an hour, and sometimes more, near the edges of the shoal-banks. After the rains, the tides off Rangoon River are subject to a circular motion; the first of the flood sets East, changing gradually to N.E. about half flood, and to North in the latter part. The ebb sets just the reverse, beginning to run West; it changes gradually to S.W. and South, ending at S.E., but there is no slack water at these times, the tides continuing to run $1\frac{1}{2}$ or 2 knots when changing from the flood to the ebb, and the same at the opposite change.

On the west part of the coast, off Porian Point, the perpendicular rise and fall of the tide is only 9 or 10 feet on the springs; but off Rangoon Bar it is frequently 20 or 21 feet; and from 21 to 24 feet, farther to the eastward, in the bottom of the gulf near the banks at the entrance of Sittang River; it is therefore proper to be careful in making free with this part of the coast, and to acquire a knowledge of the tides, in order to prevent any mistake, by anchoring near high water in a situation where a ship would be aground at low water.

MAULMAIN.—Following the coast southward from the Sittang River, we reach in latitude $16^{\circ} 30'$ the northern entrance of the river Salween, which is separated from the southern entrance by a large island, named Pelew Gewen. This island is 17 miles long from north to south, and 8 miles broad: it is moderately high, and is rather more elevated at its north and south ends than in the middle; at these ends are thick clusters of trees. A white pagoda stands on its south end upon the eastern part of the highest land, and appears just above the trees. The tops of the trees on the west side of the island are not visible at a greater distance than 12 or 15 miles; this coast is faced by a shoal which extends out 1 or 2 miles. The northern channel of the river is not navigable. The town of Maulmain is on the eastern bank of the river in latitude $16^{\circ} 30'$, its situation being at the fork of the stream, where the north and south channels divide. According to the survey of 1842, the depth in the shallowest part of the river at low tide is 7 to 8 feet. The rise of spring tides is 22 feet; neaps range 12 feet.

The southern channel of the river Salween is that used by vessels bound to the port of Maulmain. It is 9 miles wide, but the greater part of this space is occupied by the Goodwin Sands, shallow flats extending southward from Pelew Gewen Island, and by reefs jutting out from Amherst Point, the south shore of the river; hence the navigable channel is less than a mile wide. The depth at low tide is 18 to 12 feet, and buoys, which are moved as occasion requires, mark the principal dangers. These sands are subject to frequent change; instructions for entering the river are consequently useless, and render the employment of pilots a necessity. Pilots are obtained from Amherst.*

* MR. NEAT MAJOR, agent for the Liverpool Underwriters' Association at Maulmain, wrote thus in 1863:—

“The entrance to this river is becoming so narrow and intricate, that it urgently behoves the Government to take some measures for the prevention of ships getting into difficulties similar to those of the ships *Laurel* and *Clara L. Preble*, which ships were both swept by the force of the tide on to Amherst Reef, and, having received considerable injury, were compelled to return to Maulmain, discharge their cargoes, and be docked for further survey. These serious accidents have occurred within the present month, and I am credibly informed by some of the most respectable pilots that it is very dangerous to move a heavy ship out of Amherst Road to proceed to sea without

The tides in the river Salween are strong, their velocity being about 5 miles an hour during springs, and 3 miles at neaps. Vessels drawing about 22 feet can ascend the river to Maulmain. We believe it is usual to employ a steam-tug, the channels between the sands being very narrow and tortuous.

Amherst Point (Cape Kyai-kami, or Quekmi) is low, so low that it cannot be seen from a greater distance than 7 to 10 miles;* the lands in its vicinity are high and peaked, and visible in clear weather from a distance of 9 leagues. On the point is a white pagoda, called the upper Quekmi Pagoda; another pagoda (the lower one), also white, stands on the rocks off the point. There are also several pagodas along the coast. At a mile S.S.W. from the point is a little island named Green, situated half a mile from the shore; and 12 miles southward from it, in latitude $15^{\circ} 53' N.$, is Double Island, so named because a chasm in the trees upon it causes it to appear as two islands when viewed on any bearing between N.E. by E. and S.E. This island is about 100 feet high, as many long, sufficiently bold to be approached within a mile, and so thickly wooded that it resembles an immense bush—it is very inconsiderable as compared with the high lands behind it, and is not easily distinguished until well in with the shore. In a south-easterly direction from Amherst Point are some remarkable hills, the Table land and peak, which are sufficiently lofty to be visible from a distance of 30 to 45 miles: these, with the high land of Martaban to the N.E., which comes into view when you are in about the depth of 15 fathoms, are excellent guides for the port.

MR. DAVY, R.N., says (1836): "In the North-east Monsoon a ship leaving the Sand Heads should steer about S.E.; or if the current to the southward be found stronger than usual, steer more easterly, passing in mid-channel between Cape Negrais and Preparis Island; or if bordering on the weather shore, round Alguada Reef in not less than 20 fathoms; the depth in this channel will be found deepest towards Preparis Island. From this the soundings become regular, with mostly mud bottom, decreasing as you advance eastward. On no account make the low land, or steer higher than E.S.E., until the meridian of Baragu Point is passed. After passing that meridian, stand on and make the land about Double Island. The parallel of $16^{\circ} N.$ should not be crossed until within five miles of the coast, as the tides there are at the strongest; and the shoals of Pelew Gewen Island, also the flats at the mouths of the rivers, are very dangerous.

"In the South-west Monsoon shipmasters should endeavour to make the land a little southward of Kalegouk Island; and in the event of bad weather, or if the weather has a threatening appearance—more particu-

the assistance of steam power, or a strong commanding breeze, and even then it must be nearly high water.

"I am under the impression that if the lower part of the river, from Fishing Village to sea, was carefully resurveyed by competent surveyors, a new channel would be found to the northward of the present one; and if so, and properly buoyed, would be a great desideratum for vessels passing in and out of this river. There are two narrow passages or gaps in the Amherst Reef sufficiently wide for any ships to pass through with safety in cases of emergency—such as parting a cable, or drifting, &c. These passages are well known to the pilots, and only require substantial beacons erected to mark their positions; this would be the means of relieving many anxious minds, for, take an instance of a ship parting her cable, her commander or pilot, guided by these beacons, could steer boldly through the passage, and proceed to sea with confidence."

* A small fixed light, visible 6 miles, is said to have been established on the point.

larly if it be at or near the springs—should not think of anchoring at Amherst, but should run inside Kalegouk, and anchor in 6 to 9 fathoms. Double Island and the north end of Kalegouk bear from each other S. by E. $\frac{1}{2}$ E., and N. by W. $\frac{1}{2}$ W. 17 miles; when standing inshore, do not pass eastward of that line of bearing,—to a stranger, this will be the best possible guide. No part of the coast should be approached nearer than two miles, on account of the strong tides and the rocks and breakers extending out from the shore. When steering for Amherst great attention must be paid to the tides, and large vessels may anchor in 10 fathoms with the Reef buoy bearing N. by E., and the upper pagoda N.E. to E.N.E.

“It is high water on the days of full and change of the moon at Amherst Point at 2h., and at the Reef buoy at 2h. 20m.; the greatest rise and fall of the tide is during the S.W. Monsoon, when it is often 26 and 28 feet, and the velocity 6 to 7 knots. Hence, during strong South-westerly winds, with a sea and so rapid a tide, the anchorage is unsafe. It is at this time that the value of the harbour within Kalegouk Island can be properly appreciated. In the North-east Monsoon the rise and fall is 18 to 20 feet, and the rate of tide 3 to 4 knots per hour. The change of the tides is effected almost instantaneously; indeed, it may be said there is no slack water. The ebb-tide coming out of the river may be seen at some

BAY OF BENGAL.

Double Island.—On this island a Lighthouse has recently been erected, which shows a *fixed* light, visible, it is said, from a distance of 19 miles. The Light is seen through an arc of 144° or when bearing from about N. $\frac{1}{2}$ W. round by east to S.S.E.; the former bearing passes $\frac{1}{2}$ miles westward of Kalegouk Island, and the latter $1\frac{1}{2}$ miles westward of the Patch buoy off Amherst.

A strip of light shows from the Patch buoy eastward as far as Amherst point.

Double Island is in lat. 13° 52' 30" N., long. 97° 35' 30" E. Amherst Point bears from the light N. $\frac{1}{2}$ W.; the Patch buoy N. by W. $\frac{1}{2}$ W. and the west point of Kalegouk Island S. by E.

Vessels making the light should endeavour to keep it between the bearings of S.E. and N.E., paying particular attention to the tides, as at springs they run about 5 knots an hour, parallel with the coast. Vessels standing too close to the land will lose sight of the light, but so long as the light is in sight there will be no danger until 10 miles northward of it, when approaching the Goodwin Sands, where the tides set very strong. The anchoring ground in the vicinity of Double Island is good, but, on account of the strength of the tides, vessels should avoid as much as possible the risk of anchoring in such deep water.

JAMES IMRAY & SON,
MERCHANTS, LONDON.

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buoy, there are overfalls from 9 to 14 fathoms, quickly shoaling to 7 fathoms at the entrance between the Reef buoy and the Goodwin Sand. It is almost indispensable to anchor in the situation mentioned above, to wait for a row-boat and pilot, as the channel is narrow, the bottom very

* MR. DAVY says:—“It may be useful to mention the extraordinary ripples so frequently to be met with in the upper parts of the Bay of Bengal, and near the entrance to the Strait of Malacca. These ripples resemble an impetuous tide bubbling and breaking in front of an obstruction, and yet, from the observations that have been made upon them, they appear not to have the effect of current, nor in any way to throw a ship out of her reckoning. They are most frequently met with in calm weather or in light winds; often they have the appearance of a dangerous shoal, rippling and surging with much force, and advancing towards the ship against a single-reef-topsail breeze at the rate of 2 or 3 knots an hour. In striking against the ship, the water often surges over the hammocks of small vessels, and fills the decks with water; in passing to windward, they may be traced to a considerable distance.”

larly if it be at or near the springs—should not think of anchoring at Amherst, but should run inside Kalegouk, and anchor in 6 to 9 fathoms. Double Island and the north end of Kalegouk bear from each other S. by E. $\frac{1}{2}$ E., and N. by W. $\frac{1}{2}$ W. 17 miles; when standing inshore, do not pass eastward of that line of bearing,—to a stranger, this will be the best possible guide. No part of the coast should be approached nearer than two miles, on account of the strong tides and the rocks and breakers extending out from the shore. When steering for Amherst great attention must be paid to the tides, and large vessels may anchor in 10 fathoms with the Reef buoy bearing N. by E., and the upper pagoda N.E. to E.N.E.

“It is high water on the days of full and change of the moon at Amherst Point at 2h., and at the Reef buoy at 2h. 20m.; the greatest rise and fall of the tide is during the S.W. Monsoon, when it is often 26 and 28 feet, and the velocity 6 to 7 knots. Hence, during strong South-westerly winds, with a sea and so rapid a tide, the anchorage is unsafe. It is at this time that the value of the harbour within Kalegouk Island can be properly appreciated. In the North-east Monsoon the rise and fall is 18 to 20 feet, and the rate of tide 3 to 4 knots per hour. The change of the tides is effected almost instantaneously; indeed, it may be said there is no slack water. The ebb-tide coming out of the river may be seen at some distance; it brings a vast accumulation of dark-coloured matter, which contrasts strongly with the sea,—it comes down with great force, and when it strikes the ship, makes it, as sailors say, ‘all grin again.’ The strongest tides are found on the parallel of the river, and are not felt at the distance of 60 miles from the land; their strength also decreases as you steer to the southward. A 6-knot tide at Amherst will be found to have lost half its rate at Kalegouk, and at 10 miles farther south it will have still further decreased.”*

CAPTAIN D. ROSS, of the Indian Navy, the Marine Surveyor, gives the following instructions for making Amherst: “It is proper to make the land between Double Island in latitude $15^{\circ} 53' N.$, and the small islet in latitude $16^{\circ} 3' N.$, which is about $1\frac{1}{2}$ mile southward of the Pagoda, as, without this precaution, the strong tides may sweep a ship past the buoy that is placed at the point of the reef, and carry her on the Goodwin Sand. When $1\frac{1}{2}$ or 2 miles westward of this small islet, and if then the Reef buoy is seen bearing about N.N.E., endeavour to approach it on the bearing of about N.E., and anchor at about a cable’s length north-westward of it, in $4\frac{1}{2}$ or 5 fathoms at low water. The depths outside will vary from 9 to 13 fathoms, and when about three-quarters of a mile S.W. of the buoy, there are overfalls from 9 to $14\frac{1}{2}$ fathoms, quickly shoaling to 7 fathoms at the entrance between the Reef buoy and the Goodwin Sand. It is almost indispensable to anchor in the situation mentioned above, to wait for a row-boat and pilot, as the channel is narrow, the bottom very

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uneven, and the soundings no guide. If the wind be from the southward or westward, high water is the time to weigh, or just at the commencement of the ebb; but if it be from northward or north-eastward, the last quarter of the flood is the proper time to weigh, in order to have a weak tide under lee, and be enabled to keep the row-boat on the port bow, while she proceeds along the sand and shows the depth of water by a flag. The extremity of the reef being very near the buoy, no ship must pass eastward of the latter. The anchorage at Amherst will admit several ships, but must be avoided by large vessels in the S.W. Monsoon (being open to all winds from S.S.W. by west to N.W.), when a considerable swell sets in through the gaps of the reef."

CAPTAIN MAITLAND, R.N., says that a vessel should anchor at $1\frac{1}{2}$ mile from Green Island, with the pagoda on Amherst Point showing clear of it to the northward; thereby enabling pilots to come off during a flood-tide, by pulling along shore to the southward, and also giving plenty of room to weigh—a matter of some difficulty and danger in the strong tides off the Reef buoy close to the rocks and shoals. He also states that a pilot station is on the island.

As a summary of the foregoing it may be remarked, that it is advisable, generally, to approach Amherst on the parallel of 16° N.; when on this parallel, in longitude $96^{\circ} 30'$, the Zingaat Mountains will be seen in clear weather. If soundings of 10 or 11 fathoms are obtained, a vessel will be on the Martaban coast; but if they decrease to 6 or 7 fathoms, she will be on the edge of the banks fronting the Rangoon River or the adjacent coast. If the coast about Amherst be made during the South-west Monsoon, which is the stormy season, commencing in May and terminating in October (the rest of the year being made up by N.E. winds, calms, and clear settled weather), there is good anchorage off the shore at from 5 to 10 miles' distance, which continues for about 100 miles southward of the port. A ship sailing from Amherst in the S.W. Monsoon, before obtaining an offing, may probably be obliged to anchor two or three times during the flood-tide, with the risk of riding very hard, or parting her cable by the heavy sea.

KALEGOUK ISLAND.—From Cape Kyai-kami (Amherst Point) to the north end of Kalegouk Island the distance is 30 miles. Double Island has already been noticed; the shore behind it is low and fronted by a shallow flat, for which reason vessels should always keep westward of the island. At about 6 miles from Double Island, in a south-easterly direction, are two patches of rocks above water at about 3 miles from shore; in the channel between these and the land are soundings of about 5 fathoms, but as the projecting point of the coast has a reef extending from it some distance, it will be prudent to keep outside them; the depth at a very little westward of these rocks is 8 and 9 fathoms. The current hereabout, at 7 miles from the land, was observed by CAPTAIN ROSS, of the Indian Navy (1828), to flow northward at the rate of 4 knots an hour, and to increase in strength as he approached Amherst.

Kalegouk Island is $5\frac{1}{2}$ miles long, in a N. by W. and S. by E. direction, and not more than a mile wide in its broadest part, its north end, whence it tapers to a point at its south end. Steep Point, in the centre of the island, on its east side, is in latitude $15^{\circ} 33'$ N. On Woodstock Hill, 200 feet high, and $1\frac{1}{2}$ mile from its northern end, were some remarkable trees in 1862. DR. MACPHERSON says,—“The island is composed of primary rock, the superstratum being a rich mixture of open

porous soil, composed of sand and vegetable mould. Its formation is very peculiar, the northern and southern portions differing considerably. The northern half on the western side is composed of a long granite ridge, with an average perpendicular drop to the sea. The eastern side descends to the shore in gentle or abrupt slopes, while the western is broken into isolated hills, with level, well-raised intervening spaces, forming three bays. Quarry Bay, where the stones were prepared for Algnada lighthouse, is the deepest; the beach is sandy, but at ebb-tide an extensive mud flat, covered in places with mangroves, is exposed, the somewhat narrowness of the channel between the island and the mainland tending to the accumulation of mud. Both sides of the island are broken into bays. To the west, Retreat, Rocky, Sea, and Fish bays, have beautiful hard, sandy beaches, well protected by high land on each side, and open to the ocean in front, with a fine rolling surf on the beach, and only divided from one another by projecting rocky points, and from the corresponding bays on the eastern side by well-raised necks of land, sloping east and west, free from all swampy ground, and ascending north and south to the hills which divide the bays. The eastern bays look on the distant mainland, rising in bold outline on the horizon. These very much resemble the western bays; in fact, differ only by the mud uncovering at half-tides, the rise and fall at spring-tides being 22 feet. All the bays on the eastern side are perfectly protected from the South-west Monsoon, as are the bays on the western side during the North-east Monsoon; the entire island is clothed with fine primeval forest, with trees of immense dimensions and height. Water of an excellent quality is procurable at a depth of 15 feet; and a perennial spring of sweet water flows through the centre of the island."

At the south end of Kalegouk Island is an islet, one-third of a mile long, named Cavendish, surrounded by a reef which projects from its south-west side about a quarter of a mile. In the narrow channel between these islands the depth is 8 and 7 fathoms.

The west shore of Kalegouk has not been surveyed; it is believed to be lined by a reef, and should not therefore be approached nearer than the depth of 11 or 10 fathoms. The east shore has shoal water from it to a moderate distance, beyond which are soundings of 5 and 6 fathoms.

At the north end of Kalegouk, and separated from it by a very narrow channel of 5 to 8 fathoms, through which the tide flows to the north-west at the rate of 5 knots an hour, causing a heavy race, commences the Galloper Sand, a shoal extending thence 6 miles to the N. by E. in the direction of Pulo Cropic, a small islet situated about a mile from the mainland. This sand is dry at low tide over a considerable portion of its surface, other parts having a depth of not more than 6 to 12 feet, and its edges are moderately steep; consequently it should be very cautiously approached. The channel between its north end and Pulo Cropic is rather more than a mile wide, and has soundings in it of 5 to 10 fathoms; it is called North Channel, the South Channel being round Cavendish Island, at the south end of Kalegouk.

The channel between Kalegouk and the shore is 4 to 5 miles wide, and the soundings midway are about 8 fathoms. Here vessels may anchor and find good shelter from all but southerly winds; the best place is said to be off the highest part of the island in 6 or 7 fathoms. Ingress and egress are easy. The North Channel is very rarely used, being narrow.

When running for Kalegouk anchorage, give Cavendish Island a berth of about a mile, and when it bears W.N.W. haul to the northward, and

pass up to the anchorage. The shore of Kalegouk Island should have a moderate berth given to it.

According to Mr. N. ICELY, R.N., who surveyed this anchorage in 1830, vessels drawing 10 feet may be laid on shore for repair at North Creek, on the east side of the island, at about a mile from its north point. Wood and some fruit may be procured, and three or four tons of water per day in the dry season at Mahomed's well in Freshwater Bay. Buffaloes and rice can be obtained from Dermonjai Creek, on the mainland opposite the middle of the island.

COAST OF TENASSERIM, &c.—From Kalegouk Island southward to latitude 6° N., including the Mergui Archipelago, there are no ports frequented by foreign vessels; and as this coast is but very little known, no thorough survey of it (except one of the Mergui Islands by Com. LLOYD, 1828) having yet been made, it seems superfluous to attempt a description of it, especially as the harbours are all of such a character that they cannot be entered without a pilot. We therefore conclude our description of the east coast of the Bay of Bengal with some remarks upon Penang.

PENANG.—Penang is an island having the form of a parallelogram, situated between latitudes $5^{\circ} 16'$ and $5^{\circ} 28'$ N. and longitudes $100^{\circ} 10'$ and $100^{\circ} 20'$ E. It is very lofty, West Hill, in the northern part of the island, its most elevated part, being 2,713 feet above the sea. On the east side of the island is Georgetown, where a considerable trade is carried on with Singapore, and various ports of Eastern India. Fort Cornwallis is in latitude $5^{\circ} 24' 30''$ N. and longitude $100^{\circ} 20' 10''$ E.*

The channel between Penang Island and the shore is from 8 to 2 miles wide, the latter being the width of the channel opposite the town. The greater part of this space is occupied by the Great Kra Flat, an extensive shoal of 3 to 9 feet, which runs off from the main land in the direction of the island: this bank appears to be of a changeable character, as the South Channel, the channel between it and the island, was found in 1863 to be about 10 feet less in depth than when it was surveyed by LIEUT. WOORE, R.N., in 1832—hence it will not be prudent to attempt to enter Penang harbour by this channel without a pilot. We believe that the edges of the sands are marked by fishing stakes and beacons.

The anchorage at Penang is off the town in 9 to 12 fathoms, and there is protection from all winds except those from north-westward. The best berth for large vessels is said to be at about a quarter of a mile south-eastward from the fort in about 10 fathoms; small vessels anchor nearer the town in 3 to 4 fathoms. The harbour has an extent of $1\frac{1}{2}$ to 2 miles; the fort point is nearly steep, having 5 to 9 fathoms immediately off it, in the middle are 12 to 14 fathoms, and the soundings off the main decrease from 7 to $1\frac{1}{2}$ fathoms. Ships of war anchor in 7 to 10 fathoms half a mile northward of the fort.

The best route to Penang anchorage is from the north-westward. The north shore of the island is high and bold, and has a shoal extending out from it 1 to 2 miles, on the edge of which are soundings of 3 to 4 fathoms; hence it should not be closely approached, nor should a large ship get nearer the coast of the main land than 2 miles, on account of the shallow

* This is considered to be a well-determined position, and has been taken as a secondary meridian in determining the position of various places in the Bay of Bengal and Strait of Malacca. A shipmaster bound to Penang should have the Admiralty chart (No. 1366) at hand for reference.

flat extending from it. The soundings throughout this, the North Channel, are $4\frac{1}{2}$ and 5 fathoms, deepening to 9 and 10 fathoms in the vicinity of Georgetown. The South Channel in 1832 was safe for vessels drawing under 17 feet; the depth, as already observed, is said to have become considerably reduced.

WINDS.

CEYLON.—The position of this island is such that the weather and seasons of its N.E. side approximate to the meteorological character of the Coromandel coast, while its S.W. side has more affinity with the Malabar coast. The N.E. Monsoon prevails from November to February, and the S.W. Monsoon from April to September, the intervening months being periods of variable winds and calms. The N.E. Monsoon is the fine season of the west coast of the island, and the S.W. Monsoon the wet and stormy season.

POINT DE GALLE.—During the N.E. Monsoon, from December to March (inclusive), the harbour of Galle is always accessible, for a sea-breeze, varying from S.S.E. to W., generally prevails during a part of each day, and early in the morning the wind is from the northward, off the land. During the S.W. Monsoon, from April to November (inclusive), a heavy swell rolls into the mouth of the harbour from the southward, even though the wind frequently veers to the northward of W. The annual range of the thermometer is from 70° to 87° Fahr.

COLOMBO.—A gale of wind may occur about the changes of the Monsoon, in the months of May, June, November, and even as late as December; though a gale in the latter month is very rare, and several years sometimes pass away without any beyond a stiff Monsoon breeze. These gales are seldom violent, and communication between the shore and shipping is seldom interrupted, although there are occasional spells of squally weather and a high sea during the S.W. Monsoon, making the passage over the bar difficult. The annual range of the thermometer is from 76° to 87° Fahr.

In the **GULF OF MANAAR** the N.E. Monsoon often blows with great strength even as far south as Cape Comorin, bringing with it the bad weather common at that season on the Coromandel coast.

On the **SOUTH COAST OF THE ISLAND**, AND AS FAR AS THE **BASSES**, westerly winds are prevalent, more or less, throughout the year; for even during the period of the N.E. Monsoon, when the land and sea breezes are tolerably regular, the E. and N.E. winds of the morning change to W. and S.W. after mid-day.

On the **EAST COAST OF THE ISLAND** the N.E. Monsoon is prevalent at the same period as on the Coromandel coast. In November, the wind is from N.N.E. to E.N.E., and the weather generally squally and rainy. Heavy rain falls on the north part of the island during October, November, and December. Towards the middle of December to the end of January, although the Monsoon is occasionally strong, yet it is generally moderate from N. to N.N.E., and during the remainder of the season it is at times very hazy. Gales may, however, be expected any time during November, December, and January, rendering it dangerous to approach the east coast, for they blow for the most part dead on shore. At Trincomalie the annual range of the thermometer is from 74° to 91° Fahr.

IN PALKS BAY the S.S.W. winds are often very fresh and squally during May, June, and July.

At the change of the Monsoon land and sea breezes are prevalent.

In general, the eastern part of Ceylon, which is open to the N.E. Monsoon, partakes of the hot and dry climate of the coast of Coromandel. The western division, which is open to the S.W. Monsoon, has a climate like that of the Malabar coast, which is temperate and humid. The N.E. winds, although accompanied with rain, are drier than those from the S.W., and the country over which they blow has an arid appearance as contrasted with the luxuriant verdure of the southern and western districts, which continues during the greater part of the year. The driest seasons are those which occur between the range of the two Monsoons, partaking slightly of the influence of both.

The climate and seasons of the northern and southern districts may be thus strikingly contrasted. On one side of the island, and even on one side of a mountain, the rain may fall in torrents, while on the other the earth is parched and the herbage withered. The inhabitants in one place may be securing themselves from inundations, while in another they are carefully distributing the little water of former seasons, which is retained in their wells and tanks.

BAY OF BENGAL.—In the middle of the Bay of Bengal, during the N.E. Monsoon, the winds vary from N.N.E. to E.N.E.; during the S.W. Monsoon their direction is generally from the southward, and more persistent at sea than near the coast.

In March variable winds from S.W. to S., veering even to E. and N.E., are prevalent; frequently when the wind is from S. near the coast, it may vary from N.E. to S.E. at sea.

In April and May S.S.W. and S.W. winds are prevalent, varying to W.S.W. in May; when the breeze is light and variable, in April, it is occasionally interrupted by calms; and should it veer to N.E. and E., it may blow fresh, if not strong.

In June, July, and August, the S.W. Monsoon is at its height, variable between S.W. and W.; towards the end of July, and during August, it may veer to W.N.W. or N.W.

In September and October the prevalent winds are W. and S.S.W.; these, from the middle of August to the commencement of October, are accompanied by heavy rain; after the middle of September the Monsoon begins to die away, and winds, variable between] N.E. and N.N.W., are not uncommon.

In November variable winds from N.N.E. to E.N.E. are prevalent, and in December and January the N.E. Monsoon is fully established in the bay. In October and November the weather is squally, and a gale or two may be expected; at such times there is a copious rainfall. From the middle of December to the end of January the weather is more moderate.

February is generally a fine month, and the wind fresh from N.N.E. to N.E.; towards the end of the month the Monsoon is gradually disappearing, when southerly winds are as frequent as those from the N.

In January, February, and March, the alternations of the wind are from N.E. to S.E., rarely to S.W.

BETWEEN THE EQUATOR AND LATITUDE 8° OR 10° N., in October and November, the winds are often very fresh or strong from the westward, and continue so for several days in succession; near the Equator they will blow from N.W. to N.N.W. On the parallel of Ceylon and Acheen Head

(especially in the vicinity of the Nicobars) they vary from W.S.W. to W.N.W., while more to the north they may be from S.W. and S.S.W.

COROMANDEL COAST.—The following statement of the weather during each month of the year is from an extensive series of meteorological observations made at the Madras Observatory:—

During January the wind blows uniformly and steadily from the N.E., with occasionally an inclination towards the E. about the middle of the day, in the shape of sea-breeze. In the mornings, for the most part, heavy dew is deposited, and occasionally fog, which reaches only to two or three feet above the surface of the ground. The weather is mostly very serene, presenting about twenty days of uninterrupted clearness, and five of mist, the remaining days being clouded, with perhaps a single shower of rain; lightning is almost unknown in this month. The hottest time of the day is about 1 P.M., the coldest at 4.20 A.M.

In February the N.E. Monsoon continues, with occasional exceptions, till the middle of the month, after which calms and S.E. winds as frequently prevail. In the early part of the forenoon it is usually calm until 11 A.M., when the sea-breeze sets in, and blows till 10 or 12 P.M. During the whole of this month the weather is, without exception, always beautifully clear and placid, and it is generally considered to be the most healthy period of the year. There are no more than one day of haze, and one of clouds. Rain or lightning does not occur once in seven years. The hottest time of the day is at 0.40 P.M., the coldest at 5 A.M.

Throughout March the S. (or alongshore) wind prevails with very unequal force. It is accompanied with a profuse dampness and sultriness, which render its effects highly prejudicial to health and comfort. On this account the sea-breeze, which sets in at noon and blows till 10 P.M., is less courted than at other seasons. The sky is, however, beautifully clear for about twenty-seven days, the remaining four being cloudy. Dew less frequently occurs, and is less in quantity than last month; rain and lightning are little known. The hottest time of the day is at 0.20 P.M., the coldest at 5 A.M.

The remarks of last month relative to the winds are equally applicable to April. The S. wind, varying from S.E. to S.W., still continues, at times blowing very fresh, but occasionally calms ensue, which are exceedingly oppressive. The weather is clear for about twenty-four days, with four days of flying clouds, or haze, and two of clouds, on one of which rain falls; lightning occurs for two days. Dew is very little in quantity, and of unfrequent occurrence. The hottest time of the day is about noon, the coldest at 4.50 A.M.

The S. wind, which is mentioned as peculiar to the two last months, continues till the middle of May, relieved sometimes by a land wind from the W. or S.W. In this interval gales of wind of extreme violence have occasionally been experienced, commencing generally at the N.W., and veering to every point of the compass. About the 16th the regular land or hot winds set in, which are moderated in their effect towards the end of the month by occasional showers. The sea-breeze sets in about noon, and blows till 9 or 10 P.M. There are about nineteen days of clear weather, eight of flying clouds and haze, and four cloudy days, on two or three of which there is rain.* The dew is almost imperceptible; and lightning,

* In this statement the rain which fell during three gales of wind has been omitted; on the 2nd May, 1811, during the gale which then blew, there fell 5.5 inches; on the 8th, 9th, and 10th May, 1820, 16.54 inches; and on the 7th, 8th, and 9th May, 1827, 23.30 inches.

with thunder, occurs about four times. The hottest time of the day is 11:20 A.M., the coldest at 4:20 A.M.

The land wind has arrived at its maximum of effect about the beginning of June, being afterwards much moderated by clouds and rain. The sea-breeze, which is extremely uncertain, sets in about 1 P.M., and blows till about 9 or 10 P.M., but sometimes altogether fails. The weather is clear for about eight days, there being eleven days of flying clouds and haze, and the same number of cloudy days. Of these there are six days in which rain occurs, and three or four of lightning and thunder. Dew is almost imperceptible. The hottest time of the day is about 2 P.M., the coldest at 4:20 A.M.

With July, the rains of the S.W. Monsoon being generally in heavy but partial showers, the weather may be reckoned among the most cloudy of the year, there being only six clear days; the remaining days consist of thirteen cloudy and twelve of flying clouds and haze. Of these there are eight days on which rain falls, and about three of thunder and lightning. The sea-breeze is very uncertain as to the time it commences or ceases, and not unfrequently fails for several days together. The hottest time of the day is at 2:20 P.M., the coldest at 4 A.M.

The regular westerly winds, which terminate about the middle of August, are succeeded by winds of a light and variable nature, mostly from the W. and S. Calms, haze, and rain, occur in about the same proportions as last month, leaving about eight days of clear weather. Lightning, unattended by thunder, is very frequent, but thus accompanied it occurs only once or twice. The sea-breeze assumes much the same character as that experienced last month, commencing at 2 or 3 P.M., and continuing till 8 or 10 P.M. Dew is sometimes discovered, but more frequently fails. The hottest time of the day is at 2 P.M., the coldest at 3 A.M.

Throughout September light and variable winds, with occasional calms, continue; and with the exception that the weather is not quite so much clouded, the remarks of last month apply with equal propriety to this. Lightning occurs almost every evening, but accompanied by thunder three times only. The sea-breeze sets in about 2 or 3 P.M., and blows till 8 or 10 A.M., but occasionally fails for two or three days together. Dew is common, but small in quantity. The hottest time of the day is at 2 P.M., the coldest at 4:20 A.M.

In October the clouds begin to assume a more dense appearance than heretofore. Calms, lightning, and rain, are very frequent, till the 9th, when the N.E. Monsoon, or rainy season, sets in. From this time till the end of the month the atmosphere assumes a very disturbed appearance. Extremely heavy rain, with storms of wind, thunder, and lightning, invariably occur, and gales of wind, of a similar nature to those which occur in the earlier part of the year (*see* May), are sometimes experienced. On these occasions a depression of the barometer of four or five-tenths of an inch is observed. The sea-breeze, or rather a slight modification of the N.E. wind, is perceived towards the middle of the day. The hottest time of the day is at 1 P.M., the coldest at 4:50 A.M.

In November the N.E. Monsoon continues with unabated force, and the state of the weather generally is much the same as that experienced towards the end of October, save that an increased dampness of the air, and the less frequent occurrence of lightning, render a distinction necessary. The number of clear and cloudy days in this, as well as last month, is liable to great uncertainty. The remarks relative to the sea-breeze of

last month apply equally to this. The hottest time of the day is at 0-20 P.M., the coldest at 5-40 A.M.

The heavy rains and violent gusts of wind are much moderated at the beginning of December, and arrive at their close about the 15th. From this time the sky assumes an appearance of tranquillity and clearness, which forms a strong contrast with the disturbed state of the preceding month. The N.E. wind, however, continues throughout the month without interruption; there are about thirteen clear days, eleven cloudy, and seven days of flying clouds and haze. Of these there are six days on which rain falls. The mornings exhibit a copious deposition of dew, and sometimes a ground fog, which does not reach more than two or three feet above the surface. The sea-breeze sets in at 10 A.M., and blows till 4 P.M. The hottest time of the day is at 0-50 P.M., the coldest at 2-50 A.M.

At the **head of the Bay of Bengal** the Monsoons are very irregular, and the direction of the wind far from persistent; similar remarks apply to the period of change. To the northward of the parallel of 17° N. the N.E. Monsoon rarely blows with any strength, and is variable between N.N.E. and N.N.W. During this season calms, alternating with light airs, are very frequent.

Between **MASULIPATAM AND THE MOUTH OF THE HOOGLY**, in October and November, the N.E. Monsoon is variable; during November and December the weather is very uncertain, and heavy squalls, if not gales, may be expected. Towards January the N.E. Monsoon decreases in strength, and the rainy season terminates, after which land breezes from W.N.W. to S.W., and sea-breezes from E.N.E. set in; these continue throughout February and March, although the Monsoon may at times blow strong for a few hours. In March the winds are frequently from S.E. to E.S.E. during the day, and from S.S.W. to S.W. during the night. In the vicinity of Balasore and the Sunderbunds the wind, during March and the beginning of April, is frequently from N.W., in gusts.

In April southerly and south-easterly winds prevail—at times strong—bringing cloudy weather and fog. In Balasore roads, during May, the wind varies from S.S.E. to S.W. and W.S.W. These south-westerly winds are often very strong, especially so in May, when the weather is overcast and heavy squalls and gusts may be expected, if not a gale or two; this continues till June and July; the squalls are always accompanied by rain. The S.W. Monsoon is in its strength on this coast during June, July, and August.

The Monsoon in Balasore roads blows from W.N.W. to W.S.W., generally strong; in August the weather is very uncertain and squally, and the wind variable—from S.S.E. to S.S.W. and W.N.W. Heavy rain may also be expected at this time; in the same roadstead, during April and May, the wind usually blows from S. to S.E.; but should it pass from S.S.E. to S.W., it comes in strong gusts, with heavy rain, while it may be fine along the coast to the southward. During the change of either Monsoon, Balasore should be avoided.

At the *mouth of the HOOGLY* the weather is always very changeable between the Monsoons; and when N.W. winds occur at that time, they usually come in squalls and gusts,—with thick, cloudy weather, and lightning.

The rainy season terminates in October on the coast of **ABACAN**. Southerly winds are prevalent, yet strong N.E. and E. winds are not unusual. Thus it may be said, they are variable between N.E. and S.W.

February is the finest month of the year; the wind is from N. and E., while on the opposite side of the Bay of Bengal fresh W.N.W. and S.W. winds are prevalent. Land and sea breezes occur at this period.

Gales in the Bay of Bengal.*—In that part of the Bay of Bengal BETWEEN THE COROMANDEL COAST AND THE ANDAMAN ISLANDS the October and November storms come from W.S.W., varying to W.N.W. and N.W., and blow with great force. Sometimes they come from S.E., and more frequently still from N.E. When a N.E. gale occurs in January its strength is generally not so great as in the previous months.

Storms, during April to June, generally begin from N.N.W. to N.N.E., veering to N.E. and E., but moderating and dying out when they change to the southward of E.; they blow hardest from N.E. to E.; but should they continue in any strength from the southward and eastward, which is rarely the case, they will not moderate until they have blown hard from S.W., after which they cease. The approach of these gales towards the coast is indicated by a heavy swell, eight to twelve hours before their arrival.

On the COROMANDEL COAST the storms of April and May begin at N.W., changing in succession to N., N.E., E., or E. by S., after which they abate, having blown hardest at N.E. and E.; when the wind veers to S.E. or S., and thence to S.W., their force is very great, and they send a heavy swell towards the coast. An ugly, threatening appearance of the sky is the precursor of these storms, but the same aspect at this period may merely betoken heavy rain, with little wind. From the beginning of October to that of December is also a stormy season; when the wind blows hard from N.E., and after a lull veers to S.E., S., and S.W., it always blows hard. The coast should be avoided at the latter end of October and during November, unless bound to a port there, because general bad and squally weather begins, attended by heavy rain, thunder, and lightning. The squalls and gales, when they shift to the south of E., generally die out; a strong breeze in September off the land seldom lasts long.

At the HEAD OF THE BAY OF BENGAL, since the Monsoons are uncertain and irregular, storms are equally so; in April, May, and June, they are indicated by a partial lull in the S.W. Monsoon and a smooth sea, when the wind becomes variable—all round the compass—with calms; the horizon is clearer than usual, there is a hollow moaning through the rigging, and light gossamer threads are wafted through the air. In the storm which succeeds these signs the wind is strong from W.S.W., but passing quickly W. to W.N.W. and N.W., it blows very hard and steadily from that quarter for some time—the gale generally lasting from ten to twelve hours, and with greater force on the western than on the eastern side of the bay. Off Cape Palmyras, though ordinary gales veer as above, yet they sometimes change from N.W. to N. and N.N.E., or N.E., when, after a brief calm, they blow from S.W. with equal fury for an hour or so; then follows a breeze from E.S.E. to N.E., when it may again change to S.W. Heavy rain is a constant concomitant of these gales.

The gales of October and November are heavier than those of any other season. After a slight shower, with a moderate wind from E.S.E., the breeze freshens at E., veering to E.N.E., N.E. and N., where it gradually lulls. Sometimes the changes proceed to N.N.W. and N.W., with heavy

* KERHALLET:—"Considérations Générales sur l'Océan Indien," 3me éd. p. 29, et seq.

rain throughout. These Easterly and Northerly gales may last a day or two, and when a brief calm ensues, the wind is very likely to change rapidly to S.S.W., lasting with great fury for half an hour or more.

COASTS OF MARTABAN AND TENASSERIM.—ISLANDS OF ANDAMAN AND NICOBAR.—Along the coast the S.W. Monsoon commences towards the end of May, its direction being W. and W.S.W. until the middle of July; it attains its greatest strength in August and September, after which it becomes variable, alternating with calms and light airs. During October, when the S.W. Monsoon is about to close, land and sea breezes set in, but they are neither so strong nor so persistent as the similar breezes at the end of the N.E. Monsoon. In October and November the weather is squally, and the wind, commencing at E.S.E., will frequently pass through E. and E.N.E. to N.N.E. and N., accompanied with heavy rain.

The N.E. Monsoon is regular during December and January, decreasing in strength towards the middle of February, when the Monsoon alternates with land and sea breezes; this continues until April, the alternation being frequently from E. to N.W., though more commonly from the southward than from the northward. Calms of short duration may be expected occasionally during February, March, and April, after which the change to the S.W. Monsoon becomes sensible.

Among the islands forming the MERGUI ARCHIPELAGO, and thence both north and south, the wind is generally light during July and August—variable between N. and W. The strong winds so common in the Bay of Bengal at that period of the year lose much of their strength before reaching the archipelago. The foregoing remarks apply equally to the coast east of Cape NEGRAIS and to the Gulf of MARTABAN.

While the N.E. Monsoon, variable between N.E. by E. and E.N.E., is prevalent off the Tenasserim coast, northerly winds are frequently experienced off the islands of Andaman and Nicobar. Similarly with regard to the S.W. Monsoon, it is very irregular in the narrow sea between those islands and the coast; the winds, though generally variable between W. and N., are sometimes from S.E. or S.W., and in respect to strength are equally uncertain, heavy squalls and rain alternating with light airs or calms, while the sky is generally cloudy. The change of each Monsoon is always characterised by heavy squalls and cyclonic gales of short duration. The N.E. Monsoon (more northerly than easterly) commences among the Nicobars in November, and is the fine season; land and sea breezes are prevalent during that period, for the Monsoon wind is rarely strong, except in December and January; towards the end of April sudden squalls from the W. may occur. The S.W. Monsoon begins in May, and in the vicinity of the Andaman and Nicobars generally blows fresh or strong from the S.

STRAIT OF MALACCA.—The Monsoons are very irregular in the Strait of Malacca, and the winds variable; that of the N.E. (the fine season) lasts from November to April, the S.W. from May to October. During the S.W. Monsoon the sky is cloudy, and the weather squally, with rain.

In October and November the winds are from N.W. to W.; however, the N.E. Monsoon—from N.E. to E.N.E.—has generally set in towards the middle of November, and it blows with force in December and January, moderating in March: N. and N.W. winds are not uncommon during the season; and westerly winds at times last for a day or two. The Monsoon may be expected to draw to the N. any time between the latter end of

February and beginning of April, in which case it becomes light and variable; at this time fresh land and sea breezes prevail, with calms towards mid-day. These calms are more frequent along the Sumatra coast than along that of the peninsula of Malacca.

The S.W. Monsoon is at its height in June and July; and for four months, between May and September, it is variable, from S.W. to S., but never very strong, except at the northern entrance to the strait. Calms are now more prevalent along the Malacca than the Sumatra shore, but they are of short duration, generally occurring near mid-day; but the breeze is tolerably fresh during the night and at sunrise. The rainy season is from the end of August to the beginning of December, when in some parts, as at the N.W. entrance of the strait, the fall is very great, with the wind from N.W. and W., and squally weather.

During the S.W. Monsoon the winds on the N.E. COAST OF SUMATRA frequently hang to S.S.E. and S.E.; but during the night, when in the vicinity of the high land between Cape Pedir and the Carimon Isles, during June, July, and August, heavy and dangerous gusts from S.W. to S.—called *Sumatras*—are often experienced between midnight and 2 or 3 A.M. In some places they commence at 6 P.M. and last till 8 P.M., alternately squally and calm, strong and moderate. In the roadstead of Malacca they commence at 7 P.M. and last till midnight, and are dangerous if no precautions are taken against their approach.

Heavy squalls from the N.W. may also be expected at times off the north coast of Sumatra, as well as in the vicinity of the Carimon Isles and the Straits of Singapore; their approach is indicated by the rapid rising of a black and arched cloud, scarcely leaving time to take in sail; the first gust is the strongest, and, as is the case with the *Sumatras*, they are attended with rain, thunder, and lightning.

The Monsoons are more regular near Singapore.

WEST COAST OF SUMATRA.—This island, owing to its intersection by the Equator, is very difficult to deal with, as regards wind and weather; for there appears to be a strange blending and modification of the different Monsoons, at least along the central part of the coast, if not towards the north and south parts, where the seasons are better contrasted.

At Acheen and its vicinity the S.W. Monsoon is prevalent from April to November; this is the hot season, as well as that of rain, which falls in April, and again in August. Near the coast the winds are S. and S.S.W.; at sea, W.S.W. to S.W. Along the equatorial part of the island S. winds prevail, varied at times by those from N.W. and S.E., the former very strong. During the same months, or perhaps beginning in May and terminating in October, the S.E. Monsoon (or dry season), with the wind from S.S.E. to S.S.W., occurs, and is at its height in June, July, and August, when there are no land breezes; at the beginning and end of the season S. and S.W. winds (sea breezes) are prevalent during the day, and land breezes from N. and N.W. during the night. Strong *north-westers* are not uncommon at this season, though more prevalent north than south of the Equator.

The N.E. Monsoon, on the northern part of the island, is comparatively weak, and land and sea breezes prevail as far south as Bencoolen during December and January; this is the fine season. The N.W. Monsoon, south of the Equator, commences at the end of November and terminates in March, bringing with it rain and bad weather. The general winds are now from N.W. to W.N.W., occasionally interrupted by a breeze from S.

and S.S.E.; strong squalls, especially during the night, may always be expected at this season, and they are invariably accompanied by rain; the sea breeze often veers to W.S.W. in March and April.

As is usual in most parts of the Indian Ocean, the land and sea breezes are most conspicuous when the Monsoons become light and are dying out; and it must be remembered that the fine season at the south extreme of the island takes place during the wet season of the northern part, and *vice versa*; so also with regard to general bad weather off the coast.

Off the coast, on the Equator, calms are very frequent, and squalls and bad weather comparatively rare; but sudden gusts of short duration come off the mountains during the night, as near Priamen. At Padang the regular Monsoon is marked by the land and sea breezes, which blow with great constancy every day at right-angles to the coast; hence the land breeze is from E.N.E., and the sea breeze from W.S.W. The great quantity of rain and the frequency of thunderstorms in the months of March and April, and again from October to December, alone serve to mark the change of the Monsoon.

Cyclones in the Hoogly.—With the great Calcutta cyclone (October, 1864) fresh in the recollection of our readers—and in consideration of the enormous loss of life and waste of property resulting therefrom—we may aptly close these remarks with PIDDINGTON'S "Notes for Ships and Steamers lying in the Stream, or at Moorings at Calcutta, or near it; and for River Boats on the approach of a Cyclone:"—

"A glance at the chart of the river will show us that the Calcutta Reach of it lies about N.N.E. and S.S.W., while Garden Reach runs to the W. by N.; the next Reach, to Akra, about S., and the next S.W. to Oolabariah. This must be borne in mind.

"A cyclone at Calcutta usually commences somewhere between N. and E., say N.E. If, as in 1842, the centre passes over the city, then the north-easterly gale continues to increase in strength till it is a hurricane, the barometer always falling, of course, till the wind abates quickly to a calm more or less perfect and suddenly, which calm may continue for half an hour to two or three hours; and then comes another tremendous burst of the hurricane from the south-westward, even more violent and terrific than before, lasting till the rearward portion of the cyclone has passed over; and it is in this second part of the cyclone that the mischief of them is mostly done. If, as in the cyclone of 1852, the centre passes up to the eastward of Calcutta, then the wind veers to the northward, and is heaviest from that quarter; and it ends at N.N.W. or W. If it passed up to the westward of Calcutta, of which we have no instance on record, then the wind, beginning about E. or E.S.E., veers to S.E. and S., where it would be heaviest; and ends at S.W. The dangerous cyclones for us, then, are those of which the centre passes over or close to us, so as to bring a sudden shift.

"For, in the first part, where the centre passes over us, as the wind is generally to the eastward of N.N.E., the ships at the moorings are lying more or less under the lee of a weather shore, and no *great* sea gets up for those in the stream, though often a very disagreeable one. But in the second part the whole sea from the lower reaches rolls up, and adds greatly to the strain on the cables; the ships being also less sheltered than before. In the cyclone of 1842, ships were blown from their anchors, and drifted and sunk as high as Cossipore; and in the mooring tiers the inner ships were on shore, and the others heaped up on the top of them. In a word, every

man who has not seen a real tropical cyclone may be well assured that his imagination cannot picture to him half of its tremendous power of mischief, even in a river-port like this, where ships are apparently so safe from the effects of wind.

"And every sailor of the old school knows also that this power of mischief is increased by one-half when the wind's force exceeds a high figure (say nine on the Admiralty scale), and for all ships except men-of-war, by the infatuation of our ship and steamer owners in *under-anchoring* their vessels!—*i.e.*, giving to 1200-ton ships the anchors which an 800-ton vessel formerly carried; and so on. In steamers this has been carried to a preposterous extent—no doubt to ease them forward when driving through a sea. The steam being got up will, it is always supposed, ease the strain on the cable sufficiently. But this is often a dismal mistake, even with paddle-wheel steamers, as witness the stranding of the P. and O. C.'s steamer *Precursor* at Kedgerie in the cyclone of October, 1851, in spite of her steam; the disasters at Balaclava, where not a single captain appears to have thought of *backing* his sheet anchor! and at the Havana, a land-locked basin, where 80 vessels—steamers and sailing vessels—were driven on shore in the Cuba cyclone of 1844.

"We come now to the precautions to be taken in a river-port like Calcutta, and especially for the ships in the stream. Those at the moorings can do little else beyond looking to and doubling their bridles, and getting down as much top-hamper as they can—their topmasts even, if they can manage it, and this they may do by lending each other their scant crews; and if too late at first, doing it in the calm.

"Ships in the stream at Calcutta should first look to their hawse, which I regret to say is rarely kept clear. Then to getting down topgallant and even topmasts and lower yards, before the gale becomes too heavy.*

"The ground tackle has next to be thought of; and here we must bear in mind that in the first part of the cyclone the ship will probably be riding to her ebb anchor, and that if she drags that, even after veering away all she can, she has still to bring both anchors ahead with the longer scope on the northernmost anchor before she is adrift in that part of the gale; but the utmost care must be taken in the calm, and before the shift, to avoid her fouling her anchors, and then to be ready to veer away all the chain that can be afforded on the southernmost anchor, which, foul or clear, will now be the riding anchor till both, perhaps, are again brought ahead. I do not allude to the tides, as it is quite uncertain how they may be running, and indeed both tides are usually blown back at the surface by the force of the wind in the height of the cyclone, if it is against them.

"But in either half of the cyclone, the light anchors we have now-a-days may be insufficient to hold the ship; and as no sailor would, if he could help it, I suppose, go on shore with his sheet anchor at his bows, even in a river-port, I will assume that our ship or steamer has hers ready, with a good scope of chain to it, and the inner end properly clinched to the mainmast, so as to be ready for letting go under foot, or on parting.

"But in weather such as I have described above, the sheet-anchor alone, nor, if the chains have not ere this parted, the sheet and the two dragged bowers may be unable to hold the vessel, *unless the sheet-anchor before it*

* Nothing so common in our cyclones in the Eastern Seas as for them to rise to such strength in a few hours, that even in men-of-war the top-gallant masts cannot be got down, nor can a man go aloft!

is let go is backed, which should always be done by clinching, say twenty fathoms of hawser or chain to the crown of the sheet-anchor, and bending them to a kedge which should be ready for letting go from the cathead before the sheet is cut away from the chains. An anchor so reinforced will often hold when nothing else will, because the backer is not subject to the jerks of the lifts from the bight of the chain.

"When the sailor has done all he can with his ground tackle, if he finds himself still drifting, and above or below the shipping, he should cut away or be ready to cut away his masts; for both above and below the Calcutta Reach there are steep and dangerously hard banks; and grounding upon them in any weather is bad, and in a cyclone may prove fatal, especially to a loaded or an iron ship; and this should be borne in mind, because the soft muddy banks give a stranger to our river the idea that its shoals are also mud banks—than which, for the most of them, nothing can be more erroneous.

Postscript for Boats, or River Steamers and Flats.—In cyclones, it may often become with steamers, boats, and small craft, of great importance to know that the shift or veerings of wind will take place in such or such a direction rather than in another; for by this knowledge they can often run at the commencement of a cyclone for an anchorage, at which they can lie sheltered through the whole of it; or they can, if anchored on a weather shore, profit by the lull to get over to the other, before the shift of wind comes on, which would convert their former shelter into a dangerous lee-shore. Let us, as an example, take the Hoogly or Canton River, both much frequented, and running about north and south towards their mouths, and suppose ourselves in them exposed to a cyclone crossing them from east to west, in a launch with treasure on board, or in a steamer. It is clear that for the first half of the tempest, if the wind is to the eastward of N., the centre will pass to the south of the boat, and as the wind will be N.E. and E., and S.E.-ly, the eastern shore or any bank sheltering from these quarters is safe; but that if obliged to anchor to the south of a bank or island, when the centre is passing exactly over the boat's position, the latter part of the cyclone may drive her on shore, or sink her at her anchors. The Storm Card also shows how, if the wind is to the W.-ward of N., it will veer to the W. and S.W., and thus perhaps render an apparently safe berth really dangerous, if due precaution be not taken.

"In a word, the Law of Storms will here, as in many other cases, *forewarn* the mariner of what is to come; and 'forewarned is forearmed.' The tales which we all read of the wind's '*unfortunately shifting to the opposite quarter*,' when 'the boat (or ship) was driven on shore and all hands perished,' will be changed into—'During the lull (or when the wind had veered to —) the boat (or ship), in due anticipation of the latter part of the cyclone, changed her berth to the — shore, where she safely rode out the remainder of it without damage.' And let me add, that every officer and commander of whom this shall be said or written, will be held in that degree of professional esteem which is the rightful meed of such careful and scientific management of the lives and property entrusted to his charge, as contrasted with the fatalism, the fool-hardiness, or the helplessness of ignorance."

CURRENTS.

GULF OF MANAAR.—Throughout the Gulf of Manaar and off Colombo the currents are uncertain *during the N.E. Monsoon*; sometimes, however, they have been found setting to the S.W. at a rate of 18 or 20 miles a day. *During the S.W. Monsoon* a current runs into the gulf at the rate of 8 miles a day, and setting northward, follows the direction of the coasts into Palks Bay. Generally there is the greatest variation in the strength and direction of the currents during the change of the Monsoons.

CEYLON.—On the E. coast of Ceylon, *during the N.E. Monsoon*, but especially in October and November, a strong current sets to the southward along the coast; rounding the S. coast it takes a westerly direction as far as Point de Galle, and sometimes as far as Colombo. Its velocity has been estimated to average 40 to 48 miles a day; and on rare occasions it has been found to amount to 94 miles.

On the W. coast of Ceylon during the same season the currents are very variable. Sometimes a fresh N.N.E. wind blowing for several days will produce a moderately strong current setting northward along the coast; this is probably a continuation of that which on the E. coast takes a southerly direction, and on the S. coast of the island flows to the westward.

During the S.W. Monsoon the current flows to the eastward on the S. coast of Ceylon, and northward on its eastern coast: its velocity is never so great as during the N.E. Monsoon—at least near the coast of the island—and it is less in proportion as it approaches the shore; off the N.E. part of the island it has been estimated to run from 10 to 20 miles a day. From May to September no current is found on the E. coast of the island; while out at sea the set may be strong to N.N.E. and N.N.W. When the westerly winds are in full force, there is little or no current within 15 or 18 miles of the land.

CAPT. W. J. S. PULLEN, when surveying the dangers on the S.E. coast of Ceylon (in May, June, and July, 1860), found “the currents in the vicinity of the GREAT and LITTLE BASSAS REEFS alike remarkable for their rapidity and eccentricity. In the line of and between the two reefs, that is, about 6 miles off shore, during the S.W. Monsoon, the current sets along the coast to the N.E. at the rate of 1 to 2 miles per hour, only diverging from this, its apparently natural course, when within the influence of the broken ground of the reefs. The rate appears to be influenced by the strength of the wind, and is, consequently, most irregular.

“Towards the close of July, when running a meridian distance to the Great Bassas from Galle, notwithstanding that he had allowed fully 10 miles easterly current, he found that he had drifted outside the line of the Bassas Reefs; and at daylight, instead of having them in sight, was at least 10 miles to the S.E. of them—no bottom with 100 fathoms of line; set by a current $26\frac{1}{2}$ miles in 14 hours, or 1.85 the hour, on about a S. by E. course. Nor was this the strongest current experienced, nor in the only place. About half way between the two reefs a current of $2\frac{1}{2}$ knots, on an E. by N. course, was found.

“Midway between the line of the reefs and the shore the direction of the current assumes a more northerly trend, and the rate is reduced, until it at length becomes absorbed in an in-shore eddy, which was almost

invariably found setting along the coast to the S.W. at the rate of half a mile per hour.

"Between Point de Galle and the Bassas the current sets along the line of coast, the rates varying at different times, without any apparent cause, from 1 to 2 knots per hour, but said at times to attain the rate of even 4 knots. To the northward of the Little Bassas, close in on the eastern shore, a decidedly southerly set was experienced at the rate of nearly a mile an hour, which increased to a velocity of 2 knots near Trincomalie."

From September to March the southerly current is generally strong off Trincomalie, but especially so during October and November, when it sometimes runs from 50 to 70 miles a day.

BAY OF BENGAL.—According to D'APRES DE MANNEVILLETTE, the currents depend entirely on the Monsoons; *during the N.E. Monsoon* flowing S. and S.W., but to the N. *during the S.W. Monsoon*.

In April the general movement of the waters is to the N. and N.E., the current attaining its greatest strength (varying from 10 to 20 miles a day) in April and May.

In the middle of the gulf, during March and April, the current is weak and variable; between the Coromandel coast and the Nicobars, as well as at the entrance of the Strait of Malacca, it frequently sets S.W.; in the northern part of the bay it often flows southerly in March, and northerly in April.

During the S.W. Monsoon, in the eastern part of the bay and near the Strait of Malacca, the current often has a southerly set, like that near the Malabar coast.

At the distance of 40 or 50 leagues from the coasts, in the middle of the Bay of Bengal, the S.W.-erly current begins regularly about the middle of October or beginning of November—the time *when the N.E. Monsoon is well established*: before this the current is variable, setting S.S.W. and even N.W., or to some point between these two directions.

In January the S.W.-erly current loses its strength; and in February ceases in the middle of the bay, and perhaps on the coasts also, where, however, if there be any set, it runs towards the N. and N.W.

West Coast of the Bay of Bengal.—The current generally sets to the northward about the end of March, its velocity increasing in April and May, during which southerly winds prevail with great regularity. After May it generally slackens or ceases, and during the subsequent months generally runs southerly, though not always. At the beginning and during the strength of the N.E. Monsoon the current has been known to run $2\frac{1}{2}$ and 3 knots an hour to the southward along the Coromandel coast, abating, however, in January. The northerly current along the coast of Coromandel and all the eastern coast of Hindostan from Ceylon to Balasore, varies in direction between N. and N.E.—sometimes even E.N.E. In August, the current from the swollen waters of the Ganges is strong and extends far to seaward, contributing to modify the northerly set, and partially arresting it. During September to November a current setting W.N.W. or W.S.W. frequently prevails on the coast of Bengal. In March, the current along the entire coast most frequently flows to the southward—rarely to the northward. In the middle of the bay, during March and April, the current is very weak and variable.

East Coast of the Bay of Bengal.—On the eastern side of the Bay of Bengal, and near the Strait of Malacca during the *S.W. Monsoon*, the current sometimes sets to the southward.

During the *N.E. Monsoon*, near the Nicobar Islands, and also between them and the island of Junkseylon, a strong *N.W.* current is found, which sometimes, however, sets *N.* Between Cape Negrais and Chittagong, the current is seldom strong at any season, but from the middle of December to May a southerly current is occasionally experienced there, and from June to September a northerly set.

Throughout the bay, in the month of December, there are no currents but those produced by the tides.

MALACCA STRAIT.—The general current in Malacca Strait is to the northward all the year round, especially in the middle of the channel. During the *N.E. Monsoon*, while it is running northward from Arroa Island to Junkseylon and Pulo Rondo, it occasionally sets to the southward, along the Malay coast, where it is always more or less complicated by the tidal stream.

During the *S.W. Monsoon* the set of the current along the coast of Pedir, and thence out of the Strait, is to the westward; whilst at the same time, on the opposite side, between Pulo Rondo and Junkseylon, it runs to the northward.

WEST COAST OF SUMATRA.—On the west coast of Sumatra the current is seldom strong, generally not more than 12 to 18 miles a day.

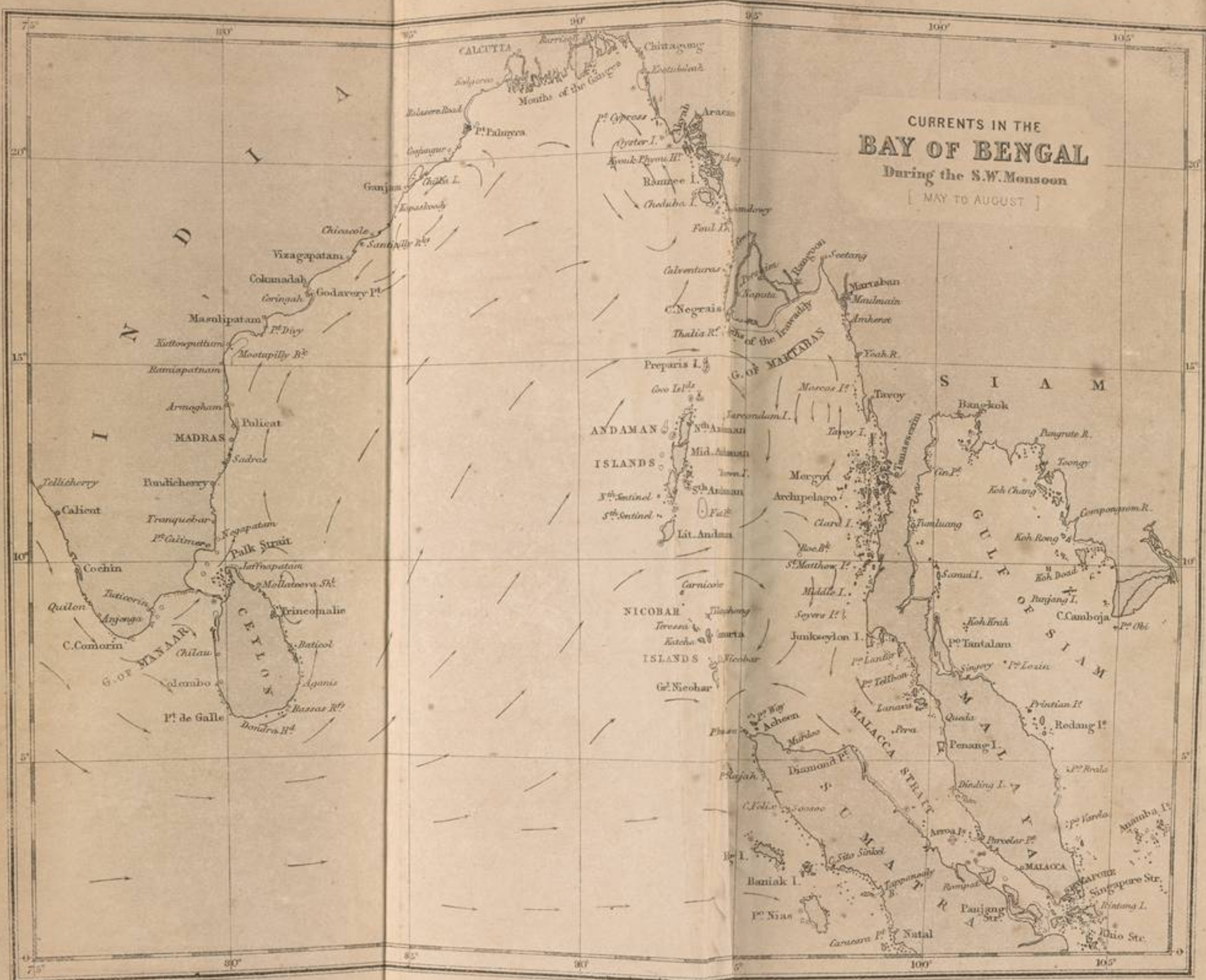
The Monsoons are so variable on this coast that they seldom influence the current to any great extent, still the general prevalence of westerly winds is such as to drive a considerable body of water towards the west coast of Sumatra, whence it sets to the *S.E.* along the coast; it very rarely runs *N.* In June and July, between Analaboe and Acheen head, a *N.W.* current, running 20 or 30 miles a day, has been experienced.

After the month of August, near Acheen, and thence along the *S.W.* coast of Sumatra, as well as on the south coast of Java, the current sets strongly to the eastward. A portion of the westerly current from Malacca Strait very frequently turns the *N.W.* point of Sumatra, and sets southward along the coast.

Most of the foregoing observations on the Bay of Bengal are from D'APRES DE MANNEVILLE, who has been, more or less, followed by all subsequent writers. It remains to draw the attention of the navigator to a paper* on the CURRENTS OF THE BAY OF BENGAL DURING THE *S.W. MONSOON*, by J. A. HEATHCOTE, Esq., L.N. :—

“**CEYLON.**—From the *S.W.* corner of the peninsula of India, the current of the *S.W. Monsoon* runs in a direction varying from *S.E.* to *S.S.E.*, according to the distance from the land, and at the rate of $\frac{1}{2}$ to $1\frac{1}{2}$ mile per hour, until about the latitude of Point de Galle, it is diverted into a more easterly course. On the line between Cape Comorin and Point de Galle, there is a strong set into the Gulf of Manaar, which begins from 30 to 35 miles outside this line, and may prove a source of danger. Vessels from Bombay to the eastward should therefore be careful to keep within the limits of the favourable *S.E.*-erly current. South of Ceylon, within

* “*Jour. Roy. Geographical Socie* 1862,” p. 234.



30 miles of the coast, the current runs strongly to the eastward from $\frac{3}{4}$ to 2 miles an hour; but farther south, that is, between the parallels of 4° and 5° , its direction is more southerly, or about E.S.E. On the east coast of Ceylon a strong current exists to S.S.E. and S., taking more or less the direction of the land, and running at the rate of $\frac{1}{4}$ to $1\frac{1}{2}$ mile an hour, or as much as 40 miles a day.

"The inaccuracy of a deduction of HORSBURGH is here apparent. He states the current at this season to be here running in an entirely opposite direction, that is, to the northward; for he argues that, as it runs to the southward in the N.E. Monsoon, it may most probably run in a contrary direction in the opposite Monsoon. Such, however, is not the case. The southerly current is well established*; not only are numerous instances of its effects on record, but the result of my own investigations has also been confirmed by the observations of officers very recently employed on the survey of the east coast of Ceylon. This current is felt not farther than from 40 to 50 miles off shore, and from its eastern limits a N.E.-erly set begins. I think it very possible that future observations may prove that this current is a return of that which flows with great velocity round the S.E. corner of Ceylon to the N.E.-ward, a portion of which may be found to bend to the northward; for, under circumstances somewhat analogous, a return current of this description is found off Cape Guardafui in Africa. At the Bassas Rocks it is met by that already described as setting eastward off the S. coast of the island; and they both together then take a N.E.-erly, and afterwards an E.N.E.-erly direction across the bay; except that in the vicinity of the parallel of 5° N. the set is less northerly, while S. of that parallel it becomes E.S.E.-erly.

"COROMANDEL.—On the coast of Coromandel a northerly set prevails within 30 miles of the shore, as far N. as the parallel of 15° ; outside these limits it turns to the north-eastward. North of the parallel of 15° it takes the direction of the land as far as Gordeware Point, and thence trends in an easterly and afterwards a north-easterly direction across the bay. From False Point nearly to Vizagapatam we have a strong S.E. current of $\frac{3}{4}$ to $1\frac{1}{2}$ mile per hour, within 30 miles of the coast; but, farther to the eastward, it gradually succumbs to the influence of the wind, and joins the general set, first in a north-easterly and then in an easterly direction across the bay.

"ARACAN.—On approaching the coast of Aracan the current becomes more northerly, and finally is governed by the form of that land, and runs strongly to the N.N.W.-ward. It thus becomes a very dangerous current for vessels making Akyab during the S.W. Monsoon. In such cases it is frequently necessary to heave-to off the port during the night; and if the existence of this current be not known, and proper precaution be not taken to keep to the southward, the vessel may be drifted into dangerous proximity to the reefs to the eastward of the harbour. In some of the works on this subject, all mention of this current is omitted, in others it is represented as running in a contrary direction; it is therefore the more necessary to call attention to it, as either the want of information on the one hand, or the existence of erroneous information on the other, may lead to injury to the greatly increasing trade of Akyab.

"CIRCULATION OF CURRENTS AND TIDAL WAVES.—This northerly current along the coast of Aracan may probably have a very intimate

* Logs of the *London*, July 1830, of the *Warren Hastings*, and of the *Kellie Castle*, May and June 1833; and of H.M.S. *Cambrian*, July 1850, &c. &c.

connection with the southerly current on the coast of Ganjam. They may both belong to the same system of circulation, the Aracan current finding its way to the westward along the sea-face of the Sunderbunds, and becoming the southerly current at False Point, and being again thrown on the coast of Aracan, as before described. But, if this be the case, any positive trace of the westerly movement is not to be discerned, or at least is most difficult to recognise in the peculiar rotatory tides which are found to seaward of the Sunderbunds. These tides set, at different periods of each tide, towards every point of the compass. The flood begins at W., at the first quarter it flows W.N.W., at half-flood it is about N., the last quarter being to E.N.E. The ebb begins at E., half-ebb runs about S., and the last quarter ebb W.S.W., thus forming a complete rotation. But although these rotatory tides go far to hide the current itself, its effects while working its way to the westward are observable in the configuration of the sandbanks off the mouths of the Ganges. The current would here exert its greatest force, and these sands are curved to the westward in a remarkable manner, their very form proving that they are under an influence stronger than that which bends the banks off the mouth of the Hoogly into their S.S.E.-erly position; the latter being due to the S.W. Monsoon itself, while the former is the effect of the current of the same Monsoon concentrated, as it were in a funnel, by the shores of Aracan. That the position of the banks off the mouths of the Ganges is *not* caused by the N.E. Monsoon, admits of but little doubt; for this portion of the sea is peculiarly sheltered from the N.E. winds, and they cannot be supposed to exert a force sufficient to affect the position of these sandbanks, as, were it so, the effects of this force would be apparent in a much greater degree to the westward; and the sands at the entrance to the Hoogly would lie in a south-westerly direction instead of their present south-easterly one.

"THE S.E. CURRENT.—A strong current to the south-eastward at the rate of $\frac{3}{4}$ to $1\frac{3}{4}$ mile per hour begins about lat. 18° and long. 90° , flows down towards Preparis Island, and then turns more easterly into the Gulf of Martaban. There is, no doubt, an accumulation of waters in the N.E. portion of the bay caused by the steady blowing of the S.W. Monsoon across the whole breadth of the sea; and this current seems to be the result of these waters attempting to find an exit. It may be of important advantage to ships from Calcutta bound to ports to the eastward, for it will materially help them in getting to the southward against the wind. From its eastern edge the currents turn off to the N.E.-ward, until near the coast of Pegu they become governed by the form of the land, and take a course to the N.N.W., joining those on the coast of Aracan already described.

"ANDAMAN ISLANDS.—The Andaman Islands play an important part in the system of currents of the S.W. Monsoon. They present an obstruction to the general set of the waters in the middle of the sea; and the same phenomena are observable in their vicinity as are to be seen wherever fluids in motion meet with an impediment under similar conditions. The currents rushing to the eastward round the N. and S. extremes of the island meet at a short distance beyond them, become confused and irregular, and throw up high rippings; while immediately under the shelter of the islands an eddy is found, running to the northward from $\frac{1}{2}$ to 1 mile per hour. That portion of the sea to the westward of the Andaman Islands is wisely avoided during the S.W. Monsoon, the reefs

lying to windward of the islands presenting dangers to which every prudent mariner would gladly give a wide berth; and I have therefore been unable to find examples of actual experience of the currents to the west of the Andamans. But it is more than probable that the north-easterly set extends close up to the islands; the waters becoming, in a certain measure, heaped up on their west side, and making their way through them and round them wherever they find an opening. Evidence of this action is particularly observable at the eastern mouth of the narrow strait which separates the South and Middle Andaman. This strait was closely examined on the occasion of the expedition—of which DR. MOUAT was the head—appointed, towards the close of the Indian mutinies, to select a site for a penal settlement in these islands. I may remark, *en passant*, that the manuscript of the original survey of the Great Andaman by LIEUT. BLAIR, executed at different periods between 1788 and 1796, and drawn on a large scale, was in the hands of the expedition, and was found to be beautifully accurate in all its details. It was our sure guide in the intricacies of channels of which no other knowledge but that afforded by this chart was to be obtained; and in those few places where it is deficient in the representation of details, we found that they had not been passed over until it had been ascertained that they could be of no practical utility. The geographical position of these islands has also been determined so far satisfactorily, that though it may not be incapable of a still nearer approach to exact truth, yet it has, I believe, attained already to a higher degree of accuracy than can be claimed for the positions at present assigned to many places of far higher commercial importance.

"MIDDLE STRAIT, GREAT ANDAMAN.—The strait between the Middle and South Andaman is one of peculiar formation; it is for the most part a narrow deep crevice, between the mountains by which it is bounded on both sides, and which are in no part distant from it much more than 300 yards, while at places the rocks completely overhang it. The channel is thus narrowed at one or two points to about 80 yards, its general breadth being from 400 to 500 yards. Its depth varies, but it is mostly deepest where it is narrowest, 25 fathoms being found where the rocks abut immediately upon the channel, and 6 fathoms where they are more distant; a depth of from 12 to 14 fathoms is, however, very generally found throughout the narrow part of the strait—its western portion, where it runs north and south, being both broader and shallower. Its western entrance from the sea has now a depth of from 4 to 6 fathoms, it having been filled up to some extent during the last seventy years, while the interior of the strait has suffered scarcely any perceptible change. We found no variation in the depth nor in the contour of the shore; even small islets of less than 50 yards in length appearing in precisely the same state as to size, elevation, and position, as represented by the first surveyor. But while the depths before mentioned are found in the strait itself, its eastern mouth is almost closed by a bank of sand and mud, which has but from 6 to 10 feet water on it; and this, I believe, may be looked upon as the effect of the current of the S.W. Monsoon, which being driven, as before described, upon the west coast of the island, finds its way through this narrow strait, and deposits at its exit the sediment which it had taken up or set in motion on its passage. The area of drainage of this strait, though small, is sufficient to throw into it a considerable quantity of silt and sand; and the very form of this bank indicates that it has come out *from* the strait, and not that it has been thrown *into* the strait by any effort of the winds

and currents of the N.E. Monsoon; and, moreover, were this latter the case, some corresponding effects would surely be observable at some of the other openings on the same side of the island, such as Port Cornwallis, the entrances north and south of Sound Island, and Port Blair, at all which places instead of shoals we find deep water. The strait between North and Middle Andaman is completely closed; it is now no longer a strait, if it ever was one; and this is not at all certain, for BLAIR had not the opportunity of surveying it. He probably found it impossible to enter even in a boat, as we did.

"In the open sea between the Mergui Archipelago and the Andamans, the influence of the prevailing wind again shows itself in a north-easterly set of $\frac{1}{2}$ to $1\frac{1}{2}$ mile per hour.

"A S.E.-erly and S.S.E.-erly current sets with considerable force down through the Mergui Archipelago and past the Seyer Islands; and from lat. 10° N. and long. 95° E., a strong current in the same direction sets, at the rate of $\frac{3}{4}$ to $1\frac{3}{4}$ mile per hour, into the entrance of the Malacca Strait. This current may probably be found some degrees farther to the eastward; but I have been unable to gather any facts in support of such a theory, though I know of nothing in opposition to it.

"The Ten-Degree Channel, between the Little Andaman and Car-Nicobar Island, is so seldom made use of as a passage for ships during the S.W. Monsoon, that I have not been able to gather a sufficient number of facts to establish the existing current.

"SUMATRA.—On the north coast of Sumatra the current of the S.W. Monsoon follows the form of the land to the westward; but this portion of the sea is sheltered from the influence of the wind. A slight return current to the eastward may be experienced in about lat. $6\frac{1}{2}^{\circ}$ N.

"Between Acheen Head and the Great Nicobar an extraordinary current is found running to the south-westward in the teeth of the Monsoon at the rate of $\frac{3}{4}$ to $1\frac{1}{2}$ mile per hour; it extends to the parallel of 5° N., and nearly to long. 92° E., when it turns to the S. and S.E. Where this current meets the ordinary N.E.-erly set, strong rippings are observed. It may be taken advantage of by ships bound westward from the Straits of Malacca, and though it is at present but little known, its existence is well substantiated by the experiences of the *Herefordshire* in August, 1825; the *Orwell* in July, 1832; the *Marquis Huntley* in August, 1831; H.M.S. *The Royalist* in June, 1845; the *Cambrian* in July and August, 1844; the *Serpent* in 1845, and again 1851; and others."

REPORTED ROCKS, &c., IN THE BAY OF BENGAL.

The following Catalogue contains the *names* and *approximate positions* of several *vigias* that have been reported as existing in the Bay of Bengal, exclusive of those which, bordering the mainland, are noticed in the Directions. They are not many, and some are *very* doubtful:—the *Bale of Cotton Rock* may possibly be an islet off the W. coast of Sumatra, but the following apposite remarks from the "INDIAN OCEAN DIRECTORY,"* on the subject of *vigias* generally, deserve the attention of mariners:—

"That some of these reported dangers are fictitious is probable, for it must be told with regret that both islands and shoals have at times, and recently too, been announced with great pomp and circumstance merely for the sake of notoriety—very unenviable in such a case; others, are given on hearsay evidence of the vaguest character; while some unquestionably represent what is described, but greatly in error as to position. The latter is no supposition, remembering the reliance once placed upon *dead-reckoning*; and as a case in point, it is well known that the E.I.C.'s ship *Derby*, bound from the Cape for Bengal in 1719, made the islands off the west coast of Sumatra and thought them to be the Maldivhs, having made $57^{\circ} 24'$ east meridian distance from the Cape. Thence, with S.W. and S.E. winds, she proceeded southward and called Trieste Island—a supposed new discovery—Gama Island, stating it to be the southernmost of the Maldivhs: still proceeding southward to get round the *supposed* Maldivhs, and having made $60^{\circ} 40'$ meridian distance east of the Cape, being then in lat. 7° S., she spoke a ship, from which she learnt that the low land in sight was Clap's Island, on the south coast of Java. On the subsequent voyage (1720) she made an error in the opposite direction, sighting Manapar Point with the church and flagstaff on a N.W. by W. bearing, and at first mistaking it for the east coast of Ceylon."

ROE BANK.—There is probably a bank of soundings in front or westward of the southern islands of the Mergui Archipelago, between latitudes $9^{\circ} 50'$ and $10^{\circ} 30'$ N., longitudes $96^{\circ} 30'$ and $97^{\circ} 30'$ E., as Captain Roe of the *Henry* is said to have obtained a cast of $8\frac{1}{2}$ fathoms on July 31st, 1822, in latitude $9^{\circ} 59'$ N., longitude $96^{\circ} 50'$ E. by *reckoning*; and, subsequently (July 25th, 1825) another cast (depth not stated) in latitude $10^{\circ} 2'$ N., longitude $96^{\circ} 46'$ E. by *chronometer*, which position is about 75 miles west from the southernmost of the St. Andrew Islands. And, Captain Heckford says that he not only has sounded on this bank, but *seen the rocks*, in latitude $10^{\circ} 2'$ N., longitude $96^{\circ} 42'$ E.; and also that he again sounded in 9 fathoms, rocks and sand plainly visible, in latitude $10^{\circ} 20'$ N., longitude $97^{\circ} 10'$ E. In reference to the last mentioned sounding (9 fathoms) Captain Heckford, in a communication to the *Nautical Magazine*, 1859, furnishes the following extract from his log, in which it will be observed, he mentions that the least depth found was 11 fathoms.

"May 10th, 1849.—At 5h. 30m. A.M., daylight, standing E.S.E., with a light wind from South and smooth sea. Observed rocks under the bottom; took a cast of the lead and found 11 fms.; kept the lead con-

* Published by J. Imray and Son.

stantly going, and had overfalls from 13 to 18 fms. At 8h. 30m., 30 fms.; next cast, no ground with 50 fms. Whilst passing over the shoal observed the bottom to be very uneven, and some of the pyramidal rocks apparently with much less water on them. Land in sight from the mast-head, bearing E. $\frac{1}{2}$ S. Longitude, by chronometer $97^{\circ} 10'$ E.; latitude, reduced from noon, $10^{\circ} 21'$ N.; and as Roe Bank is in $96^{\circ} 45'$ E. and $10^{\circ} 2'$ N., and 95 miles west of St. Matthew, I consider that shoal out 35 miles of its true position, or the shoal passed over by me to be a discovery. The portion passed over appeared to extend E.S.E. and W.N.W. about five miles; but as I was on the shoal at daylight, I am unable to state its full extent. At 8h. A.M., tacked to the W.S.W. At 8h. 30m. got the jolly boat out to try the current, and found it setting slightly to the north-westward. In jolly boat at 11h.; shoaled again to 17 fms., the rocks plainly visible, and a light breeze sprung up; braced on the starboard tack, and at noon had 28 fms., well 5 miles, lat. $10^{\circ} 20'$ N." Having this extract from the log before him, the editor of the *Nautical Magazine* proceeded to discuss the existence of this as a distinct bank, in the following manner.

"It is evident that there are either two banks, one found by Captain Heckford and the other by Captain Roe, for, as Captain H. says, there is a difference of 18 miles of latitude between them, and there appears also a difference of longitude amounting to $30'$. In order to reason from admitted facts of the subject, we addressed a few queries to Captain Heckford, to which we have received the following replies:—

18th June, 1859.

Sir,—In replying to your inquiries, I beg to state that the eye of the observer was elevated 82 feet above the level of the sea (from the main royal yard), and that in my opinion then (as now) the land seen was the peak of St. Matthew. The bearing was taken from a compass on the rail near the gangway, with a long batten placed across the compass-box, for the observer (aloft) to give a bearing as near as possible, which is magnetic, and not corrected for deviation. The distance I considered to be about 21 leagues.

I would here beg to add that the position assigned to the bank is in accordance with the longitude of the Seyer Islands. But from my long experience on this coast, I am led to believe that Barren Island, Narcondam, Elephant Point, Amherst Point, and the Torres and Seyer Islands are placed five miles too far to the westward, and which future observations I have no doubt will confirm.

I would also beg to state that I am fully convinced there is 18 miles' difference of latitude between Roe Bank and the one discovered by me, whatever may be the relative positions of these banks as to their true longitude.

I have, &c.

N. HECKFORD.

To the Editor of the *Nautical Magazine*.

"With the foregoing data we are inclined to conclude that Captain Roe's chronometer was likely to be about $30'$ too far West, because Captain Heckford's distance of the bank from the land is checked by the sight of St. Matthew's Peak from the mast-head, and which he concludes to be about 21 leagues.—(The chart makes it 62 miles.) But the bearing of St. Matthew's Peak (if the latitude of this peak be correct, and as we believe with him it is that which he saw) by no means agrees with that so carefully taken by Captain Heckford. From Captain Heckford's latitude and longitude of the bank, the peak would really bear E. 19° S., or about E.b.S. $\frac{3}{4}$ S., and not 'E. $\frac{1}{2}$ S.' For, with the peak on this bearing of 'E. $\frac{1}{2}$ S.,' Captain Heckford's position must have been in about lat. $10^{\circ} 6'$ N., assuming his longitude to be nearly right, and which we consider it to

have been; while at the same time that position agrees better with Capt. Roe's position in latitude, although differing largely from it in longitude. And we consider this difference in longitude to be more probable than that Captain Heckford should have been deceived in his view of the peak from his ship, that enabled him thus to render an important service to the chart in fixing it by his bearing and distance, as we know the peak to be 3,000 feet high, and therefore clearly within the horizon of Captain Heckford's mast-head.*

"We thus leave Roe Bank in lat. $19^{\circ} 6' N.$ on the authority of Captain Heckford's bearing and distance of St. Matthew's Peak, with the longitude assigned by him of $97^{\circ} 10' E.$ and are inclined to believe that one bank only will hereafter be found to have given rise to the question."

Vespasian Soundings.—CAPTAIN F. O. HIGGINSON, of the *Vespasian*, of Liverpool, on the voyage from England to Calcutta, made the following observations:—July 3, 1861; being to the S.E. of Ceylon, and on the southern limit of the Bay of Bengal, noticed the water to be discoloured, "brownish green;" at 11 A.M., took a cast of the lead (MASSEY'S patent lead) in 30 fathoms; steered N. $\frac{1}{4}$ E. (true) 9 miles till noon, when being in latitude $4^{\circ} 16' N.$, longitude $83^{\circ} 39' E.$, the water still discoloured, and a large number of birds around, sounded in 32 fathoms, bottom of fine white sand: continued steering the same course (viz., from noon, N. $\frac{1}{4}$ E., true, 28 miles) till 3h. 15m. P.M., when soundings were taken in 34 fathoms, hard rocky bottom—the lead came up bruised and bent; at 6 P.M., hove to and sounded in 41 fathoms, hard bottom, having made a course N. $\frac{1}{4}$ E. 51 miles since noon; no soundings afterwards.

Bale of Cotton Rock.—MR. CALLENDAR first reported this danger: "March 2nd, 1767, shipwrecked in the *Hoogly*; 28th instant, a passenger on board the *London* for Bombay, on which day the pilot left us. Light airs and calms all the way down the Bay of Bengal, with a prevailing current to the eastward. On the 5th May, steering S.E.-ly, with a variable, light breeze from the northward, we saw something ahead of us, in appearance like a large bale of cotton, being very white and round; it bore from us about S.S.E. distant about 2 miles. The sea being very smooth we kept our course as before we saw it, and by the time we got an observation, it being then noon, the rock bore, I think, about E. or E.N.E., distant half a mile or less. When we went close past the rock, being then on the west side, it was of a dark-brown, and had something like moss upon it. I think it may be about 40 feet long, about half as broad, and not over 2 feet above the surface of the water."

A Portuguese captain is reported to have seen this rock in April 1767, describing it as $1\frac{1}{2}$ or 2 feet above the water, steep-to, about 12 feet broad and 20 feet long, smooth at the top, lying S.E. and N.W.; about three ships' lengths from it, no ground at 170 fathoms.

MR. DOUGLAS, an officer of the *Countess of Errol*, is said to have been upon the rock in 1794. It was described by him to be formed like a ship's bottom, and covered with barnacles. On the east side soundings of 120 and 130 fathoms, on the N.W. and south sides no ground.

In 1797, CAPTAIN LE MEME, privateer *La Unie*, saw the Bale of Cotton

* That horizon was about 12 miles and that of the peak is 59 miles, making 71; while by the chart he was 62 miles from it, and therefore 9 miles within the distance, he would be from it if seen on the horizon from his mast-head.

Rock; he states it "to be 20 feet high, 60 long, and 20 broad, situated on a bank of sand about 300 feet long, lying S.E. and N.W. At a mile distance no ground at 100 fathoms, and 30 fathoms only a boat's length from the rock."

LIEUT. W. H. SMITH, R.N., reported that "the BALE OF COTTON ROCK is in latitude $5^{\circ} 18' N.$, and longitude $88^{\circ} 20' E.$ The summit of the rock may be about 20 feet above the level of the water, and is about 50 feet in length, and 20 in breadth. At 130 feet from the rock we found no bottom with 120 fathoms of line. We landed on the rock, where we made several good observations for the longitude, by distances of the sun and moon; it agreed exactly with the longitude given by our chronometers in the ship's run home from Cape Comorin."*

Planet Shoal.—CAPTAIN F. O. HIGGINSON, of the *Vespasian*, bound to Calcutta, reports:—"July 8th, 1861; at noon, latitude $16^{\circ} 1' N.$, longitude $84^{\circ} 51' E.$, approaching the position in the Bay of Bengal marked 'Rocky Breakers (D)'; from noon till 2h. 45m. P.M. made a true north course 22 miles, when shoal water appeared ahead, and I had to alter the course three points to clear the danger. I thought it extended from S.W. to N.E. about 2 miles, having various depths of water on it, much red weed, and many turtle around."

Gore Bank.—VICE-ADMIRAL SIR JOHN GORE, K.C.B., in H.M.S. *Melville*, on her way from Saugor roads, observes: "At noon, on the 24th July last (1832), the latitude by D. R. was $17^{\circ} 11' N.$, and longitude by D. R. $85^{\circ} 48' E.$ No observation had been obtained for two days before, the wind having blown constantly from the south-west, with heavy squalls and rain. At 4 P.M. obtained a good observation, by chronometer, which gave longitude $85^{\circ} 51' E.$;—observing the water to be discoloured, sounded in 56 fathoms, doubtful. At 5 P.M. sounded in 45 fathoms, certain, bottom. Wore ship and stood S. by E.; then followed three casts, having 42 fathoms, rocky bottom; then two casts, no bottom with 60 fathoms. At 7 P.M. had two casts, one in 25, the other in 23 fathoms. At 7:45 P.M. had two good observations of the Pole-star, which gave the latitude $17^{\circ} 30' N.$ and $17^{\circ} 31' N.$, agreeing within a mile or two of the dead reckoning. At 8 P.M. sounded in 25 fathoms; at 8:10 P.M. in 35 fathoms; at 8:20 P.M. in 40 fathoms; at 8:30 P.M. in 45 fathoms. At 8:45 and 9 P.M. 55 and 75 fathoms, no bottom. During the whole of these soundings the lead came up bruised, and the arming displaced, without anything attached to it to indicate the nature of the bottom.

"The mean of three observations (one by Antares), will place the rocky bank in latitude $17^{\circ} 26' N.$, and longitude (brought forward from 4 P.M.), $85^{\circ} 51' E.$ "

* This rock has been sought for unsuccessfully by surveying vessels in the East India Company's service. The many tracks of vessels over its assigned position sufficiently prove its non-existence.

PASSAGES TO THE BAY OF BENGAL.

FIRST OUTER ROUTE.—This is for vessels bound to the Bay of Bengal with the *certainty* of making their port *during the S.W. Monsoon*.

Having rounded the Cape, and run down the easting, steer to cross the parallel of 28° S. in longitude 82° E.; then proceed to the northward, tending to the eastward rather than the westward in crossing the S.E. Trade-wind region; cross the Equator, for the northern part of the Bay of Bengal, in longitude 84° or 85° E., and then steer direct for the port of destination.

For Trincomalie, Madras, or ports in the southern part of the bay, cross the Equator in longitude 82° or 83° E., and make the land to the *southward* of the port, as a strong northerly current is prevalent during the S.W. Monsoon.

For the Gulf of Manaar, Colombo, or Point de Galle, by this route, there is no necessity to go further east than longitude 78° or 79° , because in making the land the vessel must be to the westward, since the current during the S.W. Monsoon invariably sets round Cape Comorin into the gulf, and thence to the southward down the west coast of Ceylon.

SECOND OUTER ROUTE.—This is exclusively for the Bay of Bengal *during the N.E. Monsoon*.

Having run down the easting, cross the parallel of 28° S. in longitude 85° E., then lay up to the northward so as to pass 100 or 150 miles to the westward of Acheen Head, the N.W. point of Sumatra; and thence steer for the Nicobar Islands, leaving them to the eastward; from this point vessels may frequently make the northern part of the Bay of Bengal without tacking.

Bound to Madras, a direct course can be shaped from the Nicobars; but generally there is no occasion to cross the Equator further east than longitude 86° or 87° , if bound to the Coromandel coast or Trincomalie at this season.

The route east of the Nicobars and Andamans, when bound to the northern ports of the Bay of Bengal, is now rarely (if ever) attempted, for between those islands and the mainland the winds are generally light and variable.

When the Monsoon has fairly set in, remember the land should be made to the *northward* of the port of destination, as the current is southerly.

Bear in mind that, on any of these routes, when crossing the region of the S.E. Trade-wind, and of the Equatorial current, the tendency is to the westward, for which due allowance must be made.

Swan River to Calcutta.—If sure of making the Bay of Bengal before the S.W. Monsoon is over, steer to the N.W.-ward for the S.E. coast of Ceylon, and then proceed up the Bay on the western side.

When the N.E. Monsoon prevails in the Bay, steer N.W. (westerly) through the S.E. Trade, so as to enter the N.W. Monsoon near the meridian of 85° E., then shape a course towards Acheen Head, and proceed up the Bay.

PASSAGES FROM THE BAY OF BENGAL.

From Madras, in the S.W. Monsoon, bound round the Cape of Good Hope, endeavour to work along the coast as far as Pondicherry before leaving the land; if this cannot be done stretch off close hauled; in the offing the wind will generally veer to the westward, when a S.S.E. course may be practicable; approaching the Equator the wind will be more southerly, in which case stand on that tack on which most southing can be made; when the S.E. Trade zone is reached, steer a direct course to pass south of Rodrigues and Mauritius.

From April to November stormy weather is very rarely met with in the Southern Indian Ocean, and a vessel may then pass 30 or 40 leagues east of Rodrigues; but during the other months it is prudent to give it a berth of 70 or 80 leagues.

From Mauritius or Reunion, steer so as to pass at a distance of about 90 miles from the S.E. part of Madagascar. From the parallel of $26^{\circ} 30'$ or 27° S. bear away to the W.S.W.-ward until the African coast is made about Algoa Bay, or even as far up as Port Natal.

From the Sandheads in the S.W. Monsoon, bound round the Cape of Good Hope, endeavour to keep well to the westward, and, if possible, avoid the Andamans; but this cannot be always accomplished. HORSBURGH recommends getting into latitude 14° N. before edging away for the channel between Landfall Island and the Cocos, being more to windward than that between the Cocos and Preparis.

The following notes relate to two passages down the bay:—CAPT. L. BILTON, of the *Queen of the East*, in 1862, says: "May 15th—the last day of the springs—got to sea. We had light, variable, and baffling winds up to the 20th, when we got the S.W. Monsoon in full strength. However, I kept my reach on the starboard tack, chiefly under double reefs, and on the 23rd passed through the Preparis Channel into the Andaman Sea, and on the 25th was off Barren Island; here I met with a series of light, baffling, southerly winds, with a low barometer, and was in sight of the island till the 29th, when the S.W. wind again sprang up, and on June 3rd I made the Golden Mountain, Sumatra. On the 8th I was again on the open sea, with fine weather, having escaped the heaviest of the S.W. Monsoon—I crossed the line on the 15th, and on the 22nd got the S.E. Trades, blowing very fresh, and bringing a great beam sea. July 14th, made Mauritius."

The following remarks by CAPTAIN BLANCHARD, of the *Rivière d'Abord*, are from the *Annales Hydrographiques*, 1865:—

"I sailed from Calcutta River for Reunion, July 11th, 1864, the pilot leaving me at 6h. A.M.; the wind being tolerably strong from the S.W. and the sea rough. The next day, the appearance of the weather was bad, the sea had considerably increased, and the wind blew in heavy and sudden squalls from W.S.W. From this time until the 20th I experienced, without intermission, hard gales with strong squalls from W.S.W. and S.W., which did not admit of my making the coast of Orissa, but drove me over to the coast of Pegu.

"I determined to pass to leeward of the Andamans, and on the 20th made the channel between the two Cocos. I passed half a mile N. of the Little Coco, which at that end is quite steep; the bank of coral fringing

the S. and W. sides terminates near the N. point and approaches nearer the coast. From that point the dangers at the south end of the Great Coco were visible to the eastward, though the horizon was indistinct. The distance between the N. point of the Little Coco and the S. point of the Great Coco is 5 miles, but with the wind from W.S.W. and S.W., or even S., whatever its strength, care is requisite in avoiding the breakers off the larger island; when once under the lee of the smaller island, you may always go to the south.

"Having doubled that island, the sea was smooth, and though the squalls were still very strong, I could make sail sufficient to carry me quickly to the southward: I also found, when near the land, a counter-current running S.S.E. at the rate of from half a mile to a mile an hour. When Landfall Island bore west the weather entirely moderated—the squalls fewer, and the breeze favourable.

"July 24th, I made Pulo Rondo to the S.S.W., Pulo Way to the S., and the Golden Mountain to the S.S.E.;—the weather beautiful, the sea smooth, and a fine breeze from W.S.W.; I steered towards Pulo Way until half a mile from the land, then tacked, and soon sighted (at a short distance to the W.) the rocks south of Pulo Rondo. These rocks appeared to me united by a line of breakers level with the water, with the exception of the highest, which is separated from the others by a small, impracticable channel, and in which is considerable rippling; this rock is also distinguished by having on it two coco-nut trees of sufficient height to render it conspicuous from a distance. The second stretch on the starboard tack brought me to the N. point of Pulo Brasse, and by 6h. P.M. I had doubled (at the distance of three cables to the westward) the N.W. islets; these rocks are not perceived to be detached from Pulo Brasse until the impassable channel between is brought to bear W.N.W. In the channel between Pulo Way and Pulo Rondo I found the current setting to the west, and it is stronger the nearer you are to the N.W. islets. The wind now varied from S.W. to W.—a gentle breeze with occasional puffs.

"On the 31st of July, I crossed the Line 180 miles to the west of Sumatra. Thus, despite very unpropitious weather at the commencement of the voyage, I took but 13 days to pass down the Bay of Bengal, and in 20 days had crossed the Equator. It appears to me, therefore, more judicious to start with the determination of passing to leeward of the Andamans—at least between the middle of June and the middle of August—making no attempt to pass to windward of them; by so doing you gain time, and put less strain on the endurance of the men, while the wear and tear of the vessel is considerably lessened."

Calcutta to Swan River.—During the S.W. Monsoon work along the west coast of the Bay of Bengal far enough to windward to weather the Nicobars, then lay out of the bay on the starboard tack, cross the S.E. Monsoon and Trade, and having entered the westerly winds, proceed to the eastward for Swan River.

During the N.E. Monsoon steer to pass 80 or 90 miles west of the Andamans and Nicobars, and having entered the N.W. Monsoon, proceed along the S.W. coast of Sumatra, giving the islands a good berth in the event of the wind veering to the S.W.-ward; on this course, having reached the meridian of 110° E., stand across the S.E. Trade into the westerly winds, and then steer eastward.

PASSAGES UP OR DOWN THE BAY OF BENGAL.

For the navigation of the Bay of Bengal it may be remarked, in general terms, that there is no difficulty in proceeding from southern to northern ports during the prevalence of the S.W. Monsoon; nor from northern to southern ports during the N.E. Monsoon: also, in the lower part of the bay, vessels bound from a port on the east side to another on the west may make it with facility during the N.E. Monsoon, as vessels from a western to an eastern port have no difficulty during the S.W. Monsoon. When, however, the Monsoon is adverse, it results that a vessel must either *beat* (up or down as the case may be),—or, after standing some distance across the bay, then shape course for the port of destination; and again, at the *change* of the Monsoon the voyage may be tedious, for the light and variable winds of this period must be quite as often adverse as favourable,—requiring great judgment on the part of the commander, since no instructions would completely suffice for all the different meteorological changes which at that season occur; certain it is he should take advantage of every favourable slant, and avoid the east coast as much as possible—unless bound to or from one of the ports on that side of the bay.

Remember that on the Coromandel coast and the east coast of Ceylon the current always runs strong to the southward during the N.E. Monsoon, and to the northward during the S.W. Monsoon; consequently the land must be made 20 to 40 miles to the northward of the port in the former season, but to the southward in the latter. Also, when beating down the bay during the S.W. Monsoon every endeavour should be made to keep as far west of the Andamans as possible, so as not to make them a lee shore in case a strong westerly gale sets in. In all seasons the coast of Aracan should be avoided as much as possible.

Opinions are, however, divided as to whether, in beating down the Bay of Bengal, the Andamans should be passed to the east or to the west. If the winds permit of beating some short distance down the west side of the bay, it may be possible, when stretching across, to pass westward of the Little Andaman at the distance of about 100 miles, in which case the Nicobars may also be passed to the westward. Others are of opinion that time is lost by tacking to the westward, and that it is more advantageous to pass north of the Andamans through the principal channel, and then work down to the southward.

CAPTAIN MILLER, in a communication to the *Nautical Magazine*, in 1843, gives the following general rules for the navigation of the Bay of Bengal:—

From 15th January to 31st May . . .	{	Going north, or up the bay, take the western side; coming south, or out of it, take the eastern side.
In June, July, and August . . .	{	Going north, keep in the middle of the bay; coming south, take the eastern side, even east of the Andamans.
In September, October, and November	{	Going north, take the eastern side; coming south, take the western side.
In December, and to the 15th January	{	Going either north or south, keep the middle of the bay, and make short tacks.

Ceylon or Madras to Bengal.—The course from Ceylon or Madras to Bengal during the S.W. Monsoon is direct; keep a moderate distance from the land, and do not approach it till north of Vizagapatam.

During the N.E. Monsoon make easting across the bay; the northing can always be made on its east side, though frequently it may be possible to do so in the middle of the bay.

In February and March—end of N.E. and beginning of S.W. Monsoon—a vessel from the east coast of Ceylon may possibly make her northing direct, otherwise she must stand to the eastward. From Madras give the coast a good berth, and take advantage of the variable winds near the middle of the bay.

In September and October—end of S.W. and beginning of N.E. Monsoon—avoid the coast; stretch over to the North Andaman, or towards Cape Negrais, and when 90 to 100 miles off either, tack to the N.W.-ward.

Bengal to the Southern Ports on the West Side of the Bay.—The N.E. Monsoon is favourable, but avoid approaching too near the coast, where strong gusts prevail at the height of the Monsoon, and light variable winds towards its close. In September, with light southerly winds, work to the S.W.-ward, without leaving soundings—if possible; otherwise stand out to sea and make use of every available slant of wind.

With the S.W. Monsoon, make all the southing possible without going too far over to the east side of the bay; when 60 to 80 miles south of the port of destination steer for it. If the winds are favourable, Ceylon may probably be made from latitude 10° N. on the meridian of Point Palmyra.

Malacca Strait or Acheen to Bengal.—During the N.E. Monsoon, pass E. or W. of the Nicobars as the wind permits, in the former case entering the Bay of Bengal between Carnicobar and Little Andaman, if possible. HORSBURGH, however, recommends taking a departure from Junkseylon, then making for Narcondam Pass north of the Great Andaman, between it and the Cocos, or between the latter and Preparis.

During the S.W. Monsoon the passage should be made to the westward of the Nicobars and Andamans.

Bengal to Malacca Strait.—During the N.E. Monsoon, the most expeditious route is to pass through the channel between Cape Negrais and Preparis Island, or between Preparis and the Cocos, and then shape course to the southward. During the S.W. Monsoon, the same route (viz., between Preparis and the Cocos) may be used, but greater caution is required in making the latter group as the weather is thick and hazy; from the north end of the Andamans make for Barren Island, thence towards Seyer Island, giving it a good berth; in making to the southward, avoid alike the Andamans and the islands on the Tenasserim coast.

Various Ports of the Bay of Bengal to Rangoon.—From Bengal, during the N.E. Monsoon, sight Cape Negrais. Do not make easting until the reefs off the cape are passed. From ports on the Coromandel coast make to the northward, and take the channel north or south of Preparis, as most convenient.

From Bengal for Rangoon during the S.W. Monsoon, if the wind permit, endeavour to make Preparis—or what would be still better, Cocos Island. Then take the most convenient channel, so as to make the coast of Pegu, a little west of the bar of Rangoon. From a port on the Coromandel coast, a vessel should endeavour to make Landfall Island (Andamans) if the wind hangs to the southward, or Cocos Island if the wind draws westerly, and then pass through the channel between them; on leaving Cocos Channel steer east to sight the island of Narcondam; then steer N.E. to make the coast of Pegu, as before.

Vessels from the strait of Malacca or Acheen, bound for Rangoon during the N.E. Monsoon, should sight the westernmost of the Mergui Islands, and then make to the northward for the entrance to Rangoon River.

A vessel from Acheen or the Malacca Strait in the S.W. Monsoon, should sight the island of Narcondam, and from thence steer for Rangoon Bar.

These routes are equally available for ports on the coast of Martaban.

Rangoon to the various Ports of the Bay of Bengal.

—From Rangoon during the N.E. Monsoon for Bengal, a vessel having passed outside all the shoals near the coast of Pegu, and southward of the dangers off Cape Negrais, should then continue along the coasts of Ava and Aracan, not approaching them too close. Bound for some port on the Coromandel coast, take one of the channels between Cape Negrais and Landfall Island, and then proceed for the port of destination. Bound for the strait of Malacca, sight the southern extremity of Junkseylon. If for Acheen, steer direct for it.

Leaving Rangoon for ports on the west side of the Bay of Bengal, during the S.W. Monsoon, a vessel should, standing out to sea, endeavour to pass between the Cocos and Preparis, or through the channel north of Preparis, from whence, if bound to Bengal, the course is direct. Bound to any port on the Coromandel coast, to Acheen, or to Malacca Strait, keep out to sea if the wind becomes westerly, and endeavour to sight the island of Narcondam. Going south some boards should be made to keep the islands near the coast of Tenasserim at a moderate distance, although there are several safe channels among them. For the strait of Malacca, after having passed the south point of Junkseylon, make direct for Prince of Wales Island. Bound for Acheen, if possible get to the westward, towards the Nicobars, or else keep the southern tack till Pedir (N. coast of Sumatra) is made, and where the current (running west) will be favourable for reaching Acheen. For the Coromandel coast take the channel between Pulo Way and Pulo Brasse, then, when out at sea, make the most of every change of wind to gain westing. The voyage from Rangoon to southern and western ports is always a tedious one during the S.W. Monsoon.

Bay of Bengal to Ports on the West Coast of India, during the S.W. Monsoon.—Having crossed the Equator, and entered the region of S.E. winds, steer west between the parallels of 4° or 5° S., taking care to pass well north of Speaker Bank—the northernmost danger of the Chagos group; then pursue a course to cross the Equator in 62° or 63° E., whence the ports on the Malabar coast can readily be made; this is the *northern route*, and could only be tried suc-

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cessfully in June, July, and the beginning of August, when the S.W. Monsoon is at its height.

The *southern route*, practicable during the whole period of the S.W. Monsoon, and especially for vessels from Bengal, Sumatra, or Java, is to run down the *westing* between the parallels of 8° or 9° S.,—and south of the Chagos Archipelago; from the meridian of 70° E., bear away to cross the Equator in 62° or 63° as before. Bound to the Persian Gulf, the Equator should be crossed near the meridian of 52° E. Bound for the Red Sea, take the meridian of 48° E.

APPENDIX.

DURING the progress of this work through the press, a chart of the coast of Coromandel between Madras and Point Calimere was published by the Hydrographic Office, Admiralty (No. 71 d). It supplies corrections in the following important particulars.

POINT CALIMERE.—The land at this point has suffered so much from the sea, that the beacon upon it is now surrounded by water. At about a mile inshore is a flagstaff. The two pagodas in lat. $10^{\circ} 22\frac{1}{2}'$ N. bear West, when in line.

NEGAPATAM SHOAL is a small patch of about a mile in extent, and with only 3 fathoms upon it; it is in lat. $10^{\circ} 36'$ N., long. $79^{\circ} 55'$ E., and consequently $3\frac{3}{4}$ miles from the beach. From it a narrow 4-fathoms tongue extends $4\frac{1}{2}$ miles due North, in a direction parallel to the coast; and also extends southward from it until at last it joins the flats off Point Calimere. At a mile eastward from it the depth is 7 fathoms, and immediately westward of it 5 fathoms. As the channel between this shoal and the shore is shallow for a distance of two miles from the land, vessels approaching Negapatam from southward should keep eastward of it, in a depth of not less than 8 fathoms.

COLEROON SHOAL, in lat. $11^{\circ} 27'$ N., consists of a sandy flat at the mouth of the Coleroon River. It projects from the shore about $1\frac{1}{4}$ mile, and at a mile eastward from it is a depth of 7 to 9 fathoms.

TRIPALLOOR REEF, in lat. $12^{\circ} 37'$ N., extends one mile from the land, and is immediately succeeded by a depth of 5 and 6 fathoms, deepening to 11 and 12 fathoms at $2\frac{1}{2}$ miles from the beach. This reef runs off the coast at the seven Moolivaram pagodas.

The bank in lat. $12^{\circ} 26'$ N., 10 miles from the shore, reported to have been sounded upon by Captain Barclay, does not exist. The depth in that latitude and distance from the shore is 23 to 25 fathoms.

CHEDUBA ISLAND, on the east side of the Bay of Bengal. The following remarks on the western coast of the island of Cheduba, and on the islands and shoals south of it so far as Foul Island, are by Captain Halstead of H.M.S. *Childers*, who surveyed them in 1841.

“The extreme rocks of the reef lying off the north-west point of the island of Cheduba, are in latitude $18^{\circ} 55' 30''$ N., and in longitude $93^{\circ} 26' 30''$ E., bearing from the point N.W. $\frac{1}{2}$ N., distant 5 miles. From them the reef runs E. by N. 4 miles, having along this line two small islands; Beacon Island, lying East three-quarters of a mile from the extreme rocks, which has on it a beacon of stones about 60 feet above high water mark, and which is visible 9 miles; and Sandy Island, less high than the other, lying three-quarters of a mile from the eastern

extremity of the reef, which bears from it N.E. by E. $\frac{1}{2}$ E. Both islands have been planted with cocoa-nut trees, in order to increase their height.

"The soundings in the neighbourhood of the reef are regular, varying from 4 fathoms, a quarter of a mile off its northern face, to 8 and 9 fathoms three miles off it; while at that distance off the north-west and west ends 16 and 17 fathoms are found. An outlying rock with 7 feet water on it is found N.E. by E. of Beacon Island, distant half a mile. In the North-east Monsoon, anchorage is good in all these soundings; but the reef would afford no shelter from the heavy swell of the South-west Monsoon, at which season the channel between Cheduba and Ramree Islands (after carefully rounding the eastern extreme of the reef) is open for such purposes.

"The tides run east and west along the reef, $1\frac{1}{2}$ knot in the neaps, and nearly 3 knots in the springs, when they sometimes rise 8 feet. They are irregular in time. High water on the north coast of Cheduba at full and change is at 9h. 30m.

"The north-west point of Cheduba is a round hill (a volcano) of 200 feet in height, having casuarina trees only growing on it. It is connected with the north-west reef by a series of detached rocks above and below water, with deep water between them; and through a channel so formed, an entrance was found into a small, and (in the North-east Monsoon) good harbour, on the north coast of the island, and which was named 'Port Childers.'

"*Harbour Rock* lies S.S.E. from Beacon Island distant $1\frac{1}{4}$ mile. It is 20 feet high, 50 or 60 yards in length, the largest of all around it. From its western side a reef whose extreme is above water, extends 1 mile; 300 yards from which are 7 fathoms water; S.S.W. of it one quarter of a mile is a small rock above water; south of which another quarter of a mile is one under water, and having another bearing from it again, E. $\frac{1}{2}$ N. distant 700 yards. These two sunken rocks form the northern limit of the channel into the Port, which runs east and west, has 6 fathoms in its centre, 4 fathoms close to the two northern rocks, and 5 fathoms close to the reef forming the southern limit of the channel, which for the remarkable resemblance it bears to the ribs of a wreck is named 'Rib Reef.' The channel is half a mile wide, with the land and sea breezes blowing alternately through it either way. There is no passage for other than boats of large size, eastward of it into the Cheduba Channel; but in coming out a clear channel exists to the southward and close to the Rib Reef, which cannot, however, be recommended. In entering the Port, when the north-west point of Cheduba bears S.S.E., steer E.N.E. until it bears S. by W., when with Sandy Island bearing North, the best anchorage will be found in 4 fathoms water on a bottom of clay and mud.

"*Henry's Rock* is a detached mass 35 feet in height, visible 6 or 7 miles, bearing from the north-west point W.S.W. distant 2 miles. It is the largest mass off this part of Cheduba, and it marks the position of a considerable sized reef which surrounds it, a channel in 6 fathoms, inside of which exists; but which from the strength and irregularity of the tides is very dangerous.

"Throughout the line of coast to which these remarks refer the safe limit of approach in all ordinary cases of navigation, is 20 fathoms by day, and from 60 to 70 fathoms by night, the former clearing all dangers by about 2 miles. To the westward and to the northward of Beacon Island, however, soundings extend to a much greater distance off shore than

southward of it, where at a distance of less than 10 miles no bottom is obtained with 120 fathoms of line; and the coast of Foul Island has little less than 30 fathoms close to it all round with the exception of its north-east point.

"The western coast of Cheduba has small detached masses of rock straggling along it throughout, at a distance of less than 2 miles off the shore; but these do not prevent the practicability of anchoring along it in various parts during the North-east Monsoon, when it is frequented by native craft for rice.

"This article may then be procured in quantity, cheap, and good, as well as cattle, poultry, and fruit; water is procurable with trouble, wood with ease. But there is little inducement to anchor on its coast even at this season, while in all ordinary navigation of these seas, the whole line of coast to which these notes refer, will be well kept clear of by ships not bound to any of its ports in the South-west Monsoon, while to facilitate the entrance into these ports during that season, whether on commercial business or for refuge and refit, was the principal view with which the survey of these outlying dangers was undertaken.

"The west hill of Cheduba which rises 1300 feet, and has one large tree on its summit, may be seen by any ship approaching the north-west part of Cheduba from a very great distance; and its south peak, 1700 feet in height, will warn at a distance far beyond the limit of soundings of approach to the southern parts of the island. As these are approached, will be seen Pyramid Rock, a remarkable pinnacle rising nearly 200 feet out of the water, and distant 1 mile from the shore. It marks the situation of dangerous reefs lying southward and westward of it, and of the western shore of Flat Island, so that even in fine weather when working along this coast, to the northward of Hill Island, the Pyramid should never be brought to bear to the northward of N. by E., as there is no passage but for boats between Cheduba and Flat Island, and the channel between them is for the most part both shoal and rocky.

"The tides take the general course of the trend of the coast, running at the same rates as those found off the north-west reef, averaging the same rise in the springs, viz., 6 feet, but more irregular as to their period of rise; the North-east Monsoon, though not interfering on the coast with the regularity of the land and sea breezes, appearing to create a set to the southward. The indraught between Cheduba and Flat Island is very great.

"*Flat Island*, as its name denotes, is very low, nearly four miles in length, separated by a channel from 2 to 4 miles wide from Cheduba, and having near its centre a volcanic hill about 200 feet in height.

"*Hill Island* is a small high island about the same height as the volcano of Flat Island, from which it is separated by a channel of three-quarters of a mile; and which it much assists in recognising, lying from it due South.

"*South Rock*.—An isolated rock, 20 feet in height, lies south of Hill Island, distant half a mile; and this rock, together with an extensive reef four miles from it, bearing from the centre of Hill Island, S.S.E. $\frac{1}{2}$ E., forms the sea entrance to the channel, which, southward of Cheduba leads to and from the Bay of Bengal, to the port of Amherst Harbour, and the secure anchorages inside the islands of Ramree and Cheduba.

"*Heywood Channel*.—This channel, taking its name from Captain Peter Heywood, who seems to have been the first to use it, runs between the

shores of Hill and Flat Islands on the west, and the reefs and rocks extending from the West Shoal (above referred to) to False Island on its south-eastern limit. Its centre course is N.E. by N., in from 13 to 5 fathoms, sandy bottom as False Island is approached, and at a distance of about 2 miles from the shore and the reefs; anchorage in it is good in all moderate weather.

"*False Island* is a small low sandy islet, bearing from the volcano of Flat Island E. by S., southerly, and distant $5\frac{1}{2}$ miles. It is ordered to be planted with cocoa-nut trees.

"*West Shoal* is a dangerous reef, half a mile in diameter, with very irregular soundings around it. Half a mile from it 20 fathoms water may be found, and close to it 13 fathoms. The sea is constantly breaking on it, and at low water the points of the rocks are seen between the rollers. Unless when entering by the channels, in order to get eastward of Cheduba, Hill Island should never be brought to bear to the northward of N. by E., in order to avoid this danger.

"*Tree Island*, about 1 mile in length, 250 feet in height, and visible 10 or 12 miles, bears from Hill Island S.E. $\frac{1}{2}$ S., $11\frac{1}{2}$ miles. A reef of straggling rocks extends three-quarters of a mile off its southern point, and detached rocks are found lying half a mile distant from its eastern shore; and one patch with 4 fathoms water on it, lies at the same distance off its north-west point; with these exceptions Tree Island may with safety be approached; and it forms with the west shoal, the sea entrance to a second channel from the Bay of Bengal, into the inner anchorages to the eastward, West Shoal bearing from the north-west point of Tree Island N.W. $\frac{1}{2}$ W., 6 miles. The north-west limit of this channel is the range of reef from West Shoal to False Island; its south-east limit is formed by a large rocky reef, bearing from the north-east point of Tree Island, N. by E. $\frac{1}{2}$ E., $3\frac{1}{2}$ miles, between which and the Sail Rock of the north-west limit is a width of $4\frac{1}{2}$ miles. The fairway is N.N.E. in soundings of from 15 to 9 fathoms water.

"Its superior depth and width, and the means afforded by a clear approach to Tree Island of avoiding the danger of the West Shoal, seem to give to this channel a very great preference over the Heywood Channel. It was named Childers Channel. The tides set strong through both channels. Tree Island by triangulation and observations was found to be in lat. $18^{\circ} 26' N.$, long. $93^{\circ} 56' E.$

"*Nerbudda Rock* bears from the centre of Tree Island S.E. $\frac{1}{2}$ E., distant from the extremity of its southern reef 4 miles. It is a very small pinnacle of rock, awash at low water, with a small break of sea on it. Six fathoms of water are found close around it, and 10 fathoms within a mile, and to avoid it from the westward Tree Island must not be brought to bear to the westward of North. There is a clear channel between it and the southern reef of Tree Island, but it is preferable to round the latter.

"*Four Fathoms Shoal* is an extensive patch of rocky bottom, with very irregular soundings, from 13 to 4 fathoms. It bears from the Nerbudda S.S.E. 7 miles, and the channel between is clear, but not to be recommended. A heavy swell constantly rolls over the shoal, breaking no doubt in bad weather; but with very close soundings, nothing under 4 fathoms could be found.

"*Foul Island*, nearly 2 miles in its greatest length, and some hundreds of feet in height, being visible 10 or 12 leagues, bears from Tree Island

S.S.E. distant 25 miles, and by observations on its summit lies in lat. $18^{\circ} 3' 25''$ N., and long. $94^{\circ} 8'$ E. On its northern side is a bank of sand and mud, affording anchorage at the distance of half a mile from the shore in 8 and 10 fathoms water. Off its south point is a rocky reef of some few hundred yards in length, and with the exception of these the island is quite steep-to all round, in from 30 to 18 fathoms, rocky bottom.

"*Brougham Shoal* lies from Foul Island N. by E. $\frac{1}{2}$ E., $3\frac{1}{4}$ miles. It is a patch of rock half a mile long, with the sea always breaking on it. There are 5 fathoms water alongside it, and from 24 to 27 fathoms within a mile. It is, therefore, dangerous to approach: Foul Island affording a good mark to avoid it by.

"*Vestal Shoal* bears from the nearest part of Foul Island E. by S. 6 miles. It is small, with breakers constantly on it, and 20 fathoms of water close around it. In sailing northward or southward along these parts of the Aracan Coast, it is recommended to choose the passage between the Vestal Shoal and Foul Island, at a distance of about 2 miles from the latter.

"*William Shoal* bears from the nearest part of Foul Island, E. by S. $\frac{1}{2}$ S. $12\frac{1}{2}$ miles. It is a rocky reef extending one mile east and west, having 2 fathoms of water on its extremes, and from 5 to 7 fathoms between them. The sea rolls heavily over the reef, breaking on the shoaler parts.

"*Satellite Shoal*.—This, after a week of close search, could not be found, but its existence is not, therefore, to be doubted, though, of course, its correct position in the chart is not given. Indeed, the peculiar way in which pinnacles of rock obtrude themselves from deep water on this coast, makes it highly desirable that the portion within the line of dangers examined by the *Childers*, should be subjected to a close search, ere it be navigated with confidence by the increasing trade on this coast, when it is probable that other dangers than the *Satellite* would be discovered."

TABLE
LATITUDES AND LONGITUDES.

WEST SIDE OF THE BAY OF BENGAL.

DEPENDENT UPON MADRAS OBSERVATORY BEING IN LONGITUDE 80° 14' 19" E.	LATITUDE.	LONGITUDE.
Cape Comorin	8° 4' 35" N	77° 32' 30" E
Tuticorin (Light on Obelisk)	8 47 17	78 11 17
Paumben Pass (Lighthouse)	9 17 30	79 12 34
Katipatnam	9 58 30	79 11 10
Adrampatam	10 20 0	79 22 30
Point Calimere (extremity)	10 18 0	79 51 0
Negapatam	10 45 30	79 50 0
Carricall (centre of town)	10 55 20	79 49 0
Tranquebar (fort)	11 1 30	79 50 30
Porto Novo (centre of town)	11 29 30	79 44 30
Cuddalore (Fort St. David)	11 44 15	79 46 10
Pondicherry (centre of town)	11 55 40	79 49 0
Palar River (entrance)	12 28 0	80 8 0
Covelong	12 47 0	80 14 30
Madras (observatory)	13 4 8.1	80 14 19.5
Pulicat (Light)	13 25 10	80 19 19
Droorajapatam or Armogham	13 58 55	80 9 0
Ramiapatnam (town)	15 2 40	80 2 17
Nizampatnam (town)	15 54 30	80 39 29
Point Divy (Lighthouse)	15 58 55	81 8 15
Masulipatam (flagstaff)	16 9 40	81 8 39
Narsapoor Point (flagstaff)	16 19 0	81 42 19
Point Gordeware (Lighthouse)	16 49 5	82 18 35
Cocanadah or Kakeenada (town)	16 56 40	82 13 0
Vizagapatam	17 41 40	83 16 49
Santipilly (Lighthouse)	18 3 30	83 36 35
Calingapatam (town)	18 20 30	84 7 4
Ganjam (town)	19 23 0	85 2 49
Chilka Lake (entrance)	19 42 0	85 34 49
Juggernaut (Pagoda)	19 48 30	85 48 29
False Point (Lighthouse)	20 20 0	86 43 29
Point Palmyras (Myppurra Island)	20 43 10	87 1 19
Balasore River (entrance)	21 28 10	87 2 40
Saugor (Lighthouse)	21 38 43	88 2 10
Calcutta (Fort William flagstaff)	22 33 30	88 19 40
Mutlah River (Dalhousie Point, east side of entrance)	21 34 0	88 41 0

EAST SIDE OF THE BAY OF BENGAL.

DEPENDENT UPON FORT WILLIAM FLAGSTAFF (CALCUTTA), BEING IN LONG. 88° 19' 40" E., AND FORT CORNWALLIS* (PENANG) BEING 100° 20' 10" E.	LATITUDE.	LONGITUDE.
Chittagong (entrance)	22° 13' 0"N	91° 49' 0"E
Kootubdea (Lighthouse)	21 52 30	91 50 15
St. Martin Island (south point) ..	20 34 0	92 24 5
Oyster Island (flagstaff)	20 12 10	92 35 35
Aracan River (Lighthouse)	20 5 15	92 55 35
Terribles (south rock)	19 22 30	93 17 0
Cheduba Island (north-west point)..	18 52 30	93 29 30
Foul Island.. .. .	18 2 30	94 8 0
St. John, or Church Rocks	17 27 0	94 23 0
Calventuras (north-west group) ..	16 55 30	94 15 0
Cape Negrais	16 1 30	94 14 0
Alguada Reef (Lighthouse)	15 42 0	94 14 0
Bassein River (Hingie Island, north end).. .. .	16 0 0	94 23 0
Baragou Point	15 45 0	95 25 0
China Buckeer River (entrance) ..	16 19 0	96 9 0
Rangoon River (Elephant Point) ..	16 29 0	96 22 30
Maulmain River (Quekmi Pagoda on Amherst Point)	16 4 48	97 35 6
Double Island	15 53 0	97 36 0
Kalegouk Island (Cavendish Islet off the south end)	15 29 30	97 3 43
Northern Moscos (North Island) ..	14 27 50	97 46 33
Southern Moscos (highest part of southern large island)	13 50 0	97 55 3
Tavoy Point (Cap Island)	13 32 0	98 8 13
Tenasserim Island (highest part) ..	12 34 0	97 50 0
Ditto (city)	12 6 0	99 1 0
Western Torres (west point)	11 47 0	97 24 30
Clara Island (highest peak)	10 54 40	97 55 0
North Twin	10 33 0	97 41 0
St. Matthew's Island (peak)	9 58 0	98 11 6*
Chance Island (south point)	9 23 0	97 51 6
Sayer Islands (south islet)	8 30 0	97 36 51
Salanga or Junkseylon (south point)	7 47 0	98 16 0
Brothers	7 30 0	98 16 0
Saugald Rocks	7 10 0	98 45 0
Pulo Pera	5 42 0	98 58 0
Penang (Fort Cornwallis)	5 24 30	100 20 10

* Longitude measured from Fort Cornwallis.

TABLE OF LATITUDES AND LONGITUDES. 137

ISLAND OF CEYLON.

DEPENDENT UPON MADRAS OBSERVATORY BEING IN LONGITUDE 80° 14' 19" E.	LATITUDE.	LONGITUDE.
Colombo (Lighthouse)	6° 55' 52" N	79° 48' 40" E
Point de Galle (Lighthouse)	6 1 25	80 12 32
Great Bassas (highest part of the reef)	6 9 53	81 28 2
Little Bassas (centre)	6 22 48	81 43 23
Batticaloa River (signal station) ..	7 44 0	81 41 30
Vendeloos Bay (Elephant Point, north side of bay)	8 0 10	81 32 50
Trincomalie (Fort Frederick, flagstaff)	8 35 40	81 14 30
Ditto (Navy Yard, flagstaff) ..	8 33 30	81 13 10
Ditto (Foul Point, Lighthouse)	8 32 10	81 18 50
Moeletivoe (point on north side of inlet)	9 17 30	80 49 0
Point Pedro	9 50 30	80 14 40
Jaffnapatnam	9 40 0	79 59 30
Nedoen Teevo (north-west point) ..	9 33 30	79 37 30

ANDAMAN ISLANDS.

ALL THE POSITIONS UNCERTAIN.	LATITUDE.	LONGITUDE.
Preparis Island (north end)	14° 54' 30" N	93° 43' 30" E*
Great Coco (Table Islet)	14 9 0	93 23 40
Landfall Island (west end)	13 38 0	93 2 0
Union Ledge	13 32 0	93 12 0
Port Cornwallis (entrance)	13 18 0	93 7 0
Sound Island (north end)	12 57 0	93 4 0
Andaman Archipelago (East Island)	12 11 0	93 10 0
Port Blair (Government House, Ross Island)	11 43 0	92 49 0
Rutland Island (south end)	11 22 0	92 40 0
Sisters (southern)	11 11 0	92 44 49†
Brothers (northern islet)	10 59 0	92 40 0
Little Andaman (south-east end) ..	10 27 0	92 30 17‡
South Sentinel	10 58 0	92 13 0
North Sentinel (south-west end) ..	11 34 0	92 15 0
Port Campbell (Petrie Island, north side of entrance)	12 0 50	92 37 0
Interview Island (north end)	13 0 0	92 46 0
Narcondam Island (summit)	13 28 0	94 17 22§
Barren Island (summit)	12 16 0	93 55 26
Flat Rock on Invisible Bank	11 17 0	93 29 0¶

* Probably 93° 38' 37"; if the assumed longitude of Fort Cornwallis, Penang, (100° 20' 10"), be correct.

† Madras Observatory being 80° 14' 19" E.

‡ Longitude measured from Fort Cornwallis.

§ Dependent upon Fort Cornwallis, Penang.

|| Measured from Fort Cornwallis, Penang. Mr. Bradley, of H.M.S. *Fox*, 1848, observed the island in longitude 93° 53' 45" E. (Madras Observatory being 80° 14' 19" E.)

¶ See page 19 for other positions.

NICOBAR ISLANDS.

DEPENDENT UPON MADRAS OBSERVATORY BEING IN LONGITUDE 80° 14' 19" E.	LATITUDE.			LONGITUDE.		
	°	'	"	°	'	"
Car Nicobar (village of Saoui) ..	9	14	8N	92	44	53E
Batti Malve (centre)	8	49	0	92	51	30
Tschaura (east end)	8	25	0	93	3	37
Teressa (west point)	8	18	45	93	5	29
Katschal (south point)	7	52	10	93	26	0
Tillangschong (west side, 2 miles from north point)	8	32	29	93	34	14
Trinkut (north point)	8	8	0	93	34	10
Camorta (north point)	8	14	5	93	31	11
Nangcovri (south point)	7	56	0	93	32	20
Meroe	7	30	0	93	32	0
Little Nicobar (south point)	7	14	10	93	38	30
Cabra	7	18	0	93	51	0
Condul (south end)	7	12	17	93	39	55
Great Nicobar (Galathea Bay, point on the east side of)	6	48	26	93	49	45

NORTH COAST OF SUMATRA.

POSITIONS FROM ADMIRALTY CHART No. 219.	LATITUDE.			LONGITUDE.		
	°	'	"	°	'	"
Jambie Ayer or Diamond Point ..	5	15	30N	97	28	30E
Passangan Point	5	15	20	96	48	0
Batoo Pedir	5	30	45	95	52	20
Acheen Head (north end)	5	34	0	95	18	40
Pulo Rondo	6	4	30	95	12	0
Pulo Way (north-west end)	5	50	0	95	18	30
Pulo Brasse (north-west islet)	5	46	30	95	5	30

THE END.

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9. **Rivers THAMES and MEDWAY**, on a very large scale, extending from Sea Reach to Orfordness and the Downs, and containing plans on an extended scale of the River Medway, River Thames to London, Harwich Harbour, and Queen's and Prince's Channels. On two sheets. Drawn from the surveys made by Commanders Bullock, Hewett, R.N., &c. &c. Illustrated with views of the coast, and accompanied by a Book of Directions 8s. 0d.
 On cloth for Captains' use 10s. 6d.
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10. **RIVER THAMES**, from Ramsgate and Orfordness to the Nore. One sheet. 4s. 0d.
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11. **RIVER THAMES and STRAIT of DOVER**, showing the entire navigation from Orfordness and London to Beachy Head. With large plans of Harwich, Ramsgate, Folkestone, Dover, Calais, and Boulogne Harbours. On two sheets. Accompanied with a Book of Directions 8s. 0d.
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12. **STRAIT of DOVER**, showing the south-east coast of England from Ramsgate to Beachy Head, and the opposite coast of France from Calais to Boulogne. With plans of Ramsgate, Dover, Folkestone, Calais and Boulogne Harbours. Illustrated by numerous views of the coast. The scale is very large, being 19½ in. to 1° of Longitude. One sheet 4s. 0d.
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13. **SCILLY ISLANDS**, on a large scale, and illustrated with some views. Drawn principally from the surveys of Mr. G. Spence. One sheet 4s. 0d.
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14. **BRISTOL CHANNEL**, extending from Hartland Point and the Smalls to Bristol and Gloucester. On three sheets. Drawn from the surveys made by Commanders Robinson, R.N., Denham, R.N., Sheringham, R.N., and All-dridge, R.N., accompanied with a Book of Directions 10s. 6d.
On cloth for Captains' use 14s. 3d.
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15. **IRISH or St. GEORGE'S and BRISTOL CHANNELS**, on a very large scale, extending from Trevoise Head in Cornwall to the Firth of Clyde, with plans of Holyhead Bay, Tuskar Rocks, Lundy Island, South Coast of Man, North Rocks near Belfast, Milford Haven, River Clyde, Belfast Bay, Douglas Bay, and entrance to Loughs Foyle, Strangford, and Carlingford; and illustrated with numerous views of the coast, lighthouses, beacons, &c. On three sheets. Drawn from the surveys of Captains Beechey, Denham, Mudge, Robinson, Williams, Frazer, and Sheringham, &c. &c. accompanied with a Book of Directions 12s. 0d.
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16. **IRELAND (The West, South-West, and North Coasts of)**, from Waterford to Lough Foyle, on the same scale as the chart of the St. George's Channel, No. 15, preceding; containing plans of the harbours of Waterford, Cork, Valentia, Youghal, Bantry, Bear-Haven, Galway, Sligo, Newport, Westport, the River Shannon, and the anchorage within the Gola Islands. On three sheets. Compiled from the latest surveys, and illustrated with numerous views of the coast. Accompanied with a Book of Directions. A beautifully engraved and elegant chart 10s. 6d.
On cloth for Captains' use 14s. 3d.
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17. **NAVIGATION round IRELAND**, in two parts, either of which may be had separately.* With Sailing Directions (as below) 14s. 0d.
- Irish Channel.** With plans of Belfast, North Rocks, Maidens, &c., Tuskar Rocks, Skerries Rocks, &c., Milford Haven, South Coast of Man, and Entrance to Lough Foyle. Accompanied with a Book of Directions 7s. 0d.
- West Coast of Ireland.** With plans of Clew Bay, Broadhaven, Killala Bay, Killybegs, Sligo Harbour, Teelin Harbour, Kinsale, Galway Harbour, Tralee Bay, Valentia Harbour, and Crookhaven. Accompanied with a Book of Directions 7s. 0d.
- * This publication has hitherto been presented as one chart, but its size being very inconvenient, this new publication has been arranged in two charts. An advantage which follows from this is, that we are enabled to give more plans of harbours than hitherto.
18. **APPROACHES to the FIRTH OF CLYDE and NORTH CHANNEL**, on two large sheets, showing the navigation along the north coast of Ireland, and from the St. George's Channel to Glasgow and Greenock. Drawn from the late Admiralty surveys, and improved by remarks on some of the most important harbours, on two sheets 8s. 0d.
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On cloth and rollers for Counting-house, coloured and varnished; size 4 ft. 4 in. by 3 ft. 5 in. 20s. 0d.

19. **ENGLAND (East Coast of), from Dungeness to the River Tyne,** with plans on a large scale of the River Humber, Yarmouth Roads, Bridlington Bay, River Tyne, Hartlepool, Sunderland, &c. On four sheets. Illustrated with numerous views of the coast. With a book of Sailing Directions ... 12s. 0d.
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20. **ENGLAND (East Coast of), from Dungeness to Flamborough Head,** with plans of Yarmouth Roads, Bridlington, and the River Humber. On three sheets. With a Book of Directions 10s. 6d.
 On cloth for Captains' use 14s. 3d.
 On cloth and rollers for Counting-house, coloured and varnished; size 6 ft. 6 in. by 2 ft. 10 in. 30s. 0d.
21. **ENGLAND (East Coast of), from Orfordness to Flamborough Head,** with plans of the River Humber, Yarmouth Roads, and Bridlington Bay, and illustrated with views of the coast. On two sheets. Accompanied with a Book of Directions 8s. 0d.
 On cloth for Captains' use 10s. 6d.
 On cloth and rollers for Counting-house, coloured and varnished; size 4 ft. 4 in. by 3 ft. 5 in. 20s. 0d.
- NOTE.—This chart and the chart of the Estuaries of the Thames, No. 11, will show the navigation from Dover and London to Hull, on a very large scale.
22. **ENGLAND (East Coast of), from Orfordness to Flamborough Head,** delineating Yarmouth Roads, Hasborough Gat, Sheringham Shoals, Blakeney Harbour, the Dudgeons and Dowsings, Lynn Deeps and the Humber, with plans of Yarmouth Roads and the River Humber. On one sheet. Drawn from the survey made by Captains Hewett and Washington, R.N. 4s. 0d.
 On cloth for Captains' use 5s. 3d.
23. **EAST COAST OF ENGLAND, from Orfordness to the River Tyne,** with plans on a large scale of the River Humber, Yarmouth Roads, Bridlington Bay, Sunderland, Whitby, Scarborough, Hartlepool, and the River Tyne. On three sheets. With descriptive notes of the harbours, headlands, &c., and numerous views of the coast. Accompanied by a Book of Sailing Directions. 10s. 6d.
 On cloth for Captains' use 14s. 3d.
 On cloth and rollers for Counting-house, coloured and varnished; size 6 ft. 6 in. by 3 ft. 5 in. 31s. 6d.
- NOTE.—This chart, with Nos. 9, 10, or 11, will show the navigation from London or the Downs to Newcastle on a very large scale.
24. **YARMOUTH and LOWESTOFT ROADS,** A small plan chart showing all the leading marks, lights, &c. 1s. 0d.
25. **ENGLAND and SCOTLAND (East Coasts of), from Flamborough Head to Cape Wrath and the Orkneys,** with plans of Farn Islands, Sunderland, River Tyne, Cromarty, Pentland Firth, Hartlepool, Scarborough, Whitby, Montrose, Arbroath, Peterhead, Fraserburgh, Banff, Macduff, Aberdeen, and Wick. On three large sheets. With a Book of Directions 10s. 6d.
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26. **ENGLAND and SCOTLAND (East Coasts of), from Flamborough Head to the Orkney Islands,** with plans of Sunderland, Peterhead, Leith, and Hartlepool Harbours, the entrance to the River Tyne, &c. Improved by a full description of the signals exhibited at Sunderland and Hartlepool. Compiled from the most recent surveys. One sheet 4s. 0d.
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27. **COAL PORTS of YORKSHIRE, DURHAM, and NORTHUMBERLAND**, with plans on a large scale of the Rivers Tees and Tyne, the Ports of Sunderland, Hartlepool, Whitby, Scarborough, and Blyth, with Coquet Island Road. One sheet. Drawn from the surveys of Commanders Hewett, Slater, and Washington, R.N. Illustrated with views of the Lighthouses, &c. &c. 5s. 0d.
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30. **NORTH COAST of SCOTLAND**, from Cape Wrath to Pentland Firth, including the Orkney Islands. One sheet. 5s. 0d.
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32. **WEST COASTS of the BRITISH ISLANDS**. The same chart as No. 31 (Sea north-west of the British Islands), but with an additional sheet, thus showing the whole of the Irish Channel, the coast round Ireland, the Bristol Channel, and the English Channel west of the Isle of Wight. This chart exhibits the navigation west of the British Islands between the English Channel and the Feroe Islands. Limits, latitudes 48° 20' and 63° 35' N., and longitudes 0° 30' and 15° 40' W. On three sheets 10s. 6d.
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41. **KATTEGAT, SOUND, and BELTS**, with plans on a large scale of the Sound and Grounds, part of the Great Belt, Lamsbacka Fiord, and Wæderoe Anchorage. On two and a half sheets. Drawn from the most recent Danish and Swedish surveys, accompanied with a Book of Sailing Directions 8s. 6d.
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- 45.* **GULF of FINLAND**, on three large sheets, showing the whole navigation between Dager Ort and St. Petersburg. With plans of Cronstadt, Port Baltic or Rager Wik, Revel and Hango Harbours. Illustrated with numerous views of the coast, and accompanied by a Book of Directions 10s. 6d.
 On cloth for Captains' use 14s. 3d.

* These are all new charts, engraved in the best and clearest style. They show the navigation from the North Sea to the Gulf of Bothnia or Gulf of Finland on the largest scale yet published.

46. **COAST of NORWAY and WHITE SEA**, on a very large scale. This chart is drawn from the late Norwegian and Russian Surveys; and shows the whole navigation from the British Isles to Arkhangel. It contains plans of the vicinity of Hammerfest and Tromsø, the port of Drontheim, and the bay of Arkhangel, and is illustrated with several views of the coast. On two sheets. Accompanied with a Book of Directions 10s. 6d.
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47. **WHITE SEA**, on two large sheets. With plans of Arkhangel, Sosnovets, Veshnyak, Nokuev, Sem Islands, Iukanskie and Onega Harbours, the gulf of Onega, &c. Illustrated with numerous views of the coast, and improved by many explanatory notes. Accompanied with a Book of Directions 10s. 6d.
 On cloth for Captains' use 13s. 0d.

Shipmasters going to Arkhangel should take this chart with Nos. 34 or 35 and 46, as these publications will exhibit the whole voyage to the White Sea.

THE ATLANTIC, AND ISLANDS OF THE AZORES, &c.

48. **NORTH ATLANTIC**, from Greenland to the Equator, on a very large scale; with plans of the harbour of Funchal, Horta and Pim Bays, and Fayal Channel, and Bermuda Islands. Illustrated with some views. This chart contains much valuable information on the winds and currents, and will be found superior to any before published 8s. 0d.

On cloth for Captains' use 10s. 6d.
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49. **SOUTH ATLANTIC**, on two large sheets, from the Equator to 65° south latitude, on a very large scale; with plans of the islands of St. Helena, Ascension, Trinidad, Martin Vas, Fernando Noronha, Rocas Reef, &c. Illustrated with some views. Much valuable information on the winds, currents, and temperature of the water is embodied in this chart, and no expense has been spared in producing a good publication 8s. 0d.

On cloth for Captains' use 10s. 6d.
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NOTE.—This chart, with the chart of the North Atlantic, No. 48, shows the whole navigation to the Cape of Good Hope and Cape Horn, and will be found very serviceable, as the directions of all the currents are delineated.

50. **AZORES, or WESTERN ISLANDS**, one sheet, on a very large scale; with particular plans of Horta and Pim Bays, Fayal Channel, St. Michael Island, Ponta Delgada, Villa Franca Road, St. Lourenzo Bay, Villa da Porto, Praya, Praya in Terceira, Angra Bay, the Formigas and Dollabarot Shoals, &c. &c., illustrated with numerous views. Drawn principally from the recent survey of Captain Vidal, R.N. A beautifully engraved and cheap chart 5s. 0d.
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51. **MADEIRA, PORTO SANTO, and the DEZERTAS**, on one sheet, with a plan of the harbour of Funchal, and illustrated with some views. Drawn from the recent survey of Captain Vidal, R.N. 4s. 6d.
 On cloth for Captains' use 5s. 9d.

52. **CANARY ISLANDS**, according to the survey of Captain Vidal and Lieutenant Arlett, of the Royal Navy, containing enlarged plans of Santa Cruz, Puerto de la Luz, Arreciffe, Strait of Rio, and Strait of Bocayna, &c. Illustrated with some views 5s. 0d.
On cloth for Captains' use 6s. 3d.
53. **CAPE VERDE ISLANDS**, on a very large scale; with plans of Porto Praya, Porto Grande, Mordeiro Bay, and English Road, drawn chiefly from the surveys of Commanders A. T. E. Vidal and W. Mudge, of the Royal Navy 5s. 0d.
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COAST OF AFRICA.

54. **COAST of AFRICA, from the Strait of Gibraltar to Sierra Leone.** With plans of the harbours of Mazaghan, Salé, Mogador, Santa Cruz or Agadir, Portendic, Sierra Leone, River Senegal, River Gambia, River Cazamance, Goree, the Isles de Los, and Coast in the vicinity of Sierra Leone ... 12s. 0d.
On cloth for Captains' use 15s. 9d.
55. **COAST OF AFRICA, from Sierra Leone to the Bight of Benin.** With plans of the most important harbours, and numerous views of the coast. On three large sheets 12s. 0d.
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COASTS OF FRANCE, SPAIN, AND PORTUGAL.

- 56.* **BRITISH ISLANDS to the COAST of AFRICA**, showing the navigation between Liverpool and Ireland and Mogador. With plans of San Martin de la Arena, Castro Urdiales, Setuval, Santander, Burling Isles, Cape Finisterre, Rabat and Salé, Mazaghan, Mogador, Cadiz, and the Rivers Gironde, Tagus, and Douro. On four large sheets. With a Book of Sailing Directions 12s. 0d.
On cloth for Captains' use 17s. 0d.
- 57.* **FRANCE, SPAIN, AND PORTUGAL (the West Coasts of)**, extending from the entrance of the Irish Channel to Gibraltar. With plans on a large scale of San Martin de la Arena, Castro Urdiales, Setuval, Santander, and the Burling Isles; the Rivers Gironde, Tagus, Douro, &c. Accompanied with a Book of Directions 10s. 6d.
On cloth for Captains' use 14s. 3d.
On cloth and rollers for Counting-house, coloured and varnished; size 6 ft. 5 in. by 3 ft. 5 in. 31s. 6d.

* Either of these charts with No. 31, will show the navigation from the Færoe Islands to the Mediterranean.

58. **BAY of BISCAY**, on a very large scale, drawn from the recent surveys made by order of the French Government, with plans of the principal harbours. Accompanied with a Book of Directions 10s. 0d.
On cloth for Captains' use 12s. 6d.
59. **COASTS of SPAIN and PORTUGAL, from Cape Ortegal to the Strait of Gibraltar**; with plans on a large scale of the Rivers Tagus and Douro, the harbours of Ferrol, Corcubion, Vigo, San Lucar, &c. Drawn from the late Spanish and Portuguese surveys, and improved by the introduction of descriptive notes, views of Headlands, &c. Accompanied with a Book of Sailing Directions 8s. 0d.
On cloth for Captains' use 10s. 6d.

This chart and No. 58 preceding (the Bay of Biscay) show the navigation from the English Channel to the Mediterranean on a large scale.

THE MEDITERRANEAN SEA.

60. **The MEDITERRANEAN SEA.** Four sheets. On a large scale, with about 30 plans of the harbours, &c., among which are the following:—Malaga, Alicante, Barcelona, Villefranche, Strait of Gibraltar, Cartagena, Genoa, Hyeres Road, Leghorn, Toulon, Cagliari, Algiers, Strait of Bonifacio, Gulf of Naples, Palermo, Strait of Messina, Valetta, Smyrna, River Danube, Alexandria, Cephalonia, Trieste, Patras, &c. Illustrated with numerous views of the coast, and descriptive notes. Drawn from the late surveys made by order of the British, French, Austrian, and Russian Governments, by Commanders Smyth, Copeland, Graves, Monnier, Le Saulnier de Vauhelle, Gautier, Beauteemps-Beaupré, De Hell, A. Berrard, Dortet De Tesson, &c. A beautifully engraved chart, accompanied with a Book of Directions 14s. 0d.
 On cloth for Captains' use 19s. 0d.
 On cloth and rollers for Counting-house, coloured and varnished; size 8 ft. 4 in. by 3 ft. 4 in. 42s. 0d.
 The same chart, without the Book of Directions 12s. 0d.
 This chart may also be had in two Parts, as follows:—
61. **(Part I.)—Gibraltar to Sicily,** on two sheets. This chart shows the navigation between the coast of Portugal and Sicily, and contains the following plans, besides numerous views of the coast:—Gibraltar, Channel between Corsica and Italy, Villefranche, Barcelona, Mahon in Minorca, Alicante, Malaga, Almeria, Cartagena, Strait of Gibraltar, Valetta, Strait of Messina, Palermo, Gulf of Naples, Strait of Bonifacio, Algiers, Genoa, Hyeres Road, Leghorn, Toulon, and Cagliari. Accompanied with a Book of Directions 8s. 0d.
 On cloth for Captains' use 10s. 6d.
62. **(Part II.)—Italy to Alexandria,** on two sheets. This chart comprises the navigation between the Gulf of Venice, Black Sea, and the Levant, and contains plans of the harbours of Alexandria, Cephalonia, Trieste, Gulf of Patras, the Channel between Zante and the Morea, Mouths of the Danube, Odessa, Smyrna, &c.; it is also illustrated with several views. Accompanied with a Book of Directions 8s. 0d.
 On cloth for Captains' use... .. 10s. 6d.
63. **MEDITERRANEAN SEA (Western Portion of),** on three large sheets, showing the navigation between Gibraltar and Malta on the most extensive scale yet published. With numerous plans of the most important harbours. Accompanied with a Book of Directions 12s. 0d.
 On cloth for Captains' use 15s. 9d.
64. **MEDITERRANEAN SEA (Middle Portion of),** on two large sheets, showing the navigation between Sicily and Malta and the Grecian Archipelago. Compiled from the most recent surveys, with plans of harbours. Accompanied with a Book of Directions 8s. 6d.
 On cloth for Captains' use 11s. 0d.
65. **MEDITERRANEAN SEA (Eastern or Levant Portion),** on two large sheets, showing the navigation between the Grecian Archipelago and the coasts of Egypt and Syria. With plans of the most important harbours. Compiled from the most recent surveys. Accompanied with a Book of Directions 10s. 0d.
 On cloth for Captains' use 12s. 6d.
66. **ADRIATIC or GULF of VENICE,** on two large sheets, with numerous plans of harbours and views of the coast. Accompanied by a Book of Sailing Directions 10s. 6d.
 On cloth for Captains' use 13s. 0d.
67. **ISLAND of SICILY,** on a large scale, with plans of the principal harbours, viz:—Messina, Syracuse, Augusta, Bay of Palermo, and Trapani. A new edition revised and corrected. On one sheet 5s. 0d.
 On cloth for Captains' use 6s. 3d.

68. **ARCHIPELAGO and IONIAN ISLANDS**, on two sheets, on a very large scale, with plans of Marmorice and Karagatch Harbours, Corfu and Zante Bays, the Gulf of Smyrna and Khios Strait, &c., and illustrated with several views of the coast. Drawn chiefly from the late surveys of Commanders W. H. Smyth, R. Copeland, T. Graves, &c., of the Royal Navy. A beautifully engraved and accurate chart 10s. 6d.
 On cloth for Captains' use 13s. 0d.
 On cloth and rollers for Counting-house, coloured and varnished; size 4 ft. 4 in. by 3 ft. 5 in. 22s. 6d.
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 On cloth for Captains' use 6s. 3d.
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 On cloth for Captains' use 15s. 9d.
 On cloth and rollers for Counting-house, coloured and varnished; size 6 ft. 5 in. by 3 ft. 5 in. 31s. 6d.

* Shipmasters bound to the Black Sea or Sea of Azov, should provide themselves with the charts No. 63, 64, 68, 69, 70, 71, as they show the navigation on a very large scale.

COASTS OF NORTH AMERICA, THE WEST INDIES, &c.

72. **NEWFOUNDLAND and COAST of LABRADOR**, on four sheets. This chart is drawn from the late English and French surveys, and is believed to contain the most recent and reliable information. It is on four large sheets, and the various plans of the harbours of Quirpon, St. Margaret's Bay, Cod Roy, St. Pierre, Trepassy, Croc, St. John's, Harbour Grace, Conception Bay, Sandwich, Chateau, Red Bay, St. Lunaire Bay, &c., cannot fail to add to its utility; there are also many explanatory remarks, useful as hints to those making the land. Accompanied with a Book of Directions 12s. 0d.
 On cloth for Captains' use 17s. 0d.
 On cloth and rollers for Counting-house, coloured and varnished; size 4 ft. 10 in. by 3 ft. 9 in. 31s. 6d.
73. **BANKS and Part of the Island of NEWFOUNDLAND**, on two sheets. Compiled principally from the recent surveys made by order of the French Government. This chart contains plans of St. John's and St. Pierre Harbours, and shows the Banks in an accurate manner, on a very large scale, and will be found extremely useful to those engaged in the Quebec and Montreal trade 7s. 6d.
 On cloth for Captains' use 10s. 0d.
74. **COAST of LABRADOR, and North Part of the ISLAND of NEWFOUNDLAND**, on two sheets. With plans, on a large scale, of Croc Harbour and the Strait of Belle Isle. This chart extends from lat. 48° 30' to 55° 30' N., and exhibits the Coast of Labrador to that latitude, and will be found very useful to the Labrador fishermen and St. Lawrence traders, as, independent of the plans, it gives the coast on a large scale 7s. 6d.
 On cloth for Captains' use 10s. 0d.

75. **GULF and RIVER ST. LAWRENCE**, on three sheets. This chart shows the Coast of North America between Belle Isle and Cape Cod, and includes therefore, the Island of Newfoundland, the Gulf and River St. Lawrence, and Coast of Nova Scotia. In it are plans of Halifax, Conception Bay, Strait of Belle Isle, St. Pierre, Harbour Grace, Cape Race, Cape Ray, &c. &c. Accompanied by a Book of Directions 12s. 0d.
 On cloth for Captains' use 15s. 9d.
 On cloth and rollers for Counting-house, coloured and varnished; size 6 ft. 5 in. by 3 ft. 5 in. 31s. 6d.
76. **GULF of St. LAWRENCE**, on two sheets, on a large scale, with plans of Gaspé Harbour, Miramichi Bay, Hillsbro' Bay, and the Mingan Islands. Drawn from the recent surveys of Captain Bayfield, R.N. 8s. 0d.
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77. **COAST of NORTH AMERICA from Scatari Island to Cape Cod**, (on three sheets,) including Nova Scotia, the Bay of Fundy, &c., with plans of the harbours of Halifax, Fourchu, Yarmouth, Annapolis, Salem, Portland, Portsmouth, St. John's, and of numerous anchorages on various parts of the coast. Illustrated with views of the coast 10s. 6d.
 On cloth for Captains' use 14s. 3d.
78. **COAST of NORTH AMERICA, from CAPE CANSO to NEW YORK and the RIVER DELAWARE**, on three large sheets, with plans of several harbours. Accompanied with a Book of Directions 12s. 0d.
 On cloth for Captains' use 15s. 9d.
 On cloth and rollers for Counting-house, coloured and varnished; size 6 ft. 5 in. by 3 ft. 5 in. 31s. 6d.
79. **COAST of NORTH AMERICA, from NEW YORK and the RIVER DELAWARE to the STRAIT of FLORIDA**, on three large sheets, with plans of the most important harbours. Accompanied with a Book of Sailing Directions. 12s. 0d.
 On cloth for Captains' use 15s. 9d.
 On cloth and rollers for Counting-house, coloured and varnished; size 6 ft. 5 in. by 3 ft. 5 in. 31s. 6d.
- NOTE.—These Charts (Nos. 78 and 79) show the whole of the Atlantic sea-board of the United States, and are intended to accompany each other. They include the various surveys made by the officers engaged in the survey of the coast of the United States, and have been engraved at considerable expense, and the greatest care has been taken in their construction, that they may not be inferior to any published.
80. **BAHAMA ISLANDS and BANKS**, on two large sheets. Showing the Strait of Florida and adjacent coasts, with plans, on a large scale, of the principal harbours. Drawn from the late surveys of Commanders Owen and Barnett, of the Royal Navy, and the Spanish and United States Coast Surveys 8s. 0d.
 On cloth for Captains' use 10s. 6d.
81. **WEST INDIES and COAST of COLOMBIA**, with plans, on a large scale, of the harbours of Vera Cruz, Port Royal, Chagres, Aspinwall, and Havana. Compiled from the latest English, French, and Spanish surveys, and improved by the introduction of views of the coast, descriptive notes, &c. &c. 10s. 6d.
 On cloth for Captains' use 15s. 6d.
 On cloth and rollers for Counting-house, coloured and varnished; size 4 ft. 10 in. by 3 ft. 3 in. 27s. 0d.
82. **GULF of MEXICO, and Islands of Cuba, Haiti, Jamaica, the Caribbees, &c.**, on four large sheets. Showing the Windward Passages on a large scale. With a Book of Directions 18s. 0d.
 On cloth for Captains' use 23s. 0d.
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83. **GULF of MEXICO, and Islands of Cuba, Haiti, and Jamaica**, being three sheets of Chart No. 82, drawn principally from the surveys of Commanders Owen and Barnett. Accompanied with a Book of Directions ... 14s. 0d.
 On cloth for Captains' use ... 17s. 9d.
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85. **COAST of COLOMBIA and CARIBBEAN SEA**, on three large sheets, with plans of the harbours of Greytown, Barcelona, Cumana, Porto Cabello, Santa Anna, Sabanillo, La Guayra, Chagres, &c. &c. Drawn from the late surveys made by order of the British and Spanish Governments; accompanied with a Book of Directions ... 12s. 0d.
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* These two charts (Nos. 92 and 93) comprise the whole of the Brazil Coast, and are laid down upon the plain scale, not the diagonal.

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EAST INDIA ARCHIPELAGO, CHINA, &c.

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- 118.* **EAST INDIA ARCHIPELAGO. (Western Route to China, Chart No. 3.)** Limits, latitudes 3° N. to 16° 20' N., and longitudes 99° 20' to 110° E. 7s. 6d.
- 119.* **EAST INDIA ARCHIPELAGO. (Western Route to China, Chart No. 4.)** Limits, latitudes 1° 20' to 11° 52' N., and longitudes 107° 20' to 120° 40' E. 7s. 6d.
- 120.* **EAST INDIA ARCHIPELAGO. (Western Route to China, Chart No. 5.)** Limits, latitudes 10° 50' and 23° 40' N., and longitudes 104° 45' and 115° 20' E. 7s. 6d.
- 121.* **EAST INDIA ARCHIPELAGO. (Western Route to China, Chart No. 6.)** Limits, latitudes 10° 50' and 23° 40' N., and longitudes 112° 10' and 122° 45' E. 7s. 6d.

* These charts (Nos. 116 to 121) of what is popularly known as the Western Route to China, exhibit the navigation from Sunda Strait to the Coast of China on a very large scale. Each consists of two sheets; the set, therefore, comprises twelve sheets. They have been compiled from the most recent British, French, Dutch, and Spanish surveys. In several of the charts there are notes descriptive of the currents, winds, &c., and remarks upon the courses most advisable to follow at certain periods of the year. If mounted on cloth for Captains' use, the price of each will be 2s. 6d. extra. An Index Chart accompanies the set.

122. **STRAITS OF MALACCA and SINGAPORE**, on two large sheets, with plans of Singapore Strait, Singapore Harbour, Penang Island, Strait of Durian, &c. Drawn from the most recent surveys 10s. 6d.
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- 127.* **EAST INDIA ARCHIPELAGO (Eastern Passages to China and Japan,—Chart No. 2)**, showing the Banda Sea and great island of Timor, Pitts Passage, &c. Limits, latitudes $2^{\circ} 30'$ and $12^{\circ} 20' S.$, and longitudes $121^{\circ} 30'$ and $133^{\circ} 40' E.$ 7s. 6d.
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- 128.* **EAST INDIA ARCHIPELAGO (Eastern Passages to China and Japan,—Chart No. 3)**, showing the Arafura Sea, Torres Strait, &c. Limits, latitudes $2^{\circ} 30'$ and $12^{\circ} 20' S.$, and longitudes 133° and $145^{\circ} 15' E.$ 7s. 6d.
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- 130.* **EAST INDIA ARCHIPELAGO (Eastern Passages to China and Japan,—Chart No. 5)**, showing the Molucca Islands and south part of the Philippines. Limits, latitudes $3^{\circ} 20' S.$ and $8^{\circ} 40' N.$, and longitudes 125° and $134^{\circ} 40' E.$ 7s. 6d.
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- 131.* **EAST INDIA ARCHIPELAGO (Eastern Passages to China and Japan,—Chart No. 6)**, showing the greater part of the Philippines, the Sulu Sea, &c. Limits, latitudes 8° and $17^{\circ} 40' N.$, and longitudes $118^{\circ} 20'$ and $130^{\circ} 20' E.$ 7s. 6d.
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- 134.* **EAST INDIA ARCHIPELAGO** (Eastern Passages to China and Japan,—Chart No. 9), showing the islands of Japan. With numerous plans of harbours. Limits, latitudes 32° and 43° 54' N., longitudes 127° and 146° E. 7s. 6d.
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* These charts of the eastern portion of the East India Archipelago and the Eastern and Yellow Seas, show the various islands and passages on the largest scale yet published. Each consists of two large sheets (double elephant size), so that the whole series is composed of eighteen sheets. They have been compiled from the most recent English, Dutch, French, and Spanish surveys, and no expense has been spared to make them the most complete and accurate charts of these seas in existence. Shipmasters proceeding to Eastern Australia from China and Japan should take, in addition to these charts, those of the Western Pacific Ocean, numbered 138, 139, and 140. An Explanatory Index Chart accompanies each set of charts.

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* These are new publications, and show the great Pacific Ocean on a large scale.

- 138.* **PACIFIC OCEAN (Western Part, No. 1)**, on two large sheets. Showing the navigation northward from Sydney (Eastern Australia) to Torres Strait, and through the New Hebrides, &c. Limits; Latitudes 0° to 38° S., and Longitudes 140° to 172° 40' E. 7s. 6d.
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- 139.* **PACIFIC OCEAN (Western Part, No. 2)**, on two large sheets. Limits; Latitudes 3° S. to 35° 30' N., and Longitudes 150° E. to 177° 20' W. In this chart there are about forty plans of the principal islands and harbours met with in the route from Australia to China and Japan. 7s. 6d.
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* These three charts (Nos. 138, 139, 140), show the navigation between Eastern Australia and Japan, on the largest scale yet published. The numerous plans of harbours and islands (40 in number) greatly increase their usefulness. An Index Chart accompanies the set.

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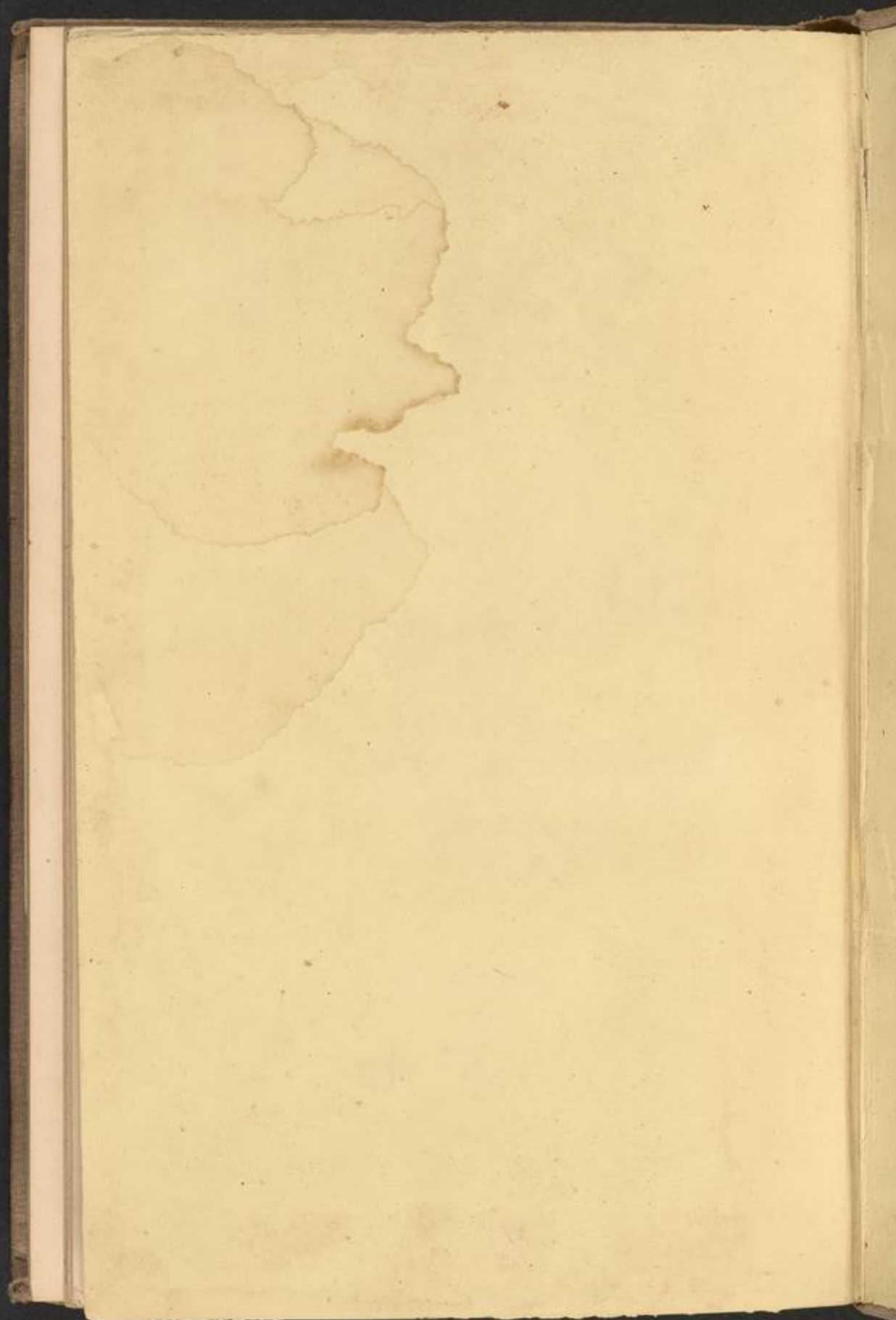
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