

Boarding officials will board vessels at the pier.

7-29 Acajutla, with a population of about 15,600 (1964), is situated in a small cove between the piers. The town is supported almost entirely by the transhipment of goods. Acajutla serves the western part of El Salvador, particularly the coffee-producing region of Santa Ana. It is a port of entry, but the customhouse is at Sonsonate, situated about 11 miles in the interior.

**Piers.**—The new government pier, an L-shaped pier, extends from shore about 810 yards in a westerly direction, thence in a northwesterly direction for about 450 yards. The northeast side of the 450 yard section has berthing space for two deep-draft vessels, with depths alongside from 5 1/2 to 7 fathoms. Two 3-ton electric cranes are available at the pier and warehouses are situated along the extension. The dimensions of a package to be discharged are unlimited, but the weight of a package is limited to 50 tons.

The inner 810-yard section of the pier has no berthing or cargo facilities.

The old pier, construction of metal, is used by fishing vessels and lighters only. Vessels occasionally work cargo at the anchorage and a medium sized tug is available to handle lighters and assist vessels.

**Communication.**—A number of steamship lines make Acajutla a regular port of call. There is a telephonic and telegraphic communication with the interior. Railroad service to San Salvador is irregular.

**Sanitation and health.**—The health of Acajutla is fair, but malaria and yellow fever are endemic. Flies are numerous and mosquitoes, coming from the swamps behind the town, infest the vicinity. The town has no sanitation facilities. Medical facilities at Acajutla are very limited; however, good facilities are available at Sonsonate, Santa Ana, and San Salvador.

**Supplies.**—Fresh provisions may be obtained on one day's notice. Water is available by pipeline at the new government pier. Deck and engineers' supplies are available in limited quantities. Fuel oil is available only in case of emergency.

**Repairs.**—Commercial divers are available in San Salvador.

7-30 **Remedios Point** ( $13^{\circ}31' N.$ ,  $89^{\circ}48' W.$ , *H. O. Chart 1366*) is a low, cliffy, easily recognizable headland, thickly clad with mangroves. A reef on which there are several rocks above and below water, on which the sea breaks, extends about 1 mile off the shore for a distance of about 2 miles northwestward of the point. East Rock, 8 feet high, and Reef Rock, a small rock above water, lie about  $\frac{1}{2}$  mile

westward and southward, respectively, of Remedios Point.

A light is shown on Remedios Point. Remedios (Black) Rock, lying  $1\frac{1}{2}$  miles northwestward of Remedios Point, is square shaped and 25 feet high. Three conspicuous boulders lie  $\frac{1}{2}$  mile northward of Remedios Rock.

A wreck, the position of which is approximate, lies about  $\frac{3}{4}$  mile west-southwestward of Black Rock.

Sacasa Rock, on which the sea occasionally breaks at low water, probably lies  $2\frac{1}{4}$  miles southeastward of East Rock; this position, however, is doubtful and the rock should be given a wide berth.

7-31 **Current.**—A  $1\frac{1}{2}$ -knot current has been reported setting eastward at a position 1 to  $1\frac{1}{2}$  miles off Remedios Rock, and setting on to and around Remedios Point.

7-32 **Caution.**—Vessels rounding Remedios Point from the eastward should give the land a berth of at least 4 miles, with Black Rock bearing westward of  $006^{\circ}$ , and staying outside the 10-fathom curve.

7-33 **Coast.**—The coast between Remedios Point and La Libertad, 28 miles to the eastward, is known as "Costa del Balsamo", as the district produces the resin known commercially as "balsam of Peru" (so called from its having been sent to Lima for export to Europe).

The first 12 miles of this coast consists of an uninterrupted gray, sandy shore with mangroves, and terminates in a conspicuous rocky cape with a well-wooded summit; then, for a distance of 10 miles, follows a succession of undulating points and perpendicular cliffs, separated by small beaches of sand and shingle, the land being of considerable elevation. The last 6 miles consists of a moderately high, gray, sandy shore with mangroves.

7-34 **THE ROADSTEAD OF LA LIBERTAD** ( $13^{\circ}29' N.$ ,  $89^{\circ}19' W.$ , *H. O. Chart 1366*) is exposed to the full sweep of the Pacific and can be considered safest in fine weather or with northerly winds; caution should be exercised in visiting it from July

to October. At times the beach is smooth, but at other times the rollers break in 4 or 5 fathoms at a distance of  $\frac{1}{4}$  mile or more off the beach, making landing difficult. These rollers, which set in suddenly, are capable of breaking cables unless vessels are anchored with a long scope of chain. The swell is occasionally so heavy as to interrupt the landing of passengers and cargo. An iron pier, with a conspicuous large reddish shed on its outer end, extends out from the shore abreast the town. La Libertad is the nearest port of entry to the city of San Salvador.

A group of white tanks near the shore in a position about 900 yards west-southwestward of the outer end of the pier is an excellent landmark. A conspicuous white-roofed building is located about 1/2 mile eastward of the root of the pier and a conspicuous red and white building was reported to lie about 1/2 mile northwestward of the root of the pier.

**7-35 Light.**—A light is shown from the roof of the shed at the end of the pier at La Libertad when vessels are expected.

**7-36 Signal station.**—A visual signal station is located near the pier at La Libertad.

**7-37 Anchorage.**—The recommended anchorage is in a depth of about 9 fathoms, sand, with the pierhead bearing  $350^{\circ}$  and La Puntilla bearing  $299^{\circ}$ . Another anchorage is in a depth of about 8 fathoms, with the pierhead bearing  $338^{\circ}$  and La Puntilla bearing  $284^{\circ}$ .

A vessel has reported that the current swung it around broadside to the swell except during the height of the breeze, and that a kedge anchor was found to be unable to hold against this current.

Unlighted barges are commonly anchored as far as  $\frac{1}{2}$  mile off the pier. Caution is indicated, particularly when entering the roadstead at night.

Tankers berth at a prepared anchorage about  $\frac{1}{2}$  mile south-southwestward of the pierhead. There are several mooring buoys and a submarine oil line at this berth. The controlling depth was reported to be 30 feet (1960).

**7-38 Dangers.**—Shoal water is reported to extend  $\frac{1}{2}$  mile southward from the shore in the vicinity of La Puntilla, on the western side of the roadstead.

An obstruction with a depth of  $3\frac{3}{4}$  fathoms over it was reported in 1923 to lie about 750 yards south-southwestward of the pierhead.

A foul area, consisting of an anchor and chain, lies about 1,700 yards south-southeastward of the head of the pier.

**7-39 Tides.**—The mean high water interval at La Libertad is 2h. 19m.; the spring range is 6.7 feet, the mean range 5.5 feet.

Pilotage is not compulsory. Pilots are not available.

**7-40 Directions.**—Vessels from the southward should steer for Volcano Salvador on the bearing  $12^{\circ}$ , which will lead up to the roadstead; should the volcano be obscured by clouds, the best mark is the large, white, tile-covered warehouse, Gorro de Libertad, 2,755 feet high,  $6\frac{1}{2}$  miles north-northwestward of the town, is also a good mark. Soundings of 25 to 27 fathoms, mud, will be obtained at about 8 miles from land, decreasing gradually to the shore. Vessels coming from the eastward or westward during favorable weather can adopt no better course than to follow the coast with an offing of 5 or 6 miles. In the immediate vicinity of the town there is no object sufficiently conspicuous to be visible from a distance.

**7-41 La Libertad (13°29'N., 89°19'W., H.O. Chart 1366)** is a town with a population of about 12,500 (1964). It is the landing place for most of the passengers and freight for the capital, San Salvador, with which the port is connected by a good automobile road 23 miles long.

**Pier.**—A pier, 1,015 feet long and suitable only for small craft and lighters, projects out in a southerly direction from abreast the town. It has a minimum depth of 16 feet alongside its covered section. The pier is fitted with five 4-ton, and one 7-ton, electric cranes, several iron ladders for landing, a cage for the accommodation of passengers, and a cargo shed. All cargo is handled by lighters, of which there are four of 35-ton and four of 45-ton capacity. Three medium sized tugs are available. No explosives are handled in this port. The maximum size package that can be handled is 24 feet by 7 feet by 7 feet.

**Supplies.**—Fresh provisions are obtainable in limited quantities. A limited supply of fresh water is available in drums.

**Repairs.**—Several commercial divers are available.

**Communication.**—Vessels of a number of steamship lines call at La Libertad regularly. The town is in telegraphic communication with the interior and is connected by telephone with San Salvador. There is a radio station at San Jacinto, near San Salvador. A cable station is operated at La Libertad, connecting Salina Cruz, San José de Guatemala, San Juan del Sur, and Panama.

**Meteorological table for San Salvador.**—See appendix II.

**Sanitation and health.**—The sanitary condition of the town is fair, but the water is not recommended for drinking unless it has been boiled. The times of maximum sickness are at the beginning and end of the rainy season. Malaria is endemic. There is a good hospital at San Salvador.

Pratique is granted by the captain of the port.

**7-42 Coast.**—From La Libertad the coast trends east-southeastward for 33 miles to the mouth of the Rio Lempa. The land, bordered with a belt of white sand, consists of an extensive plain, from which rise in the distance the Volcanoes Vicente and San Miguel; these are visible from a long distance at sea and are of great assistance to vessels bound to Acajutla, La Libertad, and other ports.

A conspicuous mark in the daytime along this coast is a white house at an elevation of 643 feet situated on the hills northward of La Concordia. At night the lights of the town of Zácatecoluca make a good landmark. Another good mark is a nearly barren peak which stands out distinctly from the dark background and rises to an elevation of 1,638 feet at a position about 5 miles east-northeastward of this white house.

**Volcano Salvador** has an elevation of 6,397 feet and can be seen at a distance of fully 60 miles from the land. Viewed from the sea it appears behind the mountain chain as a very large mountain with a flat summit, appearing somewhat like the back of a tortoise. At its eastern extremity is a cone-shaped peak.

**Volcano Vicente**, with an elevation of 7,129 feet, rises in the form of a truncated cone, which appears cleft when viewed from the eastward or the westward, one summit being more rounded than the other.

**Volcano San Miguel** rises to a height of 6,994 feet, and is a perfect cone, with a very large

base; its summit, the crater, is almost level, there being only a slight concavity in the middle. This mountain, by its great elevation, is conspicuous above all the hills in its vicinity; viewed from the westward it appears detached from the surrounding land. Steam can often be seen coming from the crater.

**7-43 Rio Jiboa** empties into the sea at a position about midway between La Libertad and Rio Lempa. It is the outlet of Lake Ilo Pango, but is closed by a bar that breaks heavily.

**7-44 Rio Lempa**, which enters the sea  $1\frac{1}{2}$  miles southeastward of Rio Jiboa, is the largest river in El Salvador; it is navigable by river steamers for a distance of 24 miles above its mouth. The entrance is about  $\frac{1}{4}$  mile broad and barred by breakers, which extend offshore for a distance of 1 to  $1\frac{1}{2}$  miles. There are only a few fishing huts on the left bank. A shoal at the mouth of the river extends  $\frac{3}{4}$  mile offshore. The entrance may be recognized by some large trees with white trunks and tops almost bare which rise above the lighter colored and lower woods.

**7-45 Coast.**—From the mouth of Rio Lempa the coast trends eastward for 20 miles to Lempa Shoals.

An ammunition dumping ground about 9 miles wide extends between the positions 55 miles southward and 60 miles southward of Lempa Shoals.

**7-46 JIQUILISCO BAY**, situated in the eastern portion of El Salvador, is entered at a position about 20 miles eastward of the entrance to Rio Lempa, between the island of San Sebastian to the eastward and the peninsula of San Juan to the westward. The entrance points are nearly 2 miles apart, and the bay within is very extensive, but most of it is occupied by large, low islands of which Recodo, Tortuga, and Espíritu Santo are the largest. Besides the main channel, deep narrow channels surround nearly all the islands. The town of El Triunfo lies on the mainland shore, at about 10 miles northwestward of the entrance points.

**7-47 Off-lying danger.**—A pinnacle rock that breaks at low water is reported in posi-

tion about 14 miles south-southeastward of the entrance to the bay. This rock was reported nonexistent (1964).

**7-48 General aspect.**—Inside the entrance for 6 miles by the main reach and 3 miles in other directions there are sand beaches with woods and thick undergrowth extending back from high-water mark. Beyond these limits there is everywhere a dense growth of mangroves in swampy ground. A few miles inland, to the northward, the land commences to rise toward the mountains.

**7-49 Lempa Shoals—Bar** ( $13^{\circ} 07' N.$ ,  $88^{\circ} 28' W.$ , *H.O. Chart 1366*).—Lempa (Bajos) Shoals consist of fine gray and black sand which has been reported to have magnetic properties. The shoals are of horse-shoe shape, about 3 miles wide at the base, the two ends resting on the shore on either side of the entrance, the oval part extending offshore to the southward about the same distance. A narrow straight channel runs down from the entrance, dividing the shoal into two arms, which unite at the bar at the extreme southern part of the oval. Neither the bay nor the shoals appear to have altered much since they have been known, though it seems probable that heavy weather, the action of the outside current, and the large volume of tidal water flowing in and out must occasionally cause temporary variations of depth on the bar. In 1941, the sea was observed breaking over the shoals about  $5\frac{3}{4}$  miles offshore, and a 3-fathom spot was found off the shoals and about  $6\frac{3}{4}$  miles offshore. Lempa Shoals were reported (1959) to have extended about 5 miles further seaward than charted.

In May 1941, it was reported that a vessel touched a submarine obstruction in  $13^{\circ} 03' 30'' N.$ ,  $88^{\circ} 34' 00'' W.$

In 1949, a shoal, with a depth of less than 3 fathoms, was reported to lie about 8 miles offshore in  $13^{\circ} 02' N.$ ,  $88^{\circ} 27' W.$

**7-50 Depths.**—The bar has a mean low water depth of about 14 feet; it is about 200 yards across between the outer and inner 3-fathom curves, and the width between the breakers over the shoal water on either side is less than

300 yards. To seaward, the depth increases gradually from 5 to 8 fathoms at 1 mile from the shoal. Vessels passing eastward or westward in the offing should not come into less than 10 fathoms. Within the bar the channel opens out considerably, but at about  $\frac{1}{2}$  mile within there are some shoal patches of  $2\frac{1}{2}$  to 3 fathoms. At 2 miles within the bar the channel narrows to 500 yards, with deep water between shallows on which the sea generally breaks; here the tide runs strongly, and there is often a short choppy sea, dangerous for boats. In the main channel between these shoal patches and the western end of Recodo Island, a distance of 8 miles, the depths are sufficient for large vessels; and 18 feet can be taken to a position beyond El Triunfo at any tide. The bay extends in a northwesterly direction about 15 miles beyond the part surveyed, its head being separated by only a few miles from Rio Lempa, with which it may at one time have been connected.

The channel leading up to the Rio San Miguel branches off from the main channel between the entrance points and is deep for  $2\frac{1}{2}$  miles, when it turns eastward into the San Miguel, where there is a bar with some 12 or 14 feet; beyond that distance it was not sounded by the surveying party.

**7-51 Breakers.**—There usually are breakers on each side of the bar at some period of the tide, even in fine weather, generally only single lines. In moderate weather, a single breaker occasionally sweeps completely across the bar.

The *Brockley Castle*, wrecked off Point Sebastian, may help to determine the exact position of the bar.

**7-52 Anchorage.**—When clear of the shoal extending southward into the entrance from Pajarito Island, and above that island, there is smooth water and well-sheltered anchorage in the main channel for at least 6 miles in depths of 5 to 10 fathoms with a width of 1,000 yards between the 3-fathom curves. The holding ground is good and the tides regular. There is always a land and sea breeze. A good berth is off the Corral de las Mulas.

**7-53 Tides.**—The high water interval at full and change at the entrance is 2h. 38m.; springs rise 7.2 feet, neaps rise 4.5 feet. At El Triunfo the tide is  $\frac{1}{2}$  hour later and rises 6 inches higher.

**7-54 Currents.**—The tidal currents are regular and follow the direction of the different reaches. There are no cross currents. In the strength of the ebb tide there are some light swirls over the entire harbor, but they are feeble. In the narrow reaches on the northern side of Recodo Island the tides meet, but not always at the same point; this depends on the strength of the tidal current. The tidal current is the strongest in the narrow part of the channel 2 miles within the bar, running sometimes as high as 3 or 4 knots. There is quite a strong current outside the bar and on the outer edge of the flats; this generally sets to the westward with a strength of 1 knot or more.

**7-55 Directions—Pilots.**—In the absence of all buoyage or marks, no directions for entering Jiquilisco Bay can be given, but the chart affords ample guidance for vessels inside the bay. Vessels desirous of entering should telegraph to the El Triunfo Co. from La Libertad or from La Union, naming the time at which they will be off the bar, when a vessel will come out and pilot them in; or a vessel may anchor off the bar and blow her whistle, which can generally be heard at the port.

There are no natural marks that would be useful to the stranger. Mariners should exercise extreme caution when navigating in these waters.

**7-56 EL TRIUNFO** ( $13^{\circ}16'N.$ ,  $88^{\circ}33'W.$ , H.O. Chart 1366) is on a reach which separates Tortuga Island from the mainland. The town of Jiquilisco lies about 4 miles northward of the port.

A pier extends about 150 yards from shore on the eastern side of the town. A slip for the use of small vessels is located about  $\frac{1}{4}$  mile northwestward of the pier.

**Supplies.**—Limited supplies of fresh provisions can be obtained.

**Communication.**—El Triunfo is connected with the general telegraph and telephone systems.

**7-57 Rio San Miguel** enters the sea about 4 miles eastward of the entrance to Jiquilisco Bay, with which it is connected by a channel inside. The mouth of the river is closed by a bar with heavy breakers. Within the bar the water is deep.

**7-58 Coast.** (H. O. Chart 931). — From Jiquilisco Bay, the coast trends eastward for 33 miles to Amapala Point. The shore is low for some miles, and then for a distance of 10 miles there is a bolder coast, with cliffs in some places, which is succeeded by a sand beach for the remaining distance. These sandy beaches give a very deceptive appearance to the land, especially at sunrise and sunset, causing it to appear closer than is really the case, and the surf to appear to break farther from the coast than it actually does; the land must, therefore be approached with great caution.

**7-59 Soundings.**—The soundings are believed to increase gradually from the shore for a distance of some miles seaward, and becalmed sailing vessels may anchor off the coast. This is, perhaps, the more prudent course, as the currents are variable, sometimes easterly and sometimes westerly, with a strength of about  $1\frac{1}{2}$  knots.

**7-60 Amapala Point** ( $13^{\circ}09'N.$ ,  $87^{\circ}54'W.$ , H.O. Chart 973), the western entrance point of the Gulf of Fonseca, is low and flat. Amapala Point is bordered to a distance of  $\frac{1}{4}$  mile by a reef of rocks and sand which causes heavy breakers; this reef has been reported, however, to extend offshore a greater distance than that stated above. At less than 1 mile off the point there are depths of 6 to 8 fathoms.

A light is shown from a white quadrangular steel framework tower, 95 feet high, located on Amapala Point.

**7-61 THE GULF OF FONSECA** is 19 miles wide at the entrance, between Amapala and Coseguina Points, and extends within the points 25 miles. It contains the ports of La Union in El Salvador, and of Amapala and San Lorenzo in Honduras, and is the outlet of the Estero Real, a navigable river of Nicaragua. From the entrance points the shores run northeastward 12 miles to Punta Chiquirin and Monypenny Point, respectively, and then diverge sharply, increasing the width of the gulf to more than 40 miles.

There are a number of islands in the gulf, but only the largest and those that by their situation affect the approaches to the inner waters of the gulf need be mentioned.

**7-62 Landmarks and directions.**—In addition to Conchagua and Coseguina Volcanoes, which plainly mark the entrance, San Miguel Volcano in El Salvador and Volcano Viejo in Nicaragua will be in sight from the offing; as the entrance is neared the cone-shaped peak of Tigre and the islands of Meanguera and Conchaguita will be distinguished. A group of conspicuous white houses stand on the western shore about  $2\frac{3}{4}$  miles southward of El Pinal summit. Five intense lights have been observed emanating from these houses. Close westward of the houses a steep embankment is conspicuous. A vessel entering from the westward should give Amapala Point a berth of 1 mile and not go inside of 5 fathoms while running up the western shore. Vessels coming from the eastward should round Coseguina Point at 2 miles, and, if bound for the Estero Real, should keep 2 miles offshore until the Farallones are abeam, and then change course to pass Monypenny Point close to.

**7-63 Winds and weather.**—Land and sea breezes blow regularly from the end of February to the beginning of May. The former are light, and blow from 10 p. m. to 9 a. m. from a direction between northeast and north-northwest; the latter, setting in at 11 a. m. and lasting until 8 p. m., blow fresh from a direction between south and southwest. At this time of the year the atmosphere over the land is thick. In the rainy season, from May to October, the weather is variable, with occasional heavy rain squalls from the east, but when the weather is settled, light variable winds prevail from northeast or north-northeast. From October to February heavy northerly winds may be expected, sometimes lasting more than a week, and entirely interrupting all communications by boats in the roadstead of La Union. In the intervals, when northerly winds are not blowing, slight variable winds prevail.

**7-64 Coast.**—From Amapala Point the shore trends northwestward to the outlet of a small river, and then turns northeastward 9 miles to Punta Chiquirin, on the north side of which is La Union.

**Conchagua Volcano**, 3 miles west-southwestward of Punta Chiquirin and about 1.6 miles from the shore, instead of having the conical form characteristic of the volcanoes of this part of Central America, is a large mountain with two summits, of which the higher, El Pinal, 4,199 high, has a gradual slope and is in part crowned with trees, while the other summit, 3,869 feet high, is of a very rounded form and covered with the herb named "sacate". This second summit is the true crater, but has been inactive many years.

The volcano presents a very remarkable appearance, which, together with its close proximity to the sea, prevents its being mistaken for any other mountain on the coast.

**7-65 Isla Conchaguita** ( $13^{\circ}14' N.$ ,  $87^{\circ}46' W.$ , *H. O. Chart 5575*),  $2\frac{1}{2}$  miles southward of Punta Chiquirin and about 2 miles from the western shore of the gulf, is  $2\frac{1}{4}$  miles long and  $1\frac{1}{4}$  miles wide. The central peak, 1,660 feet high, throws out spurs to the northward and southward; these shoulders appear well defined when seen from the westward or southwestward. From the northeastern side of the island a flat, covered by 1 to 2 fathoms of water, extends all the way to Isla Martin Perez; there are no other dangers near it. The channel westward of Isla Conchaguita leading to La Union, has depths of  $4\frac{3}{4}$  to 8 fathoms, while that to the eastward has depths of  $5\frac{1}{2}$  to 12 fathoms.

**7-66 Isla Martin Perez**, 2 miles northeastward of Isla Conchaguita, lies on the northwestern edge of the flat which extends northeastward from the latter island. This flat is separated from the shore banks to the northward and northeastward by narrow channels in which there are depths of  $3\frac{1}{4}$  to  $3\frac{1}{2}$  fathoms. The flood here sets northeastward and has a tendency to carry vessels toward the flats.

7-67 Isla Zacatillo (Isla Punta Sacate), about 1 mile northwestward of Isla Martin Perez and separated from it by Dyer Strait, is of irregular shape, about 1 1/2 miles in extent, and lies at the entrance to La Union, opposite Punta Chiquirin. Zacate Reef, on which there are a number of rocky heads awash, extends southward from the southwestern extremity of the island. About 1 mile farther south, in the middle of Dyer Strait, there is an isolated 8-foot shoal. Between the island and the shore northward of it there is no safe passage, almost the whole space being occupied by a mud flat which dries at low water. At a short distance from its north side is Isla Chuchito (Speck Islet), and at about 700 yards off its east side, in Dyer Strait, is Isla Ilca.

7-68 PORT LA UNION, the northwestern arm of the Gulf of Fonseca, is a landlocked harbor extending 7 miles in a northwesterly direction, with a width of 3 1/2 miles, measured from shore to shore. On the northern side of the bay there are extensive drying mud flats, while abreast the town there is a mud flat that narrows the available area there to a width of less than 1 mile.

DEPTHES.—The controlling depth at low water up to Cutuco Wharf is 23 feet. Vessels up to 565 feet long can enter the port. The largest vessel to have entered the port had a draft of 27 feet 10 inches.

7-69 THE ENTRANCE (13° 17' N., 87° 47' W., H.O. Chart 5575), lying between Zacate Reef and Punta Chiquirin, is deep and about 1/2 mile wide. Zacate Reef, which is steep-to and covers at high water, extends southward about 1/3 mile from the southwestern extremity of Isla Zacatillo. Punta Chiquirin terminates the eastern slope of Concagua Volcano. A shoal with a least depth of 13 feet extends eastward from the point; the 30-foot curve which embraces this shoal lies about 400 yards offshore. A rock lies a little more than 100 yards southeastward of the southeastern extremity of the point. In 1936 a vessel reported grounding on a 13 3/4-foot patch in a position about 250 yards southeastward of Punta Chiquirin Light.

7-70 COLIMA SHOAL, over which there is a depth of 14 feet, rock, lies 500 yards north-northeastward of the northern extremity of Punta Chiquirin.

Two shoal patches, with depths of 16 and 12 feet, respectively, over them, lie about 2 miles northwestward of Punta Chiquirin and 1/3 mile offshore. Depths of 15 to 18 feet have been reported to lie from 1 1/4 miles northward to 1 3/4 miles north-northwestward of Punta Chiquirin Light.

7-71 LIGHTS.—Punta Chiquirin Light is shown from an aluminum-colored steel tower on a concrete base on the southeastern extremity of Punta Chiquirin.

A light is shown near the northwestern extremity of Isla Zacatillo.

A light is shown from a 30-foot steel tower on the end of Cutuco Wharf.

7-72 OUTER ANCHORAGE.—If intending to remain only a short time, vessels can anchor in the channel between Isla Conchaguita and Isla Zacatillo and the coast. The best berth in that case would be about 2 miles southward of Punta Chiquirin, in 6 or 7 fathoms, mud, with the northern point of Conchaguita bearing about 112°. A berth should be selected as far as possible out of the heavy seas which prevail here when a strong sea breeze is blowing against the ebb tidal currents; it is recommended, on account of these currents, to moor along a north-south line.

7-73 INNER ANCHORAGE.—Vessels may anchor in almost any part of the port if care is taken not to get too near the mud flats. Large vessels waiting to go alongside Cutuco Wharf generally anchor northwestward or northeastward of the wharf; however, they should not anchor within 1/2 mile of the head of the wharf.

During spring tides a current of about 2 knots is experienced at these anchorages necessitating a long scope of chain. A second anchor is sometimes necessary when the squalls are onshore.

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**7-63 Winds and weather.**—Land and sea breezes blow regularly from the end of February to the beginning of May. The former are light, and blow from 10 p. m. to 9 a. m. from a direction between northeast and north-northwest; the latter, setting in at 11 a. m. and lasting until 8 p. m., blow fresh from a direction between south and southwest. At this time of the year the atmosphere over the land is thick. In the rainy season, from May to October, the weather is variable, with occasional heavy rain squalls from the east, but when the weather is settled, light variable winds prevail from northeast or north-northeast. From October to February heavy northerly winds may be expected, sometimes lasting more than a week, and entirely interrupting all communications by boats in the roadstead of La Union. In the intervals, when northerly winds are not blowing, slight variable winds prevail.

**7-64 Coast.**—From Amapala Point the shore trends northwestward to the outlet of a small river, and then turns northeastward 9 miles to Punta Chiquirin, on the north side of which is La Union.

**Conchagua Volcano**, 3 miles west-southwestward of Punta Chiquirin and about 1.6 miles from the shore, instead of having the conical form characteristic of the volcanoes of this part of Central America, is a large mountain with two summits, of which the higher, El Pinal, 4,199 high, has a gradual slope and is in part crowned with trees, while the other summit, 3,869 feet high, is of a very rounded form and covered with the herb named "sacate". This second summit is the true crater, but has been inactive many years.

The volcano presents a very remarkable appearance, which, together with its close proximity to the sea, prevents its being mistaken for any other mountain on the coast.

**7-65 Isla Conchaguita** ( $13^{\circ}14' N.$ ,  $87^{\circ}46' W.$ , *H. O. Chart 5575*),  $2\frac{1}{2}$  miles southward of Punta Chiquirin and about 2 miles from the western shore of the gulf, is  $2\frac{1}{4}$  miles long and  $1\frac{3}{4}$  miles wide. The central peak, 1,660 feet high, throws out spurs to the northward and southward; these shoulders appear well defined when seen from the westward or southwestward. From the northeastern side of the island a flat, covered by 1 to 2 fathoms of water, extends all the way to Isla Martin Perez; there are no other dangers near it. The channel westward of Isla Conchaguita leading to La Union, has depths of  $4\frac{3}{4}$  to 8 fathoms, while that to the eastward has depths of  $5\frac{1}{4}$  to 12 fathoms.

**7-66 Isla Martin Perez**, 2 miles northeastward of Isla Conchaguita, lies on the northwestern edge of the flat which extends northeastward from the latter island. This flat is separated from the shore banks to the northward and northeastward by narrow channels in which there are depths of  $3\frac{1}{4}$  to  $3\frac{1}{2}$  fathoms. The flood here sets northeastward and has a tendency to carry vessels toward the flats.

7-67 Isla Zacatillo, about 1 mile northwestward of Isla Martin Perez and separated from it by Dyer Strait, is of irregular shape, about  $1\frac{1}{2}$  miles in extent, and lies at the entrance to La Union, opposite Punta Chiquirin. Zacate Reef, on which there are a number of rocky heads awash, extends southward from the southwestern extremity of the island. About 1 mile farther south, in the middle of Dyer Strait, there is an isolated 8-foot shoal. Between the island and the shore northward of it there is no safe passage, almost the whole space being occupied by a mud flat which dries at low water. At a short distance from its north side is Isla Chuchito (Speck Islet), and at about 700 yards off its east side, in Dyer Strait, is Isla Ilca.

7-68 **PORT LA UNION**, the northwestern arm of the Gulf of Fonseca, is a landlocked harbor extending 7 miles in a northwesterly direction, with a width of  $3\frac{1}{2}$  miles, measured from shore to shore. On the northern side of the bay there are extensive drying mud flats, while abreast the town there is a mud flat that narrows the available area there to a width of less than 1 mile.

**Depths.**—The controlling depth at low water up to Cutuco Wharf is 23 feet. Vessels up to 565 feet long can enter the port. The largest vessel to have entered the port had a draft of 27 feet 10 inches.

7-69 **The entrance** ( $13^{\circ}17' N.$ ,  $87^{\circ}47' W.$ , *H. O. Chart 5575*), lying between Zacate Reef and Punta Chiquirin, is deep and about  $\frac{1}{2}$  mile wide. Zacate Reef, which is steep-to and covers at high water, extends southward about  $\frac{1}{3}$  mile from the southwestern extremity of Isla Zacatillo. Punta Chiquirin terminates the eastern slope of Conchagua Volcano. A shoal with a least depth of 13 feet extends eastward from the point; the 30-foot curve which embraces this shoal lies about 400 yards offshore. A rock lies a little more than 100 yards southeastward of the southeastern extremity of the point.

In 1936 a vessel reported grounding on a  $13\frac{3}{4}$ -foot patch in a position about 250 yards southward of Punta Chiquirin Light.

7-70 **Colima Shoal**, over which there is a depth of 18 feet, rock, lies 500 yards north-northeastward of the northern extremity of Punta Chiquirin.

Two shoal patches, with depths of 16 and 12 feet, respectively, over them, lie about 2 miles northwestward of Punta Chiquirin and  $\frac{1}{3}$  mile offshore. A 15-foot patch and a 20-foot patch lie about  $1\frac{1}{4}$  miles northward and  $1\frac{1}{4}$  miles north-northwestward of Punta Chiquirin, respectively.

7-71 **Lights.**—Punta Chiquirin Light is shown from an aluminum-colored steel tower on a concrete base on the southeastern extremity of Punta Chiquirin.

A light is shown near the northwestern extremity of Isla Zacatillo.

A light is shown from a 30-foot steel tower on the end of Cutuco Wharf.

7-72 **Outer anchorage.**—If intending to remain only a short time, vessels can anchor in the channel between Isla Conchagua and Isla Zacatillo and the coast. The best berth in that case would be about 2 miles southward of Punta Chiquirin, in 6 or 7 fathoms, mud, with the northern point of Conchagua bearing about  $112^{\circ}$ . A berth should be selected as far as possible out of the heavy seas which prevail here when a strong sea breeze is blowing against the ebb tidal currents; it is recommended, on account of these currents, to moor along a north-south line.

7-73 **Inner anchorage.**—Vessels may anchor in almost any part of the port if care be taken not to get too near the mud flats. Large vessels waiting to go alongside Cutuco Wharf generally anchor northwestward or northeastward of the wharf; however, they should not anchor within  $\frac{1}{2}$  mile of the head of the wharf.

During spring tides a current of about 2 knots is experienced at these anchorages necessitating a long scope of chain. A second anchor is sometimes necessary when the squalls are onshore.

Customs and health officers board vessels at the anchorage, if signaled by three long blasts. However, customarily they board vessels at the pier.

**7-74 Signals.**—At the eastern end of Cutuco Wharf, there is a signal tower with a cross arm. House flags displayed on the cross arm indicate the side of the wharf to which the designated vessels are to moor. A black ball hoisted under the house flag indicates that it is slack water at the wharf. Vessels entering or leaving the port should blow three long blasts on the whistle or siren.

**7-75 Tides.**—The mean high water interval at La Union is 2h. 51m.; the spring range is 10.5 feet, and neaps 5.7 feet.

**Tidal currents** are regular except in the rainy season, when the ebb continues somewhat longer than the flood. At the entrance to the port, between Punta Chiquirin and Zacate Reef, the ebb sometimes runs with a velocity of 3 knots and causes a strong race, which has the appearance of breakers; in the vicinity of the town the velocity is seldom over 2 knots. Northward of Isla Conchaguita the flood divides into two currents, one flowing northward into the harbor and the other northeastward between Isla Zacatillo and Isla Martin Perez.

**7-76 Caution.**—A 1- to 3-knot tidal current sets in a 032° direction against Cutuco Wharf. It is therefore advisable for a vessel to make use of the anchor in attempting to moor alongside. No such attempt should be made except at slack water or shortly before slack water.

**7-77 Winds and weather.**—Inasmuch as the harbor is landlocked, the winds, as a rule, appear to be light, and the heat is excessive. During the dry season, from December to May, the wind sometimes blows very hard from the northward. During the rainy season the "chubascos", generally coming from the eastward, occur at about 11 p. m.

**7-78 PILOTS.**—Pilotage is not compulsory but is recommended. Pilots board northwestward of Isla Conchaguita and although a pilot may take a vessel in at night such a transit

is considered hazardous. Pilotage should be arranged in advance.

The pilot vessel, a 30-foot diesel launch, displays the international signal flag, and the lights prescribed for pilot vessels.

**7-79 Directions.**—Vessels approaching Port La Union from the southward should steer to pass through the middle of the channel westward of Isla Conchaguita. On this course the entrance to the port will be seen nearly ahead. When abreast the northern end of Isla Conchaguita change course and steer for the entrance on a heading, guarding against an easterly set during the flood tide, to pass about 400 yards off the southwestern extremity of Isla Zacatillo. Thence steer northward through the channel until clear of Colina Shoal when course should be altered to the northwestward to proceed to the anchorage. Care must be taken to avoid the shoaling mentioned in section 7-70.

Vessels intending to enter without a pilot, should do so within 1/2 hour of high water. Berthing can be accomplished only at slack or nearly slack water because of the strong tidal currents in the vicinity of the wharf.

**7-80 La Union**, the principal port of entry of El Salvador, is situated on the southwestern side of the port, about 4 3/4 miles within the entrance. In 1953 the town had a population of 16,238.

**PIERS.**—Cutuco Wharf, a concrete pier about 1,050 feet long, owned and operated by the railroad company, is located 1 1/2 miles eastward of La Union and over 1/2 mile northwestward of Punta Cutuco. The northern side of the pier has depths alongside of 24 to 30 feet, and the southern side of the pier has depths of 20 to 24 feet alongside. The pier provides a berth of 570 feet on either side. Railroad tracks extend to the warehouse at the seaward end of the pier. Most cargo is handled by ships gear. Two traveling cranes of 8-ton and 5-ton capacity are available. Boat landings are located at the pier.

Lighters and a small tug are available for handling cargo at the anchorages and are generally used when small amounts are involved.

**REPAIRS.**—Emergency repairs may be carried out at the railroad machine shops at San Salvador upon request. Commercial divers are available in San Salvador.

**SUPPLIES.**—Fresh and staple provisions are available in limited quantities. Water is available from pipelines on Cutuco Wharf, although it has been reported not entirely satisfactory for boilers. The delivery rate is about 8 tons per hour, but water is occasionally scarce during the dry season. Drinking water should be boiled before using.

Diesel oil is available. Fuel oil is available in an emergency only, and then by special arrangements, from supplies maintained for use of the railroad company.

**Communication.**—Vessels of a number of steamship lines call at La Union. The International Railways of Central America, with a terminal at Cutuco Wharf, connect La Union with San Miguel, Zacatecoluca, and San Salvador. It is possible to go from La Union to Acayutla and Santa Ana by rail.

There is telegraph and telephone connections with the principal places in El Salvador.

**Hospitals.**—Two doctors are available at a poorly equipped hospital in La Union. Better facilities are available at nearby San Miguel and at San Salvador.

**7-81 Meanguera Island** ( $13^{\circ}11' N.$ ,  $87^{\circ}43' W.$ , *H. O. Chart 0973*) lies near the middle of the Gulf of Fonseca, 9 miles within the entrance. It is roughly rectangular in form, about 3 miles long and 2 miles wide, has irregular, cliffy shores, and rises to a height of 1,660 feet. A sandy flat with 12 to 15 feet of water over it extends  $\frac{1}{2}$  mile off the northeastern side, and a sunken rock, on which the sea occasionally breaks, lies off the southern side; from all other directions the island can be approached close-to. Meanguerita (Perigallo) Islet is separated from the southeastern extremity of Meanguera by a narrow channel in which there are depths of 10 to 13 fathoms.

Landing upon this island is very difficult to effect.

**7-82 Anchorage.**—Anchorage may be taken northward of Meanguera Island in a depth of about  $6\frac{1}{4}$  fathoms, with the summit of Tigre Island bearing  $058^{\circ}$  and the light structure on Punta Chiquirin bearing  $320^{\circ}$ .

The channel between Meanguera Island and Isla Conchaguita has depths of 6 to 12 fathoms.

**7-83 Tigre Island** is almost circular in form, with a diameter of about 3 miles. It is the highest of the islands in the gulf, its conical summit having an elevation of 2,490 feet. A bank with a least charted depth of  $1\frac{1}{4}$  fathoms extends 2 miles from its southern side in the direction of Meanguera, leaving between it and that island a channel  $2\frac{1}{4}$  miles wide and about 4 fathoms

deep. Extensive flats project out from the north and east sides of the island, in the direction of San Lorenzo Bay. The channel to Amapala leads along the west side of the island.

**7-84 Caracolita(Knob) Islet**, low and heavily wooded, lies close to the western side of Tigre; at 325 feet to the westward of it is a sunken pinnacle rock, a serious danger to navigation, as there is nothing but tide rips to indicate its position. A bank has formed around the rock and appears to extend toward Caracolita Islet. The tide at a quarter ebb sets past the rock with a velocity of 2 to 3 knots.

A light is shown from the southern side of the islet. This light was reported extinguished (1962).

An extensive  $2\frac{3}{4}$ -fathom shoal, extending in a north-south direction for about  $1\frac{1}{4}$  miles, lies about  $2\frac{3}{4}$  miles southwestward of Caracolita Islet Light.

**7-85 Sacate Grande**, lying northward of Tigre, is the largest island in the gulf and the only one not densely wooded to the summit. Several of its peaks are 2,000 feet high and covered with grass. It is separated from the mainland by a tortuous and narrow channel.

Northwestward of Tigre Island are several smaller islands, including Exposicion, Garoya, Inglesera, and Coyote.

**7-86 AMAPALA HARBOR** ( $13^{\circ}18' N.$ ,  $87^{\circ}39' W.$ , *H. O. Chart 5396*), the only accessible Pacific coast port of Honduras, is at the northwestern end of Tigre Island, which protects it on the south. It is a fine harbor with good holding ground.

**7-87 Depths.**—In the approaches and entrance to Amapala Harbor there are depths of not less than  $3\frac{1}{2}$  fathoms, increasing to as much as 7 fathoms or more.

The deepest water lies along the Tigre Island side of the channel, so that a vessel should pass 400 yards westward of Caracolita Islet.

**7-88 Shoals.**—The point immediately westward of the town of Amapala has a rocky shoal extending from it to the westward. About 200 yards northward of the western extremity of this shoal is a rock with  $3\frac{1}{2}$  fathoms of water over it. About  $\frac{1}{4}$  mile south-southwestward

of the western extremity of the above-mentioned shoal is a  $2\frac{1}{2}$ -fathom patch.

**7-89 Anchorage.**—There is anchorage directly opposite the town in depths of 6 to 9 fathoms, but the best anchorage is about 650 yards  $315^{\circ}$  from the end of the pier.

A light is shown on the end of the pier.

**7-90 Tides.**—The mean high water interval at Amapala is 2h.45.; the spring range is 9.8 feet, the mean range 8 feet.

**Tidal currents.**—At this anchorage the flood and ebb tidal currents run, respectively, about north and southwest, the flood current attaining a velocity of about  $1\frac{1}{2}$  knots and the ebb about  $2\frac{1}{2}$  knots.

At the northern end of Meanguera Island the flood current sets east-northeastward at a rate of about 1 knot; the ebb sets south-southwestward between Conchaguita and Meanguera with a velocity of 1.7 knots.

**7-91 PILOTAGE.**—The port has no regular pilots, but if desired a launch will be sent out to guide vessels into the port. It was reported (1966) that the launch was not available.

**7-92 Directions.**—When making for Amapala steer for a position midway between Isla Conchaguita and Meanguera Islands, so as to bring the high conical peak of Tigre between them, bearing  $60^{\circ}$ , then steer for it until the eastern extremity of Exposicion Island is open of Chica Point, the western extremity of Sacate Grande Island; then steer for the eastern extremity of Exposicion Island. When Caracolita Islet is 3 points off the starboard bow change course and bring the islet to bear  $\frac{1}{2}$  point off that bow in order to avoid the shore bank on the west side of the channel. Proceed on soundings, leaving Caracolita Islet about 350 yards off the starboard beam, and then shape a course toward a position midway between the two highest peaks of Sacate Grande Island. When the town opens, steer as requisite to the anchorage about 500 yards off the pier of the town. The channel westward of Caracolita Islet is  $\frac{1}{4}$  mile wide, and the lead should be freely used in it, as the edge of the bank is steep.

The channel leading into Amapala appears

to have a least low water depth of 21 feet. The direction and influence of the tidal current must be considered in approaching the port; the flood current sets northward, toward the bank.

The best time to leave Amapala is at the end of the flood. In proceeding from the anchorage, first steer for the summit of Isla Conchiguita, gradually changing course in order to steer for a position midway between Meanguera and Conchaguita. When the rounded point immediately westward of Amapala is abeam, change course to steer for the northern peak of Meanguera Island. Continue on this course until Caracolita Islet is abeam, distant 220 yards, and then steer for the eastern extremity of Meanguera Island. When the southern extremity of Tigre Island is abeam, change course to pass midway between Isla Conchaguita and Meanguera Island, keeping the summit of Tigre Island bearing  $60^{\circ}$ .

**7-93 AMAPALA** ( $13^{\circ}18' N.$ ,  $87^{\circ}39' W.$ , H.O. Chart 5396) occupies a narrow shelf on the northern side of Tigre Island at the foot of Tigre Mountain. The houses are well constructed and the streets are laid out in a symmetrical manner. This is the only port on the Pacific coast of Honduras, and the town is supported almost entirely by shipping. It is a port of entry for overseas vessels. The sanitary conditions of the port are fair. In 1964 Ampala had a population of 2,934.

**Pier.**—A wooden pier extends out in a northwest-erly direction from abreast the eastern part of the town for a distance of about 400 feet. This pier which is used only by lighters and small craft, has a depth of 11 feet at its outer end. Cargo is worked by means of lighters, of which the port has approximately 15. Goods are transshipped between the port and the mainland by means of lighters and boats.

**Communication.**—Steamers of a number of lines make Amapala a port of call. Local steamboats of small size ply between Amapala and La Union and San Lorenzo Bay. There is telegraph and telephone communication between Amapala and the interior. San Lorenzo, at the head of San Lorenzo Bay, is connected by an automobile road with Tegucigalpa, the capital of Honduras. A small airport is located on the island about  $\frac{1}{2}$  mile northeastward of the port.

**7-94 Cismuyo Bay** (H.O. Chart 973), 5 miles northward of Amapala, is entered between Sacate Grande and Exposicion Islands; the shores are low, marshy, and covered with mangroves. This entrance channel shoals in places to less than 3 fathoms. Another channel, leading close westward of Conchaguita, Perez,

Inglesera, and Exposicion Islands, and known as Dyer Strait, appears to be the best and has a least charted depth of  $3\frac{1}{4}$  fathoms, except for an 8-foot patch in its southwestern entrance. La Brea, near the head of the bay, is a small collection of huts where merchandise to and from Amapala is transshipped in boats. La Brea is connected with the capital by road.

A rock, awash at low water, lies 40 yards north of Inglesera Island, but there is deep water close outside it. Near the northern end of Exposicion Island there is a reef that extends out to the 3-fathom curve, about 75 yards. Since there is plenty of water well clear of these reefs, however, there is no occasion for vessels to pass close to them.

The anchorage area off Remolino Point is ample, but the shoals break off into deep water most abruptly, so that the lead is not sufficient in locating a berth. The tidal currents set with considerable force through this anchorage, and there is a danger of dragging unless well anchored with a long scope. The bottom is mud, fair holding ground. Care must be exercised to avoid anchoring too close to the shoals and swinging onto them at the change in the tide. The anchorage should be buoyed if it is to be used much.

There is practically no stand to the tide. The tide starts to ebb near one shore while it is still flooding near the other, causing whirlpools.

Proceeding to the above anchorage keep the middle of the channel between Isla Martin Perez and Isla Punta Sacate until Isla Ilca is abeam. Then haul over to the right and run on a line joining the northwestern tangents of Isla Martin Perez and Inglesera Island until near the latter. Take the middle of the channel between Violin and Inglesera Islands. As soon as Inglesera Island is passed, shape a course straight for Remolino Point.

On the ebb tide, and more particularly on the flood, an athwartship set should be guarded against between Isla Martin Perez and Inglesera Islands, and also to the northward of Inglesera Island.

7-95 San Lorenzo Bay (*Bar 13°12'N., 87°35'W., H.O. Chart 974*) lies eastward of Tigre and Socate Grande Islands. The entrance, marked by a buoy, leads over the bar about 5 miles southeastward of the center of Isla Tigre. A depth of 3 fathoms can be carried in at low water, but in several places

the width of the channel is but little over 200 yards.

Entrance, without local knowledge, should not be attempted even by vessels with less than 12-foot draft, as the channel probably shifts and the tidal currents are strong. From Raton Island the channel is wide, marked by two buoys on its western side, and can be easily navigated. The anchorage above Raton Island is always good, for, although the bay is open to the entrance of the gulf, the shoals and flats form an excellent breakwater.

The western shore of the bay above Sacate Grande Island and all the eastern shore except a small strip on Raton Island are lined with mangroves. There are numerous esteros, but in none of them except that of San Lorenzo can boats penetrate beyond the low, swampy land that forms the shore of the bay.

It was reported (1966) that the chart of the bay is inaccurate in many respects and must be used with caution.

Pilotage is not compulsory but advisable. The pilot will board at Amapala where vessels should call first for clearance.

**ANCHORAGE.**—Vessels can take anchorage in a depth of about 4 fathoms in the channel eastward of the entrance to Esteros San Lorenzo. The approach to San Lorenzo can only be made in daylight hours during the flood and near high water.

**7-96 Tides.**—The high-water interval at full and change in San Lorenzo Bay is 2h. 50m.; springs rise 12 feet, neaps 8 feet. The sea breeze raises the water at the head of the bay higher than at any other place in the gulf. On one occasion, a rise and fall of 14 feet was noticed.

7-97 The town of San Lorenzo, with a population of about 2,700 (1964), situated on the north bank of Esteros San Lorenzo about 3 miles above the head of the bay, is connected with Tegucigalpa by a motor road. Small local steamers from Amapala and La Union call at San Lorenzo; practically all of the trade of Amapala passes through San Lorenzo.

**7-98 EAST SIDE OF THE GULF OF FONSECA (H. O. Chart 973).**—From Raton Island to a position  $11\frac{1}{4}$  miles to the southward the shore continues low, and the water is so shoal that at only one place can 3 fathoms be carried to within 2 miles of the land; the natives call this place Condega. Several rivers enter the gulf be-

tween Condega and Estero Real (see sec. 7-104), but they are either choked with bars and mud flats or are too shallow at a few miles inland, for anything but lighters and small boats.

**7-99 Coseguina (Cosiguina) Point—Directions.**—Coseguina Point, the southeastern entrance point of the Gulf of Fonseca, fronts the sea in its southern and western parts with high cliffs, from which the land rises gradually to the base of Coseguina Volcano; the northern part, however, is low, consisting of a sandy beach.

The point is well defined, as seen from vessels entering from the southward, and can be passed at a distance of 2 miles over depths of 9 to 11 fathoms. The crater of Coseguina Volcano, the high point of which is well defined in a northwest-southeast direction, affords good bearings for rounding Coseguina Point. After passing Coseguina Point another point, situated about 5 miles to the north-northeastward, will open and show steep-to; it should be left about 3 miles on the starboard hand, as there is but 6 fathoms at 1½ to 2 miles off. When abeam of this point the course should be changed to lead 1 to 1½ miles to the southeastward of the Farallones. There is but 6 to 8 fathoms of water at 2 miles westward of Coseguina Peninsula. With a flood tide a good offing should be taken, as the current might carry a vessel into the Estero Real, toward which it flows with a strength of 1½ to 2 knots.

**7-100 Wreck.**—A wreck is charted at a position about 1¼ miles westward of Coseguina Point.

Coseguina (Cosiguina) Volcano, 2,860 feet high, can be seen in clear weather at a distance of 70 miles. The crater is ½ mile in diameter, and the interior walls fall perpendicularly to a depth of 22 feet, where the bottom becomes rather flat, with a small transparent lake in the center. The volcano presents so remarkable an appearance and stands

so near the sea that it cannot be mistaken for any other mountain on the coast.

Monypenny (Rosario) Point, 12 miles northeastward of Coseguina Point, is low, but the water is deep close-to. Off the point the flood tidal currents set to the eastward and the ebb to the westward.

**7-101 The Farallones (13° 05' N., 87° 41' W., H.O. Chart 5265),** 10 miles northward of Coseguina Point and 5 miles from shore, are a group of light-colored rocks; the middle and largest has a rounded top while the others are sharp and jagged. A rocky shoal extends about ½ mile southward from the largest rock.

It is advisable to give the Farallones a berth of at least 1 mile.

These islands appear from the southward as one large dome about 65 feet high, with pinnacle rocks on either side 15 to 20 feet high. When seen from the northward and eastward, the largest of the Farallones is steep-to on the right side and rounded on the left.

**7-102 Tidal Currents.**—The flood current sets strongly on shore at 1 to 2 knots between the Farallones and the coast southeastward of them. A ground swell is very marked throughout this locality, causing breakers along the shore, from Coseguina Point to Monypenny Point, and on the Farallones.

**7-103 Monypenny Anchorage.**—To the southeastward of a line joining Monypenny Point and a point on the mainland, about 9 miles to the eastward, is a large bay with shoals and flats at its head and around its shores. In the northwestern part, and eastward of Monypenny Point, is the well-sheltered Monypenny Anchorage, with depths of about 5 to 9 fathoms over an area about 6 miles long and 2½ miles wide. This is a convenient anchorage for vessels bound to Estero Real, whose bar is at the southern end of the bay.

A 3½-fathom shoal lies about 2 miles eastward of Monypenny Point.

When bound for Monypenny Anchorage, Monypenny Point may be rounded close-to; a course of  $116^{\circ}$  should be taken just before the right tangent of Monypenny Point and the next point to the southwestward are in range.

At a position 2 miles eastward of Monypenny Point the ebb and flood currents set about northwest and southeast, respectively, with a maximum strength of about 4 knots at full and change.

It is not advisable to attempt to enter this bay on a dark night unless Tigre and Meanguara Islands can be made out. The ground swell is felt nearly up to Cinder Point,  $4\frac{1}{2}$  miles southeastward of Monypenny Point.

Inasmuch as the ebb tide sets a little northward of west onto Monypenny Point with a velocity of about 2 knots, it is well to run well up with Tigre Island ahead when leaving on the ebb tide.

**7-104 Estero Real (H. O. Chart 973).**—This broad, navigable Nicaraguan river rises near Lake Managua and enters the gulf at the head of the large bay that lies southeastward of Monypenny Point. On the bar there is a depth of 18 feet at low water, and from the mouth as far as the junction of the Estero Palomina, 20 miles above, the depth is sufficient for large vessels. Up to this position the tides are but slightly affected by the river current; consequently there

is but little difficulty in ascending with the light prevailing winds. Above the Palomina the depths decrease rapidly. This river has been ascended for about 30 miles by a vessel drawing 10 feet.

For about 13 miles above the entrance to the river the banks are low, and the country flat, but about 4 miles further up, at Nacascol (Nacascolo), a low hill, about 80 feet high rises from the left bank just below a small loading place.

Entrance to the river should not be attempted without local knowledge. The tidal current in the river has been reported at times to be about 3 knots.

**7-105 Tides.**—The high water interval at full and change at the entrance to Estero Real is 2h. 37m.; springs rise 11 feet.

**7-106 Directions.**—The channel to the estero proper begins 7 miles southeastward of Monypenny Point, being here about 1 mile wide and the distance from mid-channel to the southern shore  $1\frac{1}{4}$  miles. From Monypenny Anchorage, starting from a position  $4\frac{1}{2}$  miles  $106^{\circ}$  from Monypenny Point, steer  $147^{\circ}$  for the entrance to Estero Real. Because of the lack of marks and natural ranges the chart and lead are the best guides for proceeding into and up the river.

## CHAPTER 8

### THE COASTS OF NICARAGUA AND COSTA RICA

**8-1 THE COAST OF NICARAGUA** maintains a general southeasterly direction from the Gulf of Fonseca to the eastern boundary at the head of Salinas Bay, a distance of 160 miles. The volcanic peaks and mountain ranges near the sea are so distinctive in outline or surroundings that they are easily recognizable from vessels approaching the coast in clear weather; and as they occasionally become visible during the rainy season when observations may not have been obtained the advantage of being able to distinguish them can well be understood.

**Volcano Viejo**, 5,840 feet high, 42 miles east-southeastward of Coseguina Point and 16½ miles inland, is, next to Ometepe, the highest mountain in Nicaragua; it stands directly behind Corinto, which is the most important seaport. The summit is very sharp and appears as though it were cut off at an angle. On the western side two small peaks rise near the base, while on the other side a high ridge extends for 2 or 3 miles and then sinks down to the foothills. Viejo is really the first of the Marabios Range, which extends nearly east-southeastward and terminates in Volcano Momotombo, on the shore of Lake of Managua. The Volcanoes Telica, San Jacinto, Rota, Las Pilas, and Assoco are also included in this range; but as Viejo and Momotombo are higher than any between them, they alone are especially valuable as landmarks.

**8-2 Momotombo** ( $12^{\circ}24' N.$ ,  $86^{\circ}34' W.$ , *H. O. Chart 931*), an active volcano, 4,127 feet high, is cone-shaped and so regular in outline that it resembles a pyramid, and therefore can not be mistaken for the lower and more rugged peaks to the left, especially as it terminates on the east of the chain of mountains. When viewed from the sea at some distance southward of Corinto, Momotombo appears as an immense is-

olated mountain, but when seen from Isla Cardon it appears to be joined to Assoco, a volcano of less height, the two mountains then showing as perfect cones.

Las Pilas has two rounded summits of almost equal height, presenting a saddle-shaped appearance; it is not sufficiently lofty to be seen from the offing.

Telica is the most remarkable of the mountains between Las Pilas and Viejo; it is a cone of extremely regular outline, which appears to be connected with Viejo, of which, it has about half the altitude, but from which is in reality separated by a wide interval containing the mountain Santa Clara.

**Cerro de Managua**, a long rounded ridge with a maximum elevation of 3,000 feet and showing a regular curved outline for nearly 15 miles, is 29 miles south-southeastward of Momotombo and parallel with the coast.

**Volcano Mombacho**, 4,472 feet high, rising from the shore of Lake of Nicaragua, is very irregular in outline and shows two peaks when seen from the westward, over the Cerros de Managua, and three when seen from the southward. The eastern summit, which is the highest, is remarkably sharp.

**Volcano Ometepe**, 5,085 feet high, lies in Lake of Nicaragua at a position 27 miles southeastward of Mombacho and 23 miles from the coast; this active volcano, which is often concealed by dense smoke, shows over the high land between the lake and the Pacific as a perfect frustum of a cone. The little port of San Juan del Sur is directly in front of it on the coast.

**Madera**, about 8 miles southeastward of Ometepe, is a saddle-shaped mountain; the eastern and higher summit has an altitude of 4,350 feet.

Vessels making the land off Ometepe and Madera will have the mountains of Costa Rica in sight to the eastward.

**8-3 Coast.**—From Coseguina Point the shore for the first 6 miles, sloping gradually from the base of the Volcano Coseguina, breaks squarely off into the sea and forms an almost perpendicular line of cliffs 200 feet in height. The hills here recede from the shore, and at 9 miles from the end of the bluffs there is a lagoon or a river mouth; there is an island across this entrance, and shoal ground on which the sea often breaks extends out about  $\frac{1}{2}$  mile from it.

A  $2\frac{3}{4}$ -fathom shoal lies  $6\frac{1}{2}$  miles southeastward of Coseguina Point and  $1\frac{1}{2}$  miles offshore; an obstruction was reported in 1927 to lie 2 miles southward of this shoal.

**Mesa de Roland,** 19 miles from Coseguina Point and 4 miles inland, is a flat-topped hill 1,000 feet high, which from the southward appears to rise on each side abruptly and near the top perpendicularly; behind it are hills of greater elevation, and therefore from directly seaward it is visible only a short distance.

**8-4 Speck Reef** ( $12^{\circ}41' N.$ ,  $87^{\circ}27' W.$ , *H. O. Chart 931*), lying about 20 miles southeastward of Coseguina Point and consisting of shoal patches with deep water about them, extends 3 miles along the beach and makes out  $1\frac{1}{4}$  miles. At the western end, 1 mile offshore, there are several rocks awash. At 1 mile westward of these rocks there is a 3-fathom shoal,  $\frac{1}{2}$  mile across, with 6 and 7 fathoms around it; from it the Mesa de Roland bears about  $36^{\circ}$ . The outer reef is extremely dangerous, as it does not break at half tide even with a heavy swell, although the sea breaks furiously on the inner reef at that time.

**8-5 Reported shoal.**—In 1948 a vessel reported striking a shoal in approximately latitude  $12^{\circ}37'48'' N.$ , longitude  $87^{\circ}28'00'' W.$ , south-southwestward of Speck Reef. This position is near charted depths of 11 fathoms, and the vessel obtained a sounding of 11 fathoms prior to striking the shoal.

**8-6 Burra Grande Reef,**  $25\frac{1}{4}$  miles from

Coseguina Point and 14 miles from Morro Cardon Lighthouse, is 1 mile in length, parallel with the coast, and  $\frac{1}{4}$  mile in width, with a depth of about  $1\frac{1}{2}$  fathoms, but with rocks nearly awash. The outer edge is  $1\frac{1}{2}$  miles from the shore, with soundings of 5 to 8 fathoms close to it. Inside the reef there is a narrow channel with 5 and 6 fathoms, but, as there are other shoals on the inshore side, the passage should never be attempted; one of these shoals, called Padre Ramos, with less than 2 fathoms over it, bears  $95^{\circ}$  from the southern end of Burra Grande, and its outer end is 1,500 yards from the shore.

**Isla de Limon**, lying at the mouth of a small river, 27 miles from Coseguina Point, is low, flat, covered with trees, and encircled by a whitish-colored gravel beach. The islet is only 16 feet high, but the trees upon it render it visible at a distance of 8 miles; it is connected with Isla Punta Icaco (Asarradores) by a submerged rocky bank upon which the sea almost always breaks, and over which there is so little depth that it completely closes the channel between the two islands.

It is said that a number of vessels have been lost on Burra Grande Reef, or among the shoals close to Isla de Limon, by mistaking the latter for Isla Cardon, in front of Corinto. The lighthouse on Isla Cardon and the fact that Limon is densely wooded while Cardon is comparatively bare, should serve adequately to distinguish these islands.

**8-7 Coast.**—From Isla de Limon the coast of Isla Punta Icaco, which is low and wooded, with a sandy beach, trends southeastward. A sailing vessel should not approach this coast too closely, because if the wind should fall light the current and swell would soon set the vessel onto the shore; a safe distance is 5 miles, in not less than 10 fathoms of water. During the winter, when the wind sometimes blows from a direction between south and southwest, with rainy weather, there is also danger in remaining at anchor off it, as the sea runs very high.

**8-8 CORINTO HARBOR** ( $12^{\circ}28' N.$   $87^{\circ}$

11' W., H.O. Chart 2604) is formed by the junction of the Rio Realejo and the Estero Dona Paula and extends around the southeastern end of Isla Punta Icaco, between it and the mainland on the eastward and southward and Isla Cardon on the southwestward. Isla Punta Icaco is separated from the mainland by Estero Caballo, a small creek, and therefore does not appear as an island.

The harbor has two entrance channels, Cardon Channel leading northward of Isla Cardon and False Bar Channel leading southward of that island; False Bar Channel, however, is not recommended.

**8-9 LANDMARKS.**—The landmarks for making the port in clear weather are the Volcanoes Coseguina, Viejo, and Momotombo; in clear moonlight these volcanoes have been seen 47 miles at sea. All the peaks between Piejo and Momotombo are visible from the offing; as the port is neared Asoco will come nearly in range with Momotombo and become, like it, conical in appearance. Behind the low coast that stretches for a considerable distance on each side of Corinto there is an extensive plain which rises gradually toward the interior.

There is a two-story house with a red tile gable roof on Monte Dona Paulo, on the northeast side of Castanones Peninsula. This house constitutes a conspicuous mark in the daytime when entering the harbor off Morro Cardon. This house has been reported to be practically obscured by trees. A conspicuous white chimney stands about 10 1/2 miles east-northeastward of Morro Cardon Light.

**8-10 ISLA CARDON** is 1,500 yards long in a northwest and southeast direction, of a reddish-brown color in the dry season, but green during the rainy season, almost bare of trees, about 35 feet high, and nearly level. The northwestern end is faced with perpendicular rocks and just outside Punta Ponente is a rock resembling a tower. Rocky patches and shoal water extend 300 yards off the northwestern end.

A small pier with a T-head along which there is a depth of 7 feet extends out from the eastern side of the island at a position about 125 yards southeastward of Morro Cardon Light. A building with a red roof is situated close southward of the root of this pier. An old dock projects from the shore about 1/3 mile southeastward of Morro Cardon

Light. About 100 yards westward of the old dock is a white rock.

**8-11 MORRO CARDON LIGHT** is shown on Morro Cardon, the northeastern extremity of Isla Cardon.

**8-12 CARDON CHANNEL**, the main channel between Isla Cardon and the town, has a minimum width of 200 yards and a controlling depth of 28 feet at high water, and a least depth of 24 feet at low water.

**8-13 DEPTHS**, in excess of 3 fathoms up to a maximum of 9 1/2 fathoms, prevail throughout most of the navigable harbor area.

It was reported (1966) that because of silting, areas indicated on the chart as having 11-foot depths, actually dry at low water.

It was reported (1955) that where Dona Paula range intersects the entrance range there is a depth of only 25 feet, although the charted depth is 48 feet.

**8-14 DANGERS.**—Northward of the recommended track over the bar the depths decrease.

An 18-foot patch lies about 3/4 mile west-northwestward of Morro Cardon Light, near the entrance range line and depths of 15 to 18 feet have been reported farther southward and eastward.

A shoal area extends off the eastern side of Isla Cardon, commencing about 350 yards southeastward of the northeastern extremity of the island, and continuing to the southeastern extremity of the island. The shoal area varies in width from about 100 to 350 yards, and is marked by red nun buoys Nos. 4, 6, and 8.

It was reported in 1947 that the shoals on the southwestern and southeastern sides of Cardon Channel work out toward the fairway during the rainy season and the period of southerly winds and swells, and then recede during the dry season.

**CAUTION.**—Depths up to 2 fathoms less than charted, lie on and near the entrance range line.

Shoaling to depths of about 20 feet is reported southeastward of Corinto close southward of Isla Encantada Range line.

Mariners are advised to enter only during favorable conditions using extreme caution.

Vessels of maximum draft should not enter or leave the harbor when a heavy ground swell is running on the bar.

Due to extensive changes in hydrography and topography the chart should be used with the utmost caution.

8-15 SAWYER BANK extends westward from the southwestern end of Isla Punta Icaco, leaving the narrow Cardon Channel between it and Isla Cardon. Part of the bank dries and the southwestern edge is very steep, dropping rapidly from 3 to 9 fathoms; great care is required when in its vicinity because, although this edge is sometimes indicated by breakers, it more frequently is not, and also because the flood currents sets toward it. The southern part of the bank, on which there are depths of 3 1/2 to 4 fathoms, extends just southward of Dona Paula Range line. It was reported (1963) that Sawyer Bank had extended about 800 yards farther westward than charted.

8-16 BUOYAGE.—The buoys marking the salient points of the shoals along Cardon Channel and in the harbor are red on the starboard side, entering, and black on the port. The southern extension of Sawyer Bank is marked by light buoy No. 7.

8-17 RANGE LIGHTS.—The front light of the entrance range is shown from beacon No. 1, situated on the shore westward of Corinto; the rear light of this range is shown from beacon No. 2, situated 327 yards eastward of the front light. These lights in range 084° lead across the bar.

The front light of the Dona Paula Range is shown from beacon No. 3, on Castanones Peninsula, and the rear light is shown from beacon No. 4, on the same peninsula about 150 yards 130 1/2° from the front light.

The Isla Encantada Range consists of two white, square, concrete structures from which lights are shown, situated on Isla Encantada, on the eastern side of the harbor opposite the city. These lights are in range about 065°. The range marks have been reported to be confusing in view of the fact that only the front beacon is visible when a vessel is on the range line.

CAUTION.—The inner range beacon, No. 2, of the entrance range was reported (1966) to be obscured by trees. Pilots were reported to be using the outer range beacon, No. 1, in line 087° with the southern water tank in the harbor area.

Caution must also be exercised on Dona

Paula Range as the depths are shoaling on the range line southeastward of Morro Cardon.

8-18 TOWERS.—A conspicuous tower is located near the center of the town.

Two water towers, the westernmost showing obstruction lights, are located near the main wharf on the eastern side of the town.

8-19 FALSE BAR CHANNEL (12° 27' N., 87° 12' W., H.O. Chart 2604) is the narrow entrance channel that leads between Morro Castanones and the southeastern end of Isla Cardon. The depths in this channel are constantly changing, and its use, even with the chart, is not recommended, although it appears to carry a practicable depth of 12 feet (1961) at mean low water.

MORRO CASTANONES, at the northwestern end of Castanones Peninsula, is 47 feet high; to the eastward are several wooded hills of twice that elevation. Monte Dona Paula, 72 feet high, rises from the shore at the mouth of Estero Dona Paula, almost 1 mile eastward of the bluffs.

BAJOS CASTANONES, extending along the north side of False Bar Channel, have depths of 19 to 25 feet over them. Vessels coming from the eastward should keep 2 miles from the land, or in a depth of not less than 12 fathoms, until Conway Reef is passed, and then haul up to pass about 1 mile off Isla Cardon.

CONWAY REEF, lying 2 3/4 miles southeastward of Morro Castanones, is the principal danger outside of Corinto in that direction. The two rocks above water, 8 and 5 feet high, are a little over 3/4 mile from the beach. The depths between the rocks and for 1 1/4 miles seaward of them, and probably a greater distance, are very uneven. In passing the reef, a berth of at least 2 miles should be given the rocks above water. Morro Castanones, in range with the lighthouse on Morro Cardon, will carry clear of Conway Reef, but unless acquainted with the port it will be difficult to distinguish the bluffs of Morro Castanones from Isla Cardon beyond them.

8-20 OUTER ANCHORAGE.—The anchorage outside Isla Cardon is safe enough if normal precautions are taken, but is made uncomfortable by the swell that sets in; consequently, when it is intended to make a stay, it is more prudent to enter the port. A large vessel should anchor with

Morro Cardon Light bearing about  $095^{\circ}$ , at least  $1\frac{1}{2}$  miles distant, in  $6\frac{1}{2}$  to 8 fathoms, mud and black sand. Northward of this anchorage position the same soundings will be found at a greater distance from the land, but not from the shoals, and to the southward a heavier sea is generally experienced.

**8-21 INNER ANCHORAGE.**—The port is completely sheltered from bad weather except from the direction of False Bar Channel. Merchant vessels waiting to dock habitually anchor in midstream, in depths of  $4\frac{1}{2}$  to 6  $1\frac{1}{2}$  fathoms.

Naval vessels can anchor out of the way of merchant vessels as follows: Larger vessels, in 7 fathoms of water, with Morro Cardon Light bearing  $285^{\circ}$ , distant about 1,300 yards and vessels of 10- to 16-foot draft, in a depth of  $5\frac{1}{2}$  fathoms, in the upper part of the harbor, northeast of the pier.

An area about 600 yards southward of the end of the pier should be avoided as an anchorage; the bottom is of hard sand, poor holding ground, and the full force of the tidal currents is felt over this area.

Inasmuch as the tidal currents are strong at springs, and as the holding ground is only fair, it is advisable always to moor.

**8-22 TIDES.**—The mean high water interval at Corinto Harbor is 2h. 36m.; the mean range is 6.8 feet. The lowest recorded tide was 1.7 feet below the datum of the chart, and the highest was 9.2 feet above that datum.

At the landing on the shore side of the pier there is a staff side gage with the 12-foot mark even with the underside of the horizontal, longitudinal, concrete stringer. On this gage mean low water is at the height of 4.3.

**8-23 TIDAL CURRENTS.**—In Corinto Harbor the tidal currents are strong and should be guarded against. At the outer anchorage the floor current sets strongly from northeast to east-northeast, and the ebb in the reverse direction, with a mean velocity of about 0.8 knot, but sometimes reaching 2 knots. The flood current is reported to set through False Bar Channel at a rate of about 3 knots; it has a tendency to set a vessel onto the shoal that extends northward from Castanones Peninsula.

There are times when waves 10 to 15 feet high enter through False Bar Channel and then run nearly at right angles in a south-easterly direction toward the beach, capsizing any ship's boats in their wake. Motor launches have thus been carried in to this beach and broken up. During such times, however, the waters to the eastward and northward of the red channel buoys are entirely safe for anchorage and small boats.

From observations extending over several days, made during July 1929 by the U.S.S. Cleveland, it was found that in Cardon Channel the tidal currents set approximately in the direction of the axis of the channel; the average maximum velocity was found to be 1.2 knots for the incoming current. After the outgoing current ceases to run there is a considerable period of slack water, its average duration during the time of observation being about 1 hour; high-water slack lasts about 20 minutes. The beginning of the incoming current in Cardon Channel is about 50 minutes after low water at Corinto Pier, and the beginning of the outgoing current about 10 minutes after high water there.

Inside the harbor the tidal currents set in a direction parallel with the main axis of the outer part of the pier at a rate of about 3 knots.

It is advisable for a large vessel, especially one of the single-screw type, to select flood tide for coming alongside the pier. By doing so the vessel can proceed to a position off the upper end of the pier, drop anchor, swing to the tide, and then go alongside the pier heading out. A vessel of this type might experience some difficulty in getting away from the pier if moored heading in.

**8-24 PILOTAGE** is compulsory, and the use of a pilot is a necessity for safe navigation. Pilot fees are charged whether a vessel takes a pilot or not. Furthermore, it has been reported that no vessel will be tended at the pier in Corinto unless a pilot has been employed.

The pilot comes out in an unmarked boat and boards vessels about  $1\frac{1}{2}$  miles,  $280^{\circ}$  from Morro Cardon Light. The signal for a pilot is 1 long blast. Inasmuch as no lookout is maintained, it is advisable to request a pilot by radio. Pilots will take vessels in or out by day or night; however, deep draft

vessels should attempt entry or departure only in daytime (sec. 8-14).

Port regulations require that all vessels must send an estimated time of arrival to the port authority 24 hours in advance.

Customs and health officers board incoming vessels at the pier or the anchorage.

**8-25 Directions.**—Vessels entering from the northward, when 3 or 4 miles off should bring Morro Cardon Light to bear  $105^{\circ}$  and steer for it until the light is about  $1\frac{1}{2}$  miles distant. At this time, the vessel should lie to and await the arrival of a pilot. Due to shoaling in the vicinity of the entrance and inner ranges, entry and departure should be made only with a pilot (sec. 8-14 and 8-17).

Vessels coming from the southeastward and having given Conway Reef a berth of at least 2 miles should keep not less than  $1\frac{1}{2}$  miles off Isla Cardon. This course will be in depths of not less than 7 fathoms and will lead clear of Bajos Castanones. When Morro Cardon Light bears about  $105^{\circ}$ , distant about  $1\frac{1}{2}$  miles, lie to and await the arrival of a pilot.

In leaving the harbor it is advisable to get under way at least  $\frac{1}{2}$  hour before the time of high water.

**8-26 CORINTO** ( $12^{\circ}27' N.$ ,  $87^{\circ}11' W.$ , *H. O. Chart 2604*), with a population of about 10,000 (1964), is the principal port of entry on the Pacific coast of Nicaragua; it produces nothing for export but is a shipping port for the products of the interior. The principal exports are coffee, cattle, sugar and cotton.

The town is situated on low, sandy ground at the southeastern end of Isla Punta Icaco, with swamps northward of it. Although there is no municipal sewage system, the sanitation of the place is said to be fair.

The local time used is that of the 90th meridian.

**PIERS—WHARF.**—A concrete railroad pier extends southward from the shore near the northeastern port of Corinto. The southern section of this pier has a berth about 510 feet long with 25 feet alongside.

The main wharf, situated close southward of the railroad pier, extends southward for 1,170 feet and thence westward for 375 feet and has depths of 25 to 30 feet alongside.

Four oil pipe lines and a 3-inch water line terminate on the main pier. Vessels up to 575 feet with a maximum draft of  $26\frac{1}{2}$  feet can enter and moor alongside (1966).

Cargo is handled at the wharves by means of ship's gear. Several barges of 150 tons capacity are also available. Railroad and storage facilities are located at the berths.

Supplies are available in limited quantities. Poultry and eggs can be obtained, and fruits and vegetables in season. Drinking water may be obtained by pipeline.

Fuel oil, available in emergencies only, and diesel oil are delivered by pipeline to the main pier. However, the fuel oil has been reported to be of high viscosity and therefore not entirely satisfactory for shipboard use.

**Repairs.**—Minor repairs can be made.

**Communication.**—There is a regular steamship communication with other Pacific ports to the northward and southward. A railroad extends from Corinto to Chinandega, Leon, Managua, and Granada. There is telegraphic and telephonic communication with the interior.

**Climate.**—The year is divided into a rainy and dry season, the rainy season lasting from the latter part of May until November. The average temperature for the day is  $85^{\circ}$  F., and for the night  $73^{\circ}$  F. Northeast winds prevail from November to March, and southwest winds the remainder of the year.

**Quarantine.**—Merchant vessels entering the port are visited by the captain of the port and the quarantine officer. Pratique is granted by the captain of the port, who is also the commandante de armas and the senior local government official.

**Hospital.**—Saint John Hospital, with a capacity of 35 beds, receives seamen.

**8-27 COAST** (*H. O. Chart 0931*).—From Corinto to San Juan del Sur the coast trends southeastward 107 miles, and consists generally of sandy beaches separated by cliffs against which the sea beats heavily. The 10-fathom curve skirts the coast at a distance of 1 to 2 miles, and 50 fathoms is found quite uniformly at 15 to 17 miles offshore. Anchorage along this coast is considered safe during the fine season, from November to May, when the winds, which at times are very strong, are from the northeastward.

At 11 miles from Corinto Light the flat sandy beach is broken by a low bluff rising directly from the water; a little farther to the eastward and 4 miles inland there is a range of hills 8 miles long, two of the peaks being, respectively, 890 and 920 feet high.

At nearly 18 miles from the lighthouse and  $1\frac{1}{2}$  miles from shore there is a  $2\frac{1}{2}$ -fathom shoal on which the sea breaks occasionally; close outside of it is 9 fathoms, but in other directions the water deepens gradually; at 1 mile  $332^{\circ}$  from it there is another shoal patch with rocks under water.

**8-28 Puerto Somoza and Tamarinda River** ( $12^{\circ}12' N.$ ,  $86^{\circ}47' W.$ , *H.O. Chart 0931*).—Puerto Somoza is a small cargo and oil terminal located on the east bank of the Rio Tamarinda about 1 mile within the river mouth. Ocean-going ships normally anchor outside the bar off the river mouth and discharge cargo by

lighters. Large tankers can moor in the offshore oil berth. Ships are advised not to attempt to proceed farther inshore than the anchorage outside the bar without local assistance, because the channel location and depths across the bar are not confirmed.

**TIDES.**—High water springs rise 7 1/3 feet; high water neaps rise 5 3/4 feet; low water springs rise 0 feet; low water neaps rise 1 1/2 feet.

**CURRENTS.**—The ebb current, especially after the rains, frequently has a velocity of 5 to 6 knots in the river and then maintains 4 knots over the banks at the entrance. The velocity of the flood current does not exceed 2 to 3 knots. The flood current ascends the river as far as the village.

A slight northerly set was experienced by a ship in approaching the anchorage. During a three day stay at the anchorage (November) the ship headed into the prevailing easterly wind and was not influenced very much by the currents.

**DEPTHES AND DANGERS.**—A submerged rock with a depth of 4 fathoms over it, has been reported (1961) to lie about 3 miles westward of the entrance to Puerto Somoza in about 12° 09.6' N., 86° 51.0' W.

A sunken lighter lies, in the anchorage, with Volcano Momotombo bearing 047° and the range beacons bearing 081°.

A bar comprised of several low drying sandbanks, numerous shoals, and rocks extend across the river mouth. The low sandbanks do not appear on radar, and the sea breaks nearly continuously over the shoals and rocks. The marked channels between the banks and shoals are intricate, and require local assistance for passage between them. It was reported (1964) that the main channel entrance had an average depth of about 11 feet.

Submerged rocks lie up to about 1 1/2 miles westward of the south point of the river mouth; the rocks are marked by two black conical buoys. A 4-fathom patch, rock, lies close southward of the entrance range, about 3 3/4 miles west-southwestward of the outer range beacon. A 5-fathom patch lies on the range line about 2 3/4 miles from the shore.

Depths otherwise appear to shoal gradually from the 10-fathom curve, about 2 1/2 miles off the bar, to 6 1/2 to 8 fathoms at the anchorage, about 1 1/2 miles west-northwestward of the south entrance point of the river mouth. Extreme caution is advised because of the reconnaissance nature of the sounding information and because depths are subject to change off the mouth of a river.

**ASPECT—LANDMARKS.**—Volcano Momotombo, (sec. 8-2) about 19 1/2 miles north-eastward of the river mouth, and Volcano Viejo, (sec. 8-1) about 33 miles north-northwestward of the river mouth, are the most useful peaks for bearings from the offing. A house with an aluminum roof is located on a hillside about 1/2 mile east-northeastward of the south entrance point of the river mouth. This house is the first nearshore landmark to be made out, and it is visible from 8 to 10 miles. The three gray warehouses and the boom of a crane located at the terminal about 1 mile northward of the house may also be visible for a considerable distance. The land in the vicinity of the river mouth is generally low.

**NAVIGATIONAL AIDS.**—Puerto Somoza Light is located about 1 1/4 miles eastward of the southern entrance point of the river.

Two light beacons, with diamond daymarks painted in black and white checks are located about 1/4 mile northward of the aluminum-roofed house. When in line, about 075°; these beacons lead into the anchorage. The beacons are not easily made out in the daytime, and the lights were reported visible only 2 miles.

A white buoy with a cross topmark is moored on the range line about 1 1/2 miles west-southwestward of the front range light.

Two light buoys, equipped with radar reflectors and marking the northwestern and southeastern ends of the offshore pipeline berth, are moored about 2 1/2 miles south-southwestward of the southern entrance point of the river.

**PILOTS.**—None. Local tugmasters might assist, and they will respond to the signal of four long blasts of the whistle.

**DIRECTIONS TO THE ANCHORAGE.**—From southward approach the coast to a position about 5 miles west-southwestward of the river mouth. When Volcano Momotombo bears  $050^{\circ}$  and Volcano Viejo bears  $346^{\circ}$ , steer  $351^{\circ}$  until the approach range is made out. Then keep the approach open to the northward, about  $085^{\circ}$ , to avoid the previously mentioned 4- and 5-fathom patches. Ships should sound continuously and not proceed inshore of the white buoy with the cross topmark. Ships are advised not to approach at night.

From northward a vessel should approach the coast on a southeasterly heading until the range lights are in sight. Thence proceed in on the range as above.

**ANCHORAGE.**—In 1959 a ship of 14-foot draft anchored on the range line in  $6\frac{1}{2}$  fathoms about 400 yards westward of the white buoy with the cross topmark and with Volcano Momotombo bearing  $047^{\circ}$  and Volcano Viejo bearing  $339^{\circ}$ . In 1965 a ship of  $19\frac{1}{2}$ -foot draft anchored in  $7\frac{1}{2}$  fathoms near the range line with the northernmost warehouse bearing  $056^{\circ}$ , and the aluminum-roofed house bearing  $080^{\circ}$ .

Vessels requiring pratique or assistance should anchor about 3 miles westward of the entrance range to await port officials.

**8-29 PUERTO SOMOZA, FACILITIES.**—Three small tugs of 140 horsepower are used to move the lighters. Small tankers moor to a pier at the terminal that is about 150 feet long and about 40 feet wide. Silting causes depths to change frequently, however depths alongside were reported (1964) to be 10 to 15 feet. Supplies might be obtained in an emergency from Managua which is connected to the terminal by a good highway. Water is obtained from small wells in the port.

An offshore pipeline berth consisting of five mooring buoys, is located about  $2\frac{1}{2}$  miles south-southwestward of the southern entrance point of the river. The seaward end of the pipeline is moored in about 50 feet of water. The maximum size tanker which can be accommodated is 700 feet in length with a draft of 41 feet. Three warehouses and several storage tanks are located in the port. The storage tanks each have a capacity of 150,000 barrels. The pipeline to the offshore tanker berth is 18-inch diameter.

**8-30 WINDS AND WEATHER.**—From

March 27, to May 12, 1887, according to a report of the German barque Pallas, the prevailing direction of the wind was east-northeasterly, especially in the morning and forenoon. Land and sea breezes were marked in this way, that the wind in the course of the day gradually veered from northeast through east to south, appearing about 4 p. m. as a sea breeze from southwest and toward evening, frequently after a period of calm, going back again to a land wind. The wind attained its greatest average force, 4 to 5 Beaufort scale, from east-northeast while the weakest was 1 to 3 from west. Calms occurred only in the evening. The gales called Papagayos occurred five times, when the wind reached force 8. In general the weather was fine and steady, only interrupted by occasional Papagayos and short intervals of mist. The amount of cloud was small, especially at evening.

**8-31 COAST.**—From the Tamarinda River the coast trends south-southeastward for  $11\frac{1}{2}$  miles to Cape Desolado. The hills approach the coast, and, near the cape, appear in places to rise precipitously. This coast appears to be very foul for a distance of 2 miles off shore, as throughout the entire extent there is a strong surf. A vessel should approach this part of the coast with the greatest caution and keep at least 3 miles from it in passing.

**CAPE DESOLADO**, sometimes regarded as the northwestern limit of the Papagayos, is a conspicuous headland, and, owing to the low land just to the southeastward, appears at a distance to project well into the sea, although in reality the change in the direction of the coast is very slight. The cliffs ending at the point are over 200 feet high and, just to the northward, part of the ascent is faced with a smooth perpendicular rock behind which the rise is gradual to the summit of the ridge.

The highest point, 460 feet high,  $1\frac{1}{2}$  mile inland, when seen from the northward, shows several knolls on the seaward slope; outside of these the headland soon rises. From the southward the face of the hill toward the interior appears to be steep, the other face descending gradually until near the shore, when it rises and then falls suddenly to the sea. When Loma de Tigre and the Volcano Momotombo are in range about  $017^{\circ}$ , Cape Desolado will lie almost in the range, but

neither of these volcanoes can be seen when close under the land.

8-32 VENADILLO ROAD ( $11^{\circ} 55' N.$ ,  $86^{\circ} 39' W.$ , H.O. Chart 0931), about 5 miles below Cape Desolado, is an open roadstead affording ANCHORAGE in depths of 7 to 14 fathoms; it is used by vessels engaged in shipping cedar. During the winter months the anchorage is safe even when a Papagayo is blowing, and although the wind frequently attains the force of a gale during the day, it falls light and sometimes calm at night. During the summer months it is necessary to anchor farther out in 10 to 14 fathoms so as to be ready to weigh in case an on-shore wind springs up. Landing in boats is dangerous on account of the heavy breakers on the shore, and is feasible only in the morning. The cedar is brought off in rafts.

To facilitate the recognition of the locality a mast has been erected, on which a white flag with the word "Venadillo" is shown on the arrival of a vessel, but the mast is low and cannot be distinguished beyond  $1\frac{1}{2}$  miles. The best guide is Volcano Momo-tombo, which bears  $011^{\circ}$  from the road.

A conspicuous white chimney, from which an obstruction light is shown, is located about 10 miles southeastward of Venadillo Road.

8-33 PUERTO MASACHAPA (MONTE LIMAR) is located about 13 miles southeastward of Venadillo Road at the mouth of Rio Masachapa. The port is an open roadstead, with numerous reefs close inshore. There is a pier, about 1,000 feet long, with a depth of 20 feet alongside. There are five oil pipelines: two extend about 11,000 feet southwestward, and three extend about 1,500 feet northwestward from the shore at the oil terminals. Four buoys mark the seaward approach to the shorter pipelines. The seaward end of the longer pipelines is marked by a buoy and by two hose pick-up buoys. Mooring buoys provide one berth at each of the two seaward ends of the pipeline groups. All buoys are painted white. The maximum draft which can be safely accommodated is 30 feet, and the maximum length is 545 feet. The village of Masachapa is located about  $1\frac{1}{3}$  miles southward of the oil terminals.

The most favorable time for mooring is at daybreak before the wind increases in velocity.

Vessels must be prepared with at least ten

good mooring lines, each about 1,000 feet long. Normally two are required for each of the seaward buoys, and three for each of the shoreward buoys. Small lines, cable slings, and shackles are required for raising and fastening the two hose pickup buoys.

The vessel should, as soon as possible, contact the terminal with the radio keeping them advised of the vessel's arrival.

In the event of bad weather vessels should be prepared to disconnect, and leave the moorings.

Prevailing winds are off the land and the holding ground is very poor.

PILOTAGE.—Pilotage is not compulsory, although pilots are available for mooring. The pilot boards from a green motor boat.

DIRECTIONS.—This being an open roadstead, and the difficulty in sighting the shore tanks, it is deemed safer to proceed parallel to the coast at a distance of about 10 miles until Masachapa is abeam, thence head directly for the port on a bearing of about  $060^{\circ}$ .

8-34 COAST.—From Cape Desolado the coast trends southeastward for 65 miles to San Juan del Sur. From the point about 16 miles southeastward of Cape Desolado a shoal with less than 1 fathom projects 1,200 yards. The lowland near the cape is succeeded by hills of moderate elevation, and these continue for some distance along the coast with no marked feature about them.

At 37 miles southeastward of Cape Desolado a ledge with rocks showing above water lies a little more than a mile from the beach, directly under a group of mountains, the first met with near the coast after leaving the cape. The highest of these mountains is 2,037 feet high, but the peak ne rest the coast, 1,434 feet high, is the most conspicuous. When seen from the northwestward or southeastward the group shows as a well-defined ridge,  $1\frac{1}{2}$  mile long, at right angles with the coast, the inner end being the higher. The position of the shoal is fairly well indicated by the line of the ridge.

GIGANTE POINT, about 53 miles southeastward of Cape Desolado, is a large rocky point, being the most northern of the series of bold promontories north of Brito Head. It is concealed from the northward by a projecting cliff, but in front or from the southward it can be seen for more than 12 miles; by moonlight, and when not in the shadow of the bluffs, it is very distinct. A prom-

inent mountain, 1,565 feet high, rising 4 miles inland from the point, appears from the westward to be capped by a small circular eminence.

On the north side of El Gigante is a deep crescent shaped bay, frequently used by large vessels to load cattle and logs. Inside the point 30 feet of water is reported 300 yards from shore. Except when the wind is from the west the beach is calm. A large cattle ranch is located here. Cattle and fresh water are available.

VIEJA ISLET is a huge reddish-colored rock, 165 feet high, lying 2 1/2 miles southwestward of Gigante Point and 400 yards from the shore, with deep water around it.

8-35 BRITO ROADSTEAD (11° 21' N., 85° 58' W., H.O. Chart 1035), 4 1/2 miles southeastward of Gigante Point, is merely a slight indentation of the coast at the mouth of the Rio Grande. The coast to the northward is generally bold, some of the cliffs being almost precipitous, but at Brito the land is low, and the depression extends through the hills toward Lake of Nicaragua. This vicinity was selected as the Pacific terminus of the proposed Nicaragua Canal.

Brito Head, on the western side of the river entrance, is a bluff promontory, projecting 1/4 mile southward of the general coast line; the land 600 yards behind the point reaches the height of 370 feet. A mangrove swamp extends over 1 mile eastward from the mouth of the river, behind the beach. The depths in the road are regular, the 5-fathom curve lying 350 yards from the beach, and the 10-fathom curve 1/4 mile farther out, except off Brito Head where there are 10 fathoms at 300 yards from the extremity. At 1 mile southward of the head the depth is 20 fathoms.

8-36 PORT NACASCOLO (MERAZAN) (PUERTO MORAZAN) is little more than a recess in the cliffs, 1 1/2 miles north-northwestward of the lighthouse at San Juan del Sur. A vessel anchoring just within the heads would be less than 200 yards from the rocks on either side, with shoal water less than 400 yards farther in. An outline of the port is shown on the plan of San Juan del Sur, H.O. Chart 1035, but it has not been surveyed.

Lot's Wife is an islet that lies close to the shore immediately south of Port Nacascolo.

8-37 THE PORT OF SAN JUAN DEL SUR.—(H.O. Chart 1035) is formed by an opening through the cliffs a little over 1/2 mile wide, backed by a curving sand beach. The entrance is narrowed to 800 yards by the rocky points under the cliffs. The bay within the rocky points has an extreme breadth of 1,500 yards, and extends in about 1/2 mile. This limited space is still further contracted by the shallow water along the edge of the beach. From the head of the bay the water deepens gradually to 5 and 6 fathoms between the rocky points and to 10 and 11 fathoms between the outer headlands. The bottom consists generally of sand and shells, but in some places is rocky.

The bluffs on the southern side of the entrance rise to a height of 433 feet, while those on the northern side rise to a height of 462 feet. The water on the southern side is deep up to the edge of the reefs; on the northern side the reefs extend out farther.

The lowland behind the bay is succeeded by the foothills of the dividing ridge between the Lake of Nicaragua and the ocean, and 2 1/2 miles from the beach is Papayal Mountain, 1,400 feet high. When within 15 miles of this mountain a stranger cannot fail to distinguish it by the knolls or mounds along the ridge, the outline resembling that of the left hand closed, with the first knuckle uppermost and the palm turned away. The lighthouse on the bluff at the south side of the entrance can easily be distinguished several miles. When near the port the Frailes Rocks can be seen to the southeastward. At the head of the bay and almost 1/4 mile northward of the center of the village is a fort with an observation post 75 yards to the northward and another 25 yards to the southward. A conspicuous house, painted green, is located 1/4 mile northward of the village, and a pole, which is also conspicuous, is located 1/4 mile farther northward.

The small streams emptying into the bay are dried up most of the year; their outlets are blocked up with sand and cannot be seen.

8-38 LIGHTS.—SAN JUAN DEL SUR LIGHT (11° 15' N., 85° 53' W., H.O. Chart 1035) is shown from a circular, wooden tower, 15 feet high, on the south side of the entrance to the port.

LIGHTED RANGE BEACONS are located about 1/4 mile northward of the village. These beacons are in range 067° but have been reported to be difficult to distinguish.

**8-39 Anchorage.**—The harbor being open to the southwestward the Papagayos blow directly out, and as the squalls are often violent, the bottom shelving, and the holding ground poor, vessels obliged to go inside during the season of these winds should anchor so as to clear the rock if they drag. When not loading it is better to lie outside, and preferably near the southern bluff. Anchorage for vessels working cargo is reported in a position with San Juan del Sur Light bearing 170° distant about  $\frac{1}{2}$  mile.

**8-40** This section has been deleted.

**8-41 Submarine cables.**—A cable area, in which anchoring is prohibited, lies in the northern part of the bay northward of a line bearing 070° from the front range light.

**8-42 Tides.**—The mean high water interval at San Juan del Sur is 2h.32m.; spring range 7.6 feet, mean range 6.2 feet.

The currents are not strong, and vessels usually ride to the prevailing winds.

Pilots are not available.

**8-43 Directions.**—There should be no trouble in finding the port in clear weather, nor in entering at any time if the headlands are made out. When well offshore the volcanoes, Mombacho, Ometepe, and Madera, the peaks of Orosi, and the Cerros de Elena will serve as landmarks; nearer, Papayal Mountain will be distinguished, and the Frailes Rocks will be seen to the south-eastward; the former, on a bearing 039°, opens the entrance. When the lighted range beacons, located about  $\frac{1}{4}$  mile northward of the village, are in range about 067°, steer in on that course and anchor as convenient southward of the cable area.

A vessel which frequents the port has recommended the following directions for anchoring farther in near the middle of the bay. Enter the bay with the green house and a tank behind it in range 068°, thence proceed to take up anchorage when the end of the pier and the Commandancia are in range. In this position the reporting vessel, 321 feet long with a draft of 20 feet, was able to swing through 360° at all stages of the tide. Because of local wind conditions someone with local knowledge should be on board when entering the port.

Custom and health officers come aboard after vessels anchor in the harbor. They will board vessels late at night on advance notice.

**CAUTION.**—Less water than charted was reported (1966) a little northward of the range line and about 1/2 mile westward of the outer range beacon. A vessel sounded a depth of 22 feet in this vicinity about 2 hours after low water.

**8-44 SAN JUAN DEL SUR,** with a population of about 4,200 (1964), stands on the eastern shore of the bay, plainly visible to a vessel approaching from the westward. The village is connected to Rivas, an inland town, by a road. San Juan del Sur is reported to be healthful and the sanitary conditions good.

There is a small well-sheltered pier for boats and lighters on the southern side of the bay. An extension for lighters has been completed (1955) along the west side of the pier. Two cargo booms of 20-ton capacity are located on the pier. The port has three tugs and two cranes of about 5-ton capacity.

Cargo is worked at the anchorage. Lighters, which are often half loaded in squally weather, range from 25 to 50 tons in capacity.

**Supplies.**—Beef, bread, and poultry can be obtained, but no vegetables. No fuel oil or fresh water is available.

**Communication.**—There is irregular steamer service. Four submarine telegraph cables are landed in this port, and the cable office serves as a relay point for ports north and south between Salina Cruz, La Libertad, Panama, and Santa Elena. There is a road leading to Rivas and other inland towns, and a railroad extends to St. Jorge.

**Meteorological table for Rivas.**—See Appendix II.

**8-45 COAST—Frailes Rocks.**—From San Juan del Sur the coast trends southeastward for 9 miles to Cape Natan, and then slightly more to the eastward for  $3\frac{1}{2}$  miles to Arranca Barba Point, at the entrance to Salinas Bay, and is everywhere high and bold, with soundings varying from 10 to 20 fathoms at  $\frac{1}{2}$  mile from the beach.

At 3 miles from San Juan del Sur Lighthouse and 800 yards off-shore is West Fraile Rock (Paloma Primera), and 1 mile farther and  $\frac{3}{4}$  mile from the shore is Middle Fraile (Paloma Segunda). They are nearly circular, less than 200 yards in diameter, steep-sided, flat or oval topped, and 59 feet high. East Fraile lies  $4\frac{1}{2}$  miles  $152^{\circ}$  from Middle Fraile and 1,200 yards  $264^{\circ}$  from Cape Natan. It is a steep, jagged rock 88 feet high, and when seen from the northward looks like a sloop standing to the southward under all sail except gaff topsail. From the westward this islet, owing to the high rocks inshore of the same formation, cannot be readily distinguished.

**8-46 La Flor Bay** (*H.O. Chart 1016*) is a crescent-shaped bay immediately northward of Cape Natan. Rocks narrow the entrance off the southern tip. There is about 30 feet of water reported (1943) in an anchorage just inside the northern tip. Fifteen feet of water was found about 300 yards from the shore at low tide. Small boats frequent this bay in lumbering operations. A cattle ranch is located here.

**8-47 Ostional Bay**, located about  $\frac{3}{4}$  mile northeastward of Arranca Barba Point, is another crescent-shaped bay. The Gardia Station, a small, red, tin-roofed building located on a barren hill on the northern end of the beach, can be seen from two or three miles offshore.

**8-48 Coast.**—South of Salinas Bay and Elena Bay the coast of Costa Rica projects sharply into the sea at Cape Elena and forms the northern limit of the Gulf of Papagayo (Golfo de Culebra). Southward of Cape Elena the coast sweeps around to Cape Velas, forming the Gulf of Papagayo.

The line of volcanic action, which presents so many distinctive landmarks in Nicaragua, is prolonged through Costa Rica; but owing to its divergence from the coast, only the mountains near the boundary are useful to the navigator.

**Vessels** should not anchor within 6 miles of the Costa Rican coast without prior pratique.

**Mount Orosi.**—Mount Orosi is 5,192 feet and Mount Gongora is 5,670 feet high. They are united by a lofty ridge about 3 miles long, which is often visible when the peaks are obscured. Mount Orosi is  $34\frac{1}{2}$  miles  $163^{\circ}$  from Volcano Ometepe in Nicaragua.

**Rincon del Volcan Viejo**, 8 miles  $143^{\circ}$  from Mount Gongora, is occasionally active, and its sides are broken and deeply furrowed, differing in this respect from the other volcanic peaks of Nicaragua and Costa Rica.

**Cerro de Elena** are a range of mountains forming the backbone of the Elena Peninsula, a remarkable headland reaching out on the northern side of the Gulf of Papagayo 15 miles, with an average width of 6 miles. Seen from the westward this headland looks like a mountainous island, but from the northward or southward it shows an oval serrated ridge, the outline resembling the edge of a half-open fan. Four of the peaks are over 2,000 feet in height. Cape Elena is the sharp and rocky termination of the headland.

**8-49 Salinas Bay (Bahia de Salinas)** ( $11^{\circ} 03' N.$ ,  $85^{\circ} 44' W.$ , *H. O. Chart 1030*).—This spacious harbor is formed by the doubling back of the coast, which sweeps around with a regular curve from Arranca Barba Point to Point Sacate. The bay between the entrance points is  $2\frac{1}{2}$  miles wide and extends within them about 4 miles. The northern shore is high and bold, but the eastern and southern shores consist of sandy beaches and low, marshy valleys, with bluffs at intervals. The peaks of Orosi, Gongora, and Rincon del Volcan Viejo overlook the hills behind the bay. Mount Orosi bears  $107^{\circ}$  through the entrance of the bay.

Punta Mala lies on the northern side of the bay, about 2 miles eastward of Arranca Barba Point (Punta Aranca Barba).

The trail to Rivas and San Juan del Sur skirts

the northern shore of the bay, and strikes into the hills  $1\frac{1}{4}$  miles eastward of Arranca Barba Point. There is a cattle ranch close to the northern shore and another a short distance from the head of the bay. A number of streams flowing from the hillsides have been found in December, but in the spring there were only dry beds.

The Nicaraguan-Costa Rican border, located about  $3\frac{1}{4}$  miles eastward of Arranca Barba Point, is marked by a silver-colored guard station. This border station is known as Los Monjones.

Puerto Soley, located about  $1\frac{2}{3}$  miles east-southeastward of Los Monjones, is the Costa Rican customs port. The remains of a small wharf and the customs house identify the port. The water is shallow in front of the port, and large vessels cannot proceed within 1 mile of the shore.

Salinas Island, which is of triangular shape and about 700 yards long, lies about 1 mile eastward of Sacate Point (Punta Zacate); the southern slope is much steeper than the northern, and as both appear, from a vessel entering the bay, to rise unbroken from the water's edge, the island resembles a wedge with the point to the northward. A detached rock and a rock with less than 6 feet over it lie about 200 yards west-northwestward of the northwestern extremity of the island. A bank, with a rock lying near its northern edge with numerous sunken rocks with depths of less than 6 feet over them, extends about 600 yards eastward and 400 yards southward from Salinas Island, its southern edge approaching to within 700 yards of the shore bank on the southern side of the bay.

The soundings decrease gradually from 20 fathoms just outside the entrance to 3 fathoms at about 800 yards from the head of the bay. Except just inside the southern headland, the northern and southern shores are fronted by a shore bank about 1,200 yards wide in places with drying rocky ledges and rocks with less than 6 feet over them, lying within that distance.

**8-50 Directions.** — From the southward:

Having passed Punta Blanca at a safe distance, keep Cape Elena showing outside of it, and when Salinas Island opens off Point Sacate, the rock off Descarte Point will have been cleared, and the port may then be entered. If Mount Orosi is visible, bring it to bear  $107^{\circ}$  and stand in on that course. Having entered, pass to the northward of Salinas Island and nearer to it than to the northern shore of the bay, and then, if to get shelter from the westerly winds, stand on toward the head and anchor when the island bears northward of  $270^{\circ}$ , but if a Papagayo is blowing, haul up and anchor as near the northern shore as the depth of water will permit.

To vessels coming from the northward, the entrance of the port will be hidden by Cape Natan, the shore apparently continuing unbroken to the head of Elena Bay, but when the Fraile Rocks are passed the port will come into view.

**8-51 Descartes Point** about  $2\frac{1}{4}$  miles southwestward of Point Sacate, terminates the peninsula separating Salinas and Elena Bays. Nearly 2,200 yards west-northwestward of the point is a rock above water, but so small that it cannot be seen at high water until close aboard. Depths of less than 6 fathoms extend about 200 yards southwestward and northwestward from the rock, and foul ground with depths of less than 6 feet extends about 650 yards eastward from it. The channel between the eastern extremity of the foul ground and Descartes Point has not been examined.

A rocky ledge, which dries in places, extends up to a distance of about 600 yards offshore between Descartes Point and a position about 900 yards northeastward of it. A small bay, with depths of from  $3\frac{1}{2}$  to 6 fathoms in it, lies about  $\frac{3}{4}$  mile north-northeastward of Descartes Point, and an islet lies about 200 yards offshore from the northern entrance point of the bay. Close northward of the small bay is a larger bay, nearly  $\frac{3}{4}$  mile long and about 800 yards wide at its entrance; it terminates in a sandy beach, with depths of less than 3 fathoms extending nearly 600 yards offshore from the head of the bay. A drying rocky

ledge and an islet lie close inshore, about 550 yards north-northwestward and 750 yards northward of its northern entrance point.

**8-52 Elena Bay (Bahia Santa Elena) (H. O. Chart 1016).**—which is entirely open to the westward, lies within Descarte Point and Punta Blanca, and is separated from Salinas Bay by a promontory 4 miles long and 2 miles wide. A tongue of land divides the head into two small bays, the southern being known as Juanilla, and 5 miles westward of this bay is another called Port Parker. Except where broken by the entrance of Port Parker, the southern shore of Elena Bay for 10 miles presents a straight east and west line of high wooded bluffs or steep cliffs, terminating abruptly at Punta Blanca.

Near the northern shore of the bay  $1\frac{1}{4}$  miles  $157^{\circ}$  from Descarte Point, is Despensa Island, with two elevations, of which the southern is the higher and the northern the more abrupt; and 2 miles  $127^{\circ}$  from Despensa is another island called Juanilla. Southeastward of the latter the depth is convenient for anchoring, but outside of it are soundings of 18 fathoms, deepening to 40 fathoms between the headlands. There is a reef between Despensa Island and Descarte Point, but otherwise the head of the bay is clear of danger.

**8-53 Juanilla Bay (Bahia Juanilla) ( $10^{\circ}57' N.$ ,  $85^{\circ}44' W.$ , H. O. Chart 1030).**—The tongue of land which forms the northern side of this bay is nearly a mile in length and about that distance from the southern shore, with which it is parallel. There are two small islands just off the end, and  $\frac{1}{2}$  mile farther westward is Vagares Rock, a low, rocky islet. In the passage thus formed are two dangerous rocks with  $1\frac{3}{4}$  and  $2\frac{3}{4}$  fathoms over them, but the channel between the islet and the southern shore, a mile in width, is free from dangers, and therefore a vessel entering should approach from the westward and along the southern shore of Elena Bay. The water shoals gradually from 16 fathoms southward of Vagares Rock to the head of the bay. The bottom is mud and holds well, but a small indentation on the southern side, called San Tomas Bay,  $\frac{1}{4}$  mile in extent, affords

the only protection from a westerly wind and sea.

**8-54 Port Parker (Bahia Elena) (H. O. Chart 1031).**—This fine landlocked harbor is 2 miles long and nearly 1 mile wide, and lies about midway between Juanilla Bay and Punta Blanca, in a narrow valley under the Cerros de Elena and behind the cliffs which form the entrance. The depths range from 17 fathoms at the entrance to 6 fathoms at 400 yards from the shore. The entrance looks like a gorge, and, being the only break in the cliffs eastward of Punta Blanca, can easily be found. The loftiest summits of the Cerros de Elena are farther westward toward the cape, but the ridge behind the port is crowned by two conical peaks, readily distinguished. Just outside the heads are two small islands, Arriba on the east and Abajo on the west, but the latter is so near the cliffs that it can not always be distinguished from vessels approaching from the northward. Tooth Rock, a small rock 300 yards westward of Arriba, will be made out as the entrance is neared, and must be left on the port hand going in. In the western part of the bay a ledge makes out about 400 yards, and from the southern shore sand and mud flats extend a less distance.

There are few, if any, inhabitants on the shores of the bay, and provisions and water are practically unobtainable.

**8-55 Anchorage.**—Anchorage may be taken with Abajo Point, at the western side of the entrance, bearing  $345^{\circ}$  distant 800 yards.

**8-56 Directions.**—Approaching Elena Bay from the southward, keep  $1\frac{1}{2}$  miles from Punta Blanca to avoid the rock westward of it. To enter Port Parker keep  $\frac{1}{2}$  mile from the cliffs until the entrance and the island off it are recognized, then steer between Tooth Rock and the western shore, and anchor as above.

**8-57 Punta Blanca.**—This bold and striking headland projects to the westward, its rocky sides rising abruptly from the water to the sharp and jagged summit, which, at about a mile within the point, is 681 feet high. The coast ridge which it terminates is separated from the Cerros de Elena on the south by a narrow valley, which extends

eastward to Juanilla Bay and includes Port Parker. Nearly 200 yards outside the point is a small rock 5 feet above water, and nearly 1 mile westward of this rock is another 2 fathoms under water, with 20 and 25 fathoms all about it. To avoid this danger, keep the Little Bat Island open westward of Cape Elena.

**8-58 Playa Blanca Bay (Bahia Playa Blanca) (H.O. Chart 1016).**—This bight, which is formed between Punta Blanca and Cape Elena, through open to the westward, affords a shelter from the Papagayos. About  $3\frac{1}{2}$  miles eastward of Cape Elena and 1 mile from the shore are two large rocks, and inshore of them is an island about 800 yards in extent. The mouth of the valley extending eastward from the head of the bay is fronted by a sandy beach  $\frac{1}{4}$  mile long.

To anchor in the bay, enter on course  $090^\circ$ , steering for the middle of the beach, and anchor in depths of 8 to 10 fathoms.

**8-59 Cape Elena (Cabo Santa Elena) (10° 54' N., 85° 58' W., H.O. Chart 1031)** is a distinctive landmark. It is a narrow rocky ridge, extending nearly 2 miles into the sea in a westerly direction, the sides rising abruptly from the water's edge and meeting sharply at the summit 449 feet high. A small islet and some rocks above water lie close off the cape with soundings of 15 and 20 fathoms close-to and 40 fathoms at less than  $\frac{1}{2}$  mile.

**8-60 Murcielago Bay (Bahia Murcie Lagos) (H.O. Chart 1031)**, southeastward of Cape Elena, is divided into two parts by Bat or Murcielago Islands. The largest of these islands, the third in the chain from the eastward, is a little over 1 mile long and 479 feet high. Between the most westerly of the group and the Little Bat Islands are dangerous ledges. Ackerman (Isla Piedra Negra), a large island at the eastern end of the bay, is connected with the shore by a reef. A reef extends nearly  $\frac{1}{2}$  mile west-southwestward from Ackerman Island, and at a little over 1 mile in the same direction, there is a low rock called Piedra Negra, with deep water close-to. Rush Island (Isla Pedada) lies about 2 miles

northwestward of Ackerman Island, and is connected to the shore by a shoal ridge.

There is a fresh-water pond 30 yards from the beach at  $\frac{1}{2}$  mile northward of the low point on the mainland opposite Ackerman Island.

Although vessels have anchored several times under the northeastern shore, between Rush and Ackerman Islands, in depths of 12 to 15 fathoms, the bay is not safe during the season of the Papagayos. On the lee side of the islands there are depths of 30 fathoms or more close-to, and the declivity of the bottom along the northern slope is so sharp that the anchors do not hold well. The gusts that come down the sides of the mountains are often very heavy. As a rule, the Papagayos moderate toward sunset, but this is not always the case.

**8-61 Little Bat Islands.**—The largest of these rocks, over 1 mile westward of the westernmost of the Bat Islands, is about 200 feet in extent and 70 feet in height, with flat top and perpendicular sides. About 200 yards southeastward is a smaller rock, similar in appearance but with a detached portion. The opening shows from the southwestward between the two parts.

**8-62 Caution.**—The ledges to the eastward suggest the existence of pinnacles along the submerged ridge, which the lead failed to find. As the soundings give no warning of dangers, the passage eastward of Little Bat Islands should never be attempted.

**8-63 Directions.**—To reach the anchorage from the northward, haul close around Cape Elena, keep the Bat Islands on the starboard hand, pass to the southward of Rush Island, and anchor under the lee of the land, with the western end of Ackerman bearing  $180^\circ$ .

From the southward, steer for the largest of the Bat Islands on any bearing northward of  $315^\circ$  until Ackerman Island bears  $068^\circ$  or Piedra Negra is sighted and brought to the eastward of this bearing, then alter course to  $045^\circ$  for the anchorage.

**8-64 Potrero Grande Bay (Bahia Potrero Grande) (10° 51' N., 85° 48' W., H.O. Chart 1030)** is 3 miles eastward of Ackerman Island.

The entrance is 1,750 yards wide between high hills, and is open to the west-southwestward. The bay widens a little within, but not enough to afford any additional protection to the anchorage. A sand beach curves around the head of the bay, and behind it is a lagoon which receives several rivulets from the surrounding hills. A number of rocks show above water close under the cliffs of the entrance, but there are no dangers outside of them. Soundings decrease from 20 fathoms in the entrance to 5 fathoms at 300 yards from the head of the bay.

**8-65 Coast (H. O. Chart 1016).**—From the southern extremity of the promontory that lies on the southeastern side of Potrero Grande Bay, the coast turns sharply northeastward for nearly 2 miles and then sweeps around to Gorda Point (Punta Gorda), forming a bay, 16 miles wide and 7 miles long, within the Gulf of Papagayos, which is between Capes Elena and Velas. The northern shore is high and bold, but on the eastern side of the bay there is a wide valley extending inland, the southern slope rising to a table-land which fronts the bay, with cliffs 950 feet in height. Below these the shore, which turns to the southwestward, is moderately high and densely wooded. Soundings varying from 12 to 25 fathoms will be had within  $\frac{1}{2}$  mile of the shore, deepening to over 50 fathoms between the capes.

**Blaze Rock**, of quadrangular shape, 140 feet high, lies  $\frac{3}{4}$  mile from the beach at the head of the bay; there are sunken rocks off its western side, but the depths off its southern side are convenient for anchoring.

**Huevo Bay (Bahia Huevo)** is a small inlet, open to the southwestward, about 9 miles southwestward of Blaze Rock and immediately northward of Port Culebra, from which it is separated by a long narrow peninsula ending in Mala Point (Punta Mala). The Huevos Islands, two in number, form the northern side of the bay and lie so near each other, and the inner one so near the shore, that they appear to be high wooded bluffs on the mainland.

#### 8-66 Port Culebra (Bahia de Culebra)

(*H. O. Chart 1030*), the finest harbor in Central America, is spacious, secure, and easy of access, with depths sufficient for the largest of ships. The entrance, open to the southwestward, is 1 mile wide between Mala Point on the northwest and Buena Point on the southeast, and extends within the points 4 miles to the northwestward, with an average width of 2 miles. The shores are steep-to, the water shoaling very gradually from 20 fathoms at the entrance to 5 fathoms near the head of the harbor; anchorage may be had anywhere in the harbor, over a bottom of mud and sand.

**North Viradores** ( $10^{\circ}37' N.$ ,  $85^{\circ}43' W.$ , *H. O. Chart 1030*) are two flat, rocky islets just above the surface, with a rocky column 60 feet high near the center of the outer and larger, which lies 600 yards southwestward of Mala Point. This column forms an excellent mark for vessels approaching from the northward; it will not readily be seen when coming from the westward, owing to the lack of vegetation on the steep face of Mala Point beyond. The other low rocky islet lies nearly 400 yards off Mala Point.

**South Viradores** are three small grass-covered islets lying northwestward of Cacique Point, the outer one being about 1,500 yards from the shore. As these islets are fairly well defined against the wooded hills behind, they serve as marks for Port Culebra and Cocos Bay. Between the South Viradores and Cacique Point there is a channel of 5 to 10 fathoms, but it should not be used, as a rocky reef runs out  $\frac{1}{4}$  mile to the westward of the point, and some detached rocks lie southward and eastward of the South Viradores.

**8-67 Tides.**—The mean high water interval at Port Culebra is 2h. 38m.; the spring range 9 feet, the mean range 7.5 feet.

**8-68 Directions.**—Making Port Culebra from the northward, having rounded Cape Elena and the Little Bat Islands, steer  $130^{\circ}$  until North Viradores are made, then bring the pillar rock a little on the port bow, passing it on the port hand and haul into the port.

Approaching from the westward or the south-

ward, having made Santa Catalina Islands,  $7\frac{1}{2}$  miles northward of Cape Velas, pass them on the starboard hand, steer  $51^{\circ}$  past Brumel Islands and Gorda Point, and then about  $62^{\circ}$  along the shore. South Viradores will soon be made out under the land, with the entrance beyond and a little to the left, and the anchorage will be reached with hardly a change of course.

**8-69 Cocos Bay.** —From Buena Point the coast sweeps around to Cacique Point, distant  $1\frac{1}{4}$  miles, and then in a deeper curve to Point Miga,  $1\frac{1}{4}$  miles beyond the latter bight, forming Cocos Bay. It is open to the northwestward, and extends 1 mile within the points, both of which are rocky cliffs surmounted by hills. The head of the bay is a sandy beach, from the southern part of which a line of rocks runs northward about  $\frac{1}{4}$  mile; another small rock lies in its eastern part. The depth of water shoals from 14 fathoms between the entrance points to 8 fathoms at 800 yards from the head.

If intending to anchor in Cocos Bay, bring the South Viradores to bear about  $90^{\circ}$  and run to within 1 mile of them, thence steer in, keeping a little nearer Cacique Point in order to avoid the ledges near the southwestern shore, and anchor in 8 fathoms. Cocos Bay is a port of entry.

**8-70 Coast (H. O. Chart 1016).** — From Point Miga to Gorda Point, about 4 miles west-southwestward, the beach recedes under high hills, which at Gorda Point descend abruptly to the sea from a height of 340 feet. About  $2\frac{1}{2}$  miles southwestward of Gorda Point is another prominent projecting point sometimes called Gorda, but less striking in appearance, though the change in the direction of the coast is greater; it is higher than the country in its vicinity, the highest point being near the sea, and appears as a great rounded hill with a slight indentation on the summit. From this point, off which lie Brumel Islands, the coast sweeps around, broken by numerous bights, to Cape Velas, distant  $10\frac{1}{4}$  miles south-southwestward.

**Brummel Islands** ( $10^{\circ}31' N.$ ,  $85^{\circ}50' W.$ , *H. O. Chart 1031*), lying  $\frac{1}{2}$  mile southwestward of the point, are two islands very close together. They are 140 feet high, covered with grass, and bare of trees. The shores are steep and rocky, and the islands appear as one except when viewed from the northwestward. Reefs extend from both the northern and southern sides to a distance of 600 yards and from the eastern end a short distance, but the extreme western end is clean; no dangers were found in the channel between the islands and the mainland.

**8-71 Santa Catalina Islands**,  $3\frac{1}{4}$  miles southwestward of Brumel Islands and 7 miles northward of Cape Velas, form an important landmark and are not easily mistaken. They have usually been considered as one island, but the opening between them can be seen when bearing  $45^{\circ}$ . On every side a perpendicular wall of rock, over 100 feet high rises directly from the sea, and as the sloping face above is covered with sacate the resemblance to a stone fortification with tufted parapets is striking. The highest point of the island is 231 feet and the water close-to is deep with the 20-fathom curve 300 to 700 yards distant, while seaward it increases in less than a mile to 35 fathoms.

**8-72 Bank.** —Southeastward of Santa Catalina Islands and midway towards Braxilito Bay, there is a bank about  $2\frac{1}{4}$  miles in extent, the water shoaling to 15 fathoms, and between it and the coast is a wide, 20-fathom channel. Scattered over this bank are several groups of pointed rocks that rise above the surface, and it is thought that there are others under water. Vessels should give these rocks a wide berth, not venturing within a line from Cape Velas to Santa Catalina Islands, except to run through the channel referred to.

**8-73 Potrero Bay (Bahia Potrero) and Braxilito Bay (Bahia Brasilito)** are open to the northwestward and lie in the angle of the coast between Brumel Islands and Cape Velas. They are simply curves in the shore, separated from each other by a high wooded point nearly 1 mile in length, close off which is Eyre Island, about

600 yards in extent. Potrero Bay is the northern of the two.

Ships loading on the coast with dyewood, cedar, and mahogany have visited these bays occasionally. While the outlying bank of Santa Catalina does not prevent the sea from rolling in, the waves are more or less broken by the rocks, and these bays may be regarded as fairly secure anchorages.

Potrero Bay, has several small islets on the northeastern shore, and near the head is a shoal patch with rocks awash. When going in, keep on the southwestern side and anchor where the depth is suitable; the water shoals gradually from 15 fathoms at the entrance.

Braxilito Bay, has soundings which diminish regularly from 16 fathoms midway between the entrance points to 6 and 8 fathoms at  $\frac{1}{2}$  mile from the shore, but inside this distance they are irregular, and on either side at 800 yards from the shore are rocks under water or awash. If intending to anchor within  $\frac{1}{2}$  mile of the beach, do not allow Eyre Island to shut out the point of land nearest to Brumel Islands.

**8-74 Directions.**—The channels on either side of the bank southeastward of Santa Catalina Islands are wide and deep, and either may be used for entering Potrero and Braxilito Bays. A vessel using the northern channel should run in between Brumel and Santa Catalina Islands, and steer so as to pass about 1 mile eastward of a small rock, 2 miles  $120^{\circ}$  from the northern end of Santa Catalina. A rock awash lies about 800 yards northward of the small rock.

When on range between Brumel Islands and Cape Velas ( $018^{\circ}$ — $198^{\circ}$ ) the rock will be passed, and, the point separating the two bays being a little on the starboard bow, the course can be maintained into Potrero Bay, or changed for Braxilito Bay.

From the southward, having rounded Cape Velas, keep about 1 mile from the shore, and when the southernmost group of rocks on the bank is in range with Santa Catalina Islands, Braxilito Bay will be open on the starboard bow. Steer for Eyre Island until all the groups of rocks

are brought to the westward of Santa Catalina, and run into the bay. For Potrero Bay, stand on past Braxilito, round Eyre Island at a distance of about  $\frac{1}{2}$  mile, and keeping nearer the southwestern shore, anchor in the desired depth.

**8-75 Cape Velas** ( $10^{\circ}22' N.$ ,  $85^{\circ}53' W.$ , *H. O. Chart 1031*) is the southern limit of the Papagayos, Cape Desolado, Nicaragua, 110 miles distant, being considered the northern limit, although these gales are not strictly confined to these limits. The cape is well wooded, and off the coast to the southeastward of it are some islets and rocks.

**Morro Hermoso**, 769 feet high, which rises immediately behind Cape Velas and marks this important turn of the coast, looks like an island when first seen from the southward. The sides have a regular and gradual slope, and the short, narrow ridge running eastward and westward has a slight depression which gives it a saddle-shaped appearance; the eastern summit is round and the western sharp. Behind Morro Hermoso are several hills of greater elevation, and when approached from the westward the morro will first be noticed as a conical hill under them.

Southward of Cape Velas is a slight bay, known as Barca Quebrada Anchorage, in which vessels may anchor in a position midway between Wreck Point, at the southern limit, and a rocky reef lying  $1\frac{1}{2}$  miles southward of the cape and about  $\frac{3}{4}$  mile from the shore. The boat landing is behind the rocks, and also close to a wreck on the beach at the head of the bight.

**8-76 San Francisco Point** (*H.O. Chart 1016*) lies about  $6\frac{1}{2}$  miles southward of Cape Velas, thence the coast trends south-southeastward for about 24 miles to Guionos Point. Detached rocks are found up to about 2 miles offshore along this part of the coast.

In 1927 the American Steamer *Jacob Luckenbach* stranded on rocks about  $\frac{7}{8}$  mile offshore at  $8\frac{1}{2}$  miles southward of San Francisco Point. It was observed that at high water only a few black rocks were visible along the coast a short distance offshore, but at low water the continuous heavy

southwest swell was breaking on the coral reefs from  $\frac{1}{4}$  to  $1\frac{1}{4}$  miles offshore from Cape Velas to Guionos Point. Alongside the vessel there was a rock having a depth of 3 feet at low water. Soundings taken by vessels engaged in salvage work revealed the existance of pinnacles having a depth of 30 feet approximately 2 miles outside the stranded vessel.

On Filibustero Point,  $14\frac{3}{4}$  miles south-southeastward of San Francisco Point, there is a group of red-roofed houses. A prominent building is located about 6 miles northwestward of Filibustero Point.

**8-77 Caution.**—Deep-draft vessels should not approach within 10 miles of the coast between Cape Velas and Cabo Blanco. Fishing craft have reported the soundings in this area as unreliable. Numerous depths of 10 to 15 fathoms have been reported up to 13 miles offshore between these capes. In 1966 a depth of 5 fathoms was reported 10 miles southwestward of San Francisco Point.

**Cerros de San Blas**, a short mountainous ridge parallel with the coast and 8 miles distant from it, can easily be made out, as it is so much higher than the land to the westward, the highest point, 3,337 feet high, bearing southeastward from Cape Velas, distant 20 miles.

**8-78 Guionos Point** ( $9^{\circ}54' N.$ ,  $85^{\circ}40' W.$ , *H. O. Chart 1016*) shows from either side as a wooded hill with a gradual descent from the highest point, 360 feet high, to the edge of the cliffs that overhang the sea. A rocky reef, making out to the westward from the point, uncovers at low water, and at all times the sea breaks over the mass of rocks that have fallen from the cliffs. At a little distance below the point, the bluffs, with bare precipitous faces, are crowned by several wooded knolls. Guionos Point has been reported to give good radar returns up to 13 miles.

There are a number of dangers to navigation off this point, made more serious by the great depth of water close to them, and by the northwesterly current, which here runs in the winter with a velocity of 2 knots. A sunken rock, with 20 fathoms close to it and 50 fathoms within  $2\frac{1}{2}$  miles, lies about 3 miles northwestward of the point and 2 miles from the coast. Another sunken rock lies slightly over a mile south-southwestward of the point, with 15 fathoms close to it and 50 fathoms within  $1\frac{1}{4}$  miles,

but breakers have been reported about 1 mile south-southwestward of this rock. In calm weather the sea breaks over these rocks only at long intervals. There are other dangers in the vicinity of the point, forming a continuous reef, covering it from the northwest to the southwest, but none of them is outside of a line between the two just described.

A depth of 15 fathoms has been reported (1963) about 11 miles west-northwestward of Guionos Point.

**8-79 Caution.**—This point is difficult to recognize at night; allowance should be made for a probable set of current to the northwestward before rounding it from the westward. The current may prove to be of great velocity.

**8-80 Coast.**—From Guionos Point the coast trends east-southeastward for 21 miles to Quiñones Point, and thence southeastward about the same distance to Cape Blanco, the western headland of the Gulf of Nicoya, forming an open bay 40 miles wide between the former point and the cape, and extending within them 7 miles. The land is said to be, in general, high and covered with trees, with occasionally some sandy plains and small deep bays. About  $4\frac{1}{2}$  miles eastward of Guionos Point a ledge makes out  $\frac{1}{2}$  mile from the shore; outside of this distance there appear to be no dangers along this entire stretch of coast.

**8-81 Coast marks.**—Between Cape Velas and Golfo de Nicoya, the mountains are of moderate elevation, and to a vessel in the offing they present few peculiarities of outline; but on a nearer approach the Cerros de San Blas will be made out northward of Guionos Point, or Split Peak northward of Cabo Blanco.

The cone-shaped summit of Mount Boughey, 2,558 feet high, will be seen about 8 miles northeastward of Guionos Point, and between this mountain and Split Peak, 28 miles to the southeastward, the coast range shows several points of equal elevation, with no particular marks for distinguishing them.

**8-82 Piedra Blanca Bay (Bahia Piedra de Blanca)** ( $9^{\circ}52' N.$ ,  $85^{\circ}29' W.$ , *H. O. Chart 1031*), about 11 miles eastward of Guionos Point and 29 miles from Cabo Blanco, is semicircular in shape, nearly a mile in width and extends 1,400 yards. From the western point a reef of rocks extends  $\frac{1}{2}$  mile southeastward, leaving an entrance  $\frac{1}{2}$  mile wide, open to the south-southeastward,

between the end of the reef and the eastern point of the bay. A vessel entering should stand in along the eastern shore, which is clean, and should anchor sufficiently far to the westward to swing clear of a sunken rock which lies in the eastern part of the bay. The water shoals gradually from 10 fathoms in the entrance to 3 fathoms at about 250 yards from the head of the bay. The best mark for the bay is Piedra Blanca, a large whitish rock, about 650 yards westward of the western entrance point and 200 yards from the shore.

About 1,200 yards westward of Piedra Blanca is a small islet near the shore, which will also be discernable against the cliffs as the entrance is neared. Within this islet and to the westward of it the shore recedes, forming a moderately deep bay, but rocky and unsafe.

QUINONES POINT (H.O. Chart 1016), midway between Guionos Point and Cabo Blanco, projects but slightly into the sea to the westward, the extremity being sharp and rocky.

8-83 PUNTA MUSIMILLAMA, 5 miles southeastward of Quinones Point, is similar to the latter, but more projecting. A fair-sized but non-navigable river discharges close northward of the point. From here to Cabo Blanco the coast trends southeastward for 15 1/2 miles; along this coast there is a wooded country through which several small streams discharge into the sea. Vessels may anchor along this coast in depths of 10 to 20 fathoms, sand and mud, but in general it is not advisable to approach the shore inside the 10-fathom curve.

SPLIT PEAK, 2,592 feet high, 15 1/4 miles northward of Cabo Blanco and 7 miles from the coast near Punta Musimillama, takes its name from the cleft, distinctly visible from the westward, that divides the summit of the mountain, the southern point being the higher. It rises from the plateau northward of the Cabo Blanco, and as it exceeds in altitude any of the peaks between it and Golfo de Nicoya, it may be regarded as the eastern termination of the coast range.

8-84 CABO BLANCO (9° 33' N., 85° 07' W., H.O. Chart 1034) is the termination of a

plateau that forms one of the most striking landmarks on the coast, especially for vessels approaching from the westward and has been reported to give good radar returns up to 16 miles. The plateau is 1,200 feet above the sea and extends inland 6 miles, forming a promontory between the sea and Golfo de Nicoya. Inland and northward of it a lower plain succeeds, stretching to the foothills under Split Peak, and while this plain remains below the horizon the more elevated plain resembles a long island some distance from the mainland. Every other headland on the coast is irregular in outline; Cano Island, off San Pedro Point (see sec. 8-147), which alone can be said to resemble it, is so near the coast to the eastward that a mistake would be impossible. From the brow of the cliffs at the southern end of the plateau the distance to the extreme point of the cape is little more than 1 mile.

8-85 ISLA BLANCA, 1 mile southward of the cape, is 226 feet high, and oval in shape, with an extent of 600 yards from north to south; it is a mass of barren, whitish rock rising abruptly on all sides. The islet is surrounded by a rocky ledge, which dries at low water, with 10 fathoms or more immediately southward of it. The channel between the islet and the shore is not recommended for use.

Off the southeast side of the island there is a high rock that has the appearance of a distant sail, and is of about the same color as the island.

8-86 ISLA BLANCA LIGHT is shown on the summit of the islet but was reported (1966) to have been destroyed.

8-87 OFF-LYING BANK.—In 1927 a submarine elevation, which was named Guardian Bank, was reported to lie about 127 miles westward of Cabo Blanco between the parallels of 8° 52' N., 9° 48' N., and between the meridians of 87° 04' W., 88° 13' W. Reported soundings have ranged from 5 to 60 fathoms. Lead soundings have indicated the existence of black sand, fine gray sand, and rocks on the bottom in the area. Heavy tide rips have been observed in approximate positions 9° 21' N., 87° 26' W. Searches by several vessels,

however, have revealed no bank in the designated area, and it may therefore be assumed that the shoal depths are pinnacle formations, or that reported positions are in error.

A shoal, with a depth of 11 fathoms, has been reported (1962) to lie in approximately  $8^{\circ} 51' N.$ ,  $88^{\circ} 06' W.$

In 1953 depths from 11 to 14 fathoms were reported extending in a  $118^{\circ}$  direction from a position in approximate  $9^{\circ} 31' N.$ ,  $85^{\circ} 21' W.$

Depths of 17 to  $21\frac{1}{2}$  fathoms have been reported (1958) in approximate position  $10^{\circ} 06' N.$ ,  $87^{\circ} 08' W.$ , about 80 miles westward of the coast.

In 1950 a depth of 50 fathoms was reported in approximate position  $11^{\circ} 04' N.$ ,  $88^{\circ} 39' W.$ ; in 1951 a depth of 15 fathoms was reported close southwestward of the above position.

**8-88 GOLFO DE NICOYA.**—This great gulf, one of the most important on the west coast of Central America, is 34 miles wide at the entrance between Cabo Blanco and Punta Judas, and penetrates into the land about 52 miles, first in a northerly and then in a northwesterly direction, narrowing to 5  $\frac{1}{2}$  miles at 26 miles from the entrance, and then expanding with an average width of 8 miles to the head. The only port of entry is Puntarenas, on the eastern shore about halfway up the gulf, at its narrowest part. A number of islands, some of considerable extent, lie along the western shore; vessels navigating the gulf pass to the eastward of all of them.

**THE WESTERN SHORE** of the gulf borders an uncultivated and almost uninhabited region, and is seldom visited. Between Cabo Blanco and Islas Negritas the soundings increase rapidly offshore, but at about 3 miles above the cape a rocky reef makes out about a mile and extends some distance along the shore. Above the Islas Negritas, as far as Isla Vanado, the depth is convenient for anchoring, but above the latter island extensive shallows occupy the western two-thirds of the gulf, all the way to the head.

**8-89 BAHIA BALLENA** ( $9^{\circ} 44' N.$ ,  $85^{\circ} 00' W.$ , H.O. Chart 1060).—Having rounded Cabo Blanco and brought the western shore and Isla Jasper into view, Cabeza Ballena, a bold, conspicuous promontory, 14 miles above the cape, will be made out; on nearing it, Bahia Ballena, which indents the land  $2\frac{1}{4}$  miles with a width of 2 miles, will open out between the head and several wooded hills to the southward. A low sand beach, scattered along which, just above the high water mark, are a few huts and native store, sweeps around the head of the bay. The water shoals rapidly from 24 fathoms between the headlands to 3 and 4 fathoms 600 yards from the head of the bay. Running in, it is necessary to keep  $1\frac{1}{2}$  miles from either point, as none of the outlying rocks is more than  $1\frac{1}{4}$  miles from shore.

**8-90 ISLA JASPER (ISLA TOLINGA)**, 563 feet high, is 13 miles within the line of the headlands and  $18\frac{1}{2}$  miles from Isla Blanca. Isla Alcatraz, separated from Isla Jasper by a narrow shallow channel, lies between that island and the western shore.

Rocks, above and below water, lie within  $1\frac{1}{2}$  mile eastward of these islands.

**8-91 ISLAS NEGRITAS**, situated 3 miles northeastward of Isla Jasper, are two high, narrow, rocky, heavily wooded islands, each about 1 mile long. Negritas Adentro, the western island, is separated from the mainland by a passage with a least charted depth of 30 feet and a width of  $1\frac{1}{4}$  miles, and from Negritas Afuera, the eastern island, by a passage with a least charted depth of 42 feet and a width of 750 yards. A rocky ledge, on the outer end of which is Sail Rock, extends eastward  $1\frac{1}{4}$  miles from the eastern end of Negritas Afuera. With light or variable winds sailing vessels should avoid getting too near this rock, as the tide runs past it with considerable force and the depth is too great for anchoring.

8-92 **Islas Negritas** Light is shown from the eastern extremity of Negritas Afuera; this light was reported (1962) extinguished.

8-93 **Isla Cedro**, lying close to the shore of the mainland at about 1½ miles northwestward of Islas Negritas, is of considerable size, but of very irregular shape. There are several small islets and rocks about it, and others in the bight to the northward.

8-94 **Shoals.**—Detached shoals with depths of 3¾ and 4¾ fathoms lie about 2 miles northwestward and 2¼ miles north-northwestward, respectively, of the eastern extremity of Isla Cedro.

8-95 **Isla Aves** and **Pan de Azucar** are small but conspicuous islets, distant, respectively, 6 and 7½ miles northwestward of Sail Rock. The latter islet is sometimes resorted to for shingle ballast, the anchorage being on the west side. There is a safe anchorage in a depth of 7 fathoms between these islets.

Shoal water extends about 400 yards off the northern side of Pan de Azucar, and detached shoals with depths of 1¼ and 3¾ fathoms lie, respectively, about 600 yards eastward and 900 yards northeastward of the eastern extremity of Isla Aves.

8-96 **Isla San Lucas**, opposite Punta Arenas and at the turn of the gulf, is about 1¾ miles long. A small but secure harbor, at the head of which there is a Costa Rican penal colony, lies on the northwestern side of the island. Communication with the island is strictly forbidden.

8-97 **Isla Caballo** (*H. O. Chart 1034*) is about 3½ miles above Isla San Lucas and 2½ miles from the western shore; just beyond it is Isla Bejucos, and 1 mile southwestward of the latter, in close proximity to the shore, is Isla Venado.

8-98 **Isla Chira**, near the head of the gulf, greatly exceeds any of the other islands in extent, being 6½ miles long, east and west, and 3 miles wide. Extensive shoals border the island, except on the northeastern side, where there is good anchorage in depths of 5 or 6 fathoms, near

the shore. Directions for proceeding to this anchorage are given in section 8-130.

8-99 **Isla Ostion** is a small islet situated about 1¼ miles northward of Isla Chira.

8-100 **Rio Tempesque**, a sluggish, muddy stream, discharges into the gulf at the head, 6 miles above Isla Chira. A small steamer from Puntarenas navigates the river as regularly as the tides permit, advantage being taken of high water both for crossing the mud flats below the mouth and for ascending and descending the river. It is stated that vessels have ascended the river for a distance of 80 miles.

8-101 **Lights.**—**Sombrero Negro** Light is shown from a small concrete structure built on what appears to be a pile of oyster shells, situated 3¾ miles southward of Isla Chira.

A light is shown from a small concrete structure on the southern extremity of Bocana Head, about 2 miles westward of Sombrero Negro Light.

A light is shown from a concrete structure on the west side of the mouth of Rio Tempesque.

A light is shown from a concrete structure on a hillside on the northeastern shore of the gulf, about 3½ miles northward of the western end of Isla Chira.

A light is shown from a concrete structure on Isla Ostion, about 3½ miles northwestward of the eastern extremity of Isla Chira.

A light is shown from a concrete structure on the end of a small pier at the village of Pajaro, about 4½ miles east-northeastward of the eastern extremity of Isla Chira.

8-102 **Light buoys.**—A light buoy showing a flashing white light is moored off the mouth of a small stream on the southwestern side of the gulf, about 2 miles westward of the western extremity of Isla Chira.

A light buoy showing a flashing white light is moored off the mouth of Rio Guasina, on the northeastern side of the gulf, about 5¼ miles northwestward of Punta Arenas.

8-103 **The eastern shore** of the gulf trends

northwestward from Punta Judas, the eastern entrance point, to Punta Herradura, a distance of nearly 12 miles, and thence sweeps around to the northward, northwestward, and westward to Punta Arenas, 22 miles north-northwestward of Punta Herradura, forming a bight that recedes 6 miles within the line joining these points. At the head of the bight, in the vicinity of the Rio Grande, the 5-fathom curve runs about  $1\frac{1}{2}$  miles from shore and the 20-fathom curve close outside; but the water is generally deep along this shore as far as Punta Calderas, above which the depths are convenient for anchoring. Off Isla Caño and Punta Herradura there are depths of 30 fathoms within 1 mile of the land.

**8-104 Punta Judas** ( $9^{\circ}31' N.$ ,  $84^{\circ}32' W.$ , *H. O. Chart 1034*), the eastern entrance point of Golfo de Nicoya, may be identified from vessels fairly close inshore on either side of the point by Mount Judas, a wooded 321-foot elevation that rises behind the point. The land rises steeply from the point and then slopes more gradually to the summit of the hill, situated about  $\frac{1}{4}$  mile inland. A slightly shelving reef that partly uncovers at low water extends out about 1 mile from the point. The heavy breakers on this reef make the vicinity of Punta Judas one of the most dangerous places along this coast, but by giving the point a berth of at least 2 miles, vessels can keep in depths of not less than 13 fathoms.

The description of the coast southeastward of Punta Judas is continued in section 8-132.

**8-105 Roca Escollo**, on which the sea breaks at less than half tide and which is sometimes visible at low water when a heavy swell is running, lies about 7 miles northwestward of Punta Judas and nearly 1 mile southwestward of Punta Guapinol. Between the rock and the latter point there are depths of 9 to 12 fathoms, but within a distance of 200 yards outside the rock there are depths of 15 fathoms.

**8-106 Bahia Jaco**, situated immediately northwestward of Punta Guapinol, has depths of 6 to 11 fathoms and affords fair anchorage between the months of November and March for vessels with local knowledge.

**8-107 Isla Caño**, 10 miles northwestward of Punta Judas, is connected at its eastern end with the mainland by a reef which is almost bare at low water. The island consists of a narrow, rocky, abruptly rising ridge that extends out almost at right angles to the shore line. Appearing as a bold and lofty headland to the left of the Herradura Mountains, it is a prominent mark for vessels coming up the coast, and has been reported to give good radar returns up to 25 miles.

**8-108** A light is shown from a steel framework tower, 40 feet high, on the western end of Isla Caño.

**8-109 Puerto Herradura** (*H. O. Chart 1060*), between Isla Caño and Punta Herradura, is an indentation about  $1\frac{1}{2}$  miles in extent, open to the westward but affording shelter from all other quarters. Inasmuch, however, as communication with the interior is virtually cut off by the mountains that hem it in, and as its usefulness as an anchorage and port of refuge at the entrance of the gulf is impaired by the sunken Roca Havannah nearly in the center, this anchorage is seldom used. Along the northern shore of the bay are numerous detached rocks, some of which lie nearly 400 yards off, and a ledge extends southward about  $\frac{1}{4}$  mile from Punta Herradura. The water is deep between the heads, and the soundings are irregular for some distance within, but at  $\frac{1}{2}$  mile from the beach that extends across the head of the bay there is good anchorage in a depth of about 9 fathoms with the mouth of a small stream bearing east-northeastward. There are a few huts on the sandy beach.

**8-110 Roca Havannah** has a depth of only 2 feet over it a low-water spring, but it is seldom visible, and seldom breaks even at low water; vessels should, therefore, depend upon bearings to avoid it. The rock lies 1,100 yards  $356^{\circ}$  from the eastern end of Isla Caño. In entering, it is advisable not to allow the western end of Isla Caño to draw westward of  $211^{\circ}$  until Punta Herradura bears  $295^{\circ}$ , when the danger will be past.

**8-111 Tides.**—The mean high water interval at Puerto Herradura is 2h. 38m.; the spring range is 9 feet, the mean range 7.5 feet.

8-112 PUNTA SUCIA (H.O. Chart 1034) situated 2 1/2 miles northward of Punta Herradura, is fronted by a rocky ledge which projects 1/2 mile to the westward and is partly bare at low water. At 1/2 mile westward of the outer end of the reef there are depths of 30 fathoms.

8-113 PUNTA AGUJAS (PUNTA LEONIA), lies about 1 mile northeastward of Punta Sacia. A rocky ledge projects out from the point in a northwesterly direction for about 800 yards; there are depths of 20 fathoms at about 800 yards off the outer edge of the reef. Scattered along at intervals of about 1 mile on the coast northeastward of Punta Agujas there are four villages. There are no good anchorages in this vicinity, but between the mouth of the Rio Grande and Punta Calderas anchorage may be taken in depths of 5 to 20 fathoms at a distance of 1 to 2 miles offshore.

8-114 PUNTA CALDERAS.—From Punta Sacia the coast trends northeastward for 5 miles, and then northwestward for 10 miles to Punta Calderas, which is very prominent and covered with trees. On the shore bank abreast the village of Tivives, which lies at the mouth of Rio Jesus Maria, about 2 3/4 miles southeastward of Punta Calderas, there are some sunken rocks. At the mouth of the Rio Barranca, about 4 miles northward of Punta Calderas, the coast turns sharply westward and extends in that direction for 7 miles to Punta Arenas.

8-115 CALDERA, an important oil port, is located about 2 1/2 miles north-northeastward of Punta Caldera on the northeastern shore of Bahia Caldera, and about 8 miles east-southeastward of Puntarenas. It is important commercially for its storage of gasoline, Diesel oil, kerosene, and asphalt. There are five bulk storage tanks, camouflaged on their seaward sides. Caldera is connected by rail with Puntarenas and San Jose.

Three submarine pipelines (two 8-inch and one 10-inch) connect the storage tanks with an anchorage about 800 yards offshore, where vessels load or discharge fuel. Four mooring buoys are available, and marker buoys indicate terminal connections of the various pipelines. The berth can accommodate a vessel 575 feet in length, with a draft of 32 1/2 feet.

Bahia Caldera affords good deep-water anchorage, unobstructed by reefs or sand

bars. Strong north winds are frequent in January, and at high tide during that season the water is rough.

Commercial vessels planning to call at Caldera must first clear through Puntarenas, the nearest port of entry. A pilot can be obtained at Puntarenas.

8-116 PUNTARENAS ANCHORAGE (9° 58' N., 84° 49' W., H.O. Chart 1060) is the area southeastward of the town of Puntarenas, which is situated about 1/2 mile within Punta Arenas, the outer end of a slender tongue of land which extends to the westward from the mainland nearly 4 miles along the southern side of an inlet or estero opening to the westward. A shoal bank, as defined by the 5-fathom curve, extends about 3 miles southward from the head of the mole. A 2 1/2-fathom patch and a 1 3/4-fathom patch lie 2 1/4 miles southward and 1 mile southwestward, respectively, of the light. The roadstead is on the eastern side of this bank and the channel leading up the gulf is on the western side. Less than charted depths were reported (1962) in the roadstead, and mariners are advised to use CAUTION in this area. Although the roadstead is open to the southward, toward the entrance to the gulf, some protection is afforded to the anchorage by Islas Negritas, which project out from the western shore of the gulf at a position 8 miles to the southward. In 1953 a 30-foot draft was the maximum permitted for entering the port but a 24-foot draft was recommended safe maximum (1963).

The anchorage usually selected during the fine season, from November to April, is in 5 fathoms, with the light on the mole bearing about 314° and Pan de Azucar 242°, but the depth is convenient for anchoring as far eastward as Punta Calderas or Rio Barranca; the water shoals gradually to 3 and 4 fathoms at 1/2 mile from the beach. Inasmuch as the bottom is sand, not particularly good holding ground, and as anchors are liable to foul by vessels' swinging to the tidal currents and to land and sea breezes, it is advisable to moor along a southeast-northwest line.

8-117 LANDMARKS.—Excellent landing marks for approaching the anchorage are: a conspicuous church spire located in the town, and a red-roofed building near the root of the mole.

Two radio towers, the easternmost showing obstruction lights, are located on the shore about 2 3/4 miles eastward of the town.

8-118 Lights—Beacons.—A light is shown at the bend in the mole southward of the town.

A light is shown from a white square concrete tower, 8 feet high, on Punta Arenas.

A light is shown on the wreck located  $\frac{1}{2}$  mile west-southwestward of the pier.

A tripod beacon is located close southeastward of Punta Arenas Light. This beacon was reported (1962) to be almost entirely concealed by palm trees.

8-119 Signals.—Vessels berthed alongside the pier must use the following whistle signals; one long blast, shore line parted; one long and 2 short blasts, line to mooring buoy parted. Vessels must sound 4 long blasts on the whistle one hour before departure.

8-120 Wrecks.—A wreck, with 12 feet of water over it at low water, lies about  $\frac{1}{2}$  mile southward of the light on the pier at Punta Arenas. The wreck located  $\frac{3}{4}$  mile west-southwestward of the pier, is submerged except for the light tower, and is considered dangerous.

8-121 Offshore pipeline berth.—Three mooring buoys are located at the seaward end of a submarine pipeline about  $1\frac{1}{4}$  miles eastward of the L-shaped pier. Transfer hoses are supported by other buoys. Vessels are required to use both anchors and secure astern to the mooring buoys. The controlling depth at the berth is 27 feet at mean low water. Communications with the handling plant ashore is made by radiotelephone.

8-122 The inner harbor, consisting of the estero northward of the town and eastward of the mouth of the Rio Aranjuez, is a landlocked and secure place for small vessels. The large quantity of sediment carried down during the rainy season by the various small rivers along its northern shore, however, is gradually filling up the estero, or contracting it to the narrow limits of a rather shifting tidal channel. The harbor is fairly well marked and has a short pier to which small vessels may moor. It is advisable to navigate the inner harbor only at high water but small boats may proceed to the pier at any stage of the tide.

8-123 Regulation.—No vessel is allowed to enter a Costa Rican port until visited by a health officer, the captain of the port, and a customs official.

8-124 Tides.—The mean high water interval at Puntarenas is 2h. 44m.; springs rise 9.2 feet, neaps rise 8.5 feet.

8-125 TIDAL CURRENTS.—The flood current sets westward and the ebb current east-southeastward with a strength of 1 to 1 1/2 knots. Currents with velocity of as much as 2 knots have been observed. The general system of tidal currents in Golfo de Nicoya is as follows: The flood current sets northeastward, then northward, and then, off Puntarenas, westward; the ebb sets in the reverse directions. The flood current off Punta Heradura has a slightly northwesterly set, but it is hardly strong enough to be noticeable. Strong tide rips will be found off Sail Rock.

The flood current, on entering Golfo de Nicoya, sets directly toward the mouth of the Rio Barranca, causing the sediment of that river to deposit most heavily at the mouth and also, to some extent, along the shore to the westward. These currents then set along to the westward at a maximum rate of 2 knots. From a position eastward of Angostura the rate decreases, varying from 1.5 to 1.7 knots, until near the mole where it again increases and sets away from the shore. The ebb sets in a contrary direction.

8-126 Winds and weather.—There are only two seasons, the rainy and the dry, the former generally lasting from April through November. During the rainy season the winds blow from the south-southwest and in September and October often reach gale force, accompanied by heavy rain. During the dry season calms prevail, but in the evening there are often violent "Chubascos", which blow from a direction between north and east and are accompanied by heavy rain; these storms seldom last longer than  $\frac{3}{4}$  hour.

"The northerly winds, which are considered dangerous to shipping during February and March, do not strike the location of the mole, but rather, due to the protection afforded by the spit, they strike at a position about 1 mile to the southward. Southerly winds are broken by the Islas Negritas and the peninsula that forms the western shore of the gulf. During the afternoon, at times, strong westerly winds set up a choppy sea, but not sufficient to inconvenience large vessels. Easterly winds are of little consequence and give little trouble."

8-127 Pilotage is not compulsory for vessels anchoring off Puntarenas, but it is compulsory for vessels going alongside the mole. In view of the constantly shifting dangers in the inner harbor and in the gulf above Punta Arenas, the use of

a pilot in navigating those waters is highly advisable. The port has a government pilot whose services may be procured through the office of the Captain of the Port, situated at the head of the mole. The pilot comes out in a launch and boards vessels one mile off the mole. The signal for a pilot is 3 long blasts. The pilot will take vessels alongside the mole at night, but prefers to wait until daylight.

**8-128 Directions-General remarks.**—The entrance to Golfo de Nicoya is so wide that no difficulty should be experienced in making it. It is plainly marked on the western side by Isla Blanca and the plateau behind Cabo Blanco, and on the eastern side by the termination of the mountain range that overlooks the coast, the last spur, known as the Herradura Mountains, rising abruptly from the eastern shore of the gulf to a height of 2,813 feet. Cerro Grande de Turubales, situated 17 miles north-northeastward of Punta Judas, shows over the Herradura Mountains when off the entrance, and eastward of them when down the coast; it is a prominent peak with a small conical summit 5,520 feet high. At 2½ miles eastward of it is a mountain 5,335 feet high, with a flat top nearly ½ mile across; and at 20 miles farther eastward there are mountains of still greater elevation, one of them, 7,938 feet high, showing at its summit the broad crater of an extinct volcano.

**8-129 Directions to Puntarenas Anchorage.** Vessels approaching from seaward usually steer such a course as to pass about 2½ miles of Cabo Blanco, and then set course for a position about 3¾ miles eastward of Islas Negritas Light. This course will be about 043°. The course to the same position, passing about 2 miles off Isla Caño, will be about 342°. Vessels approaching from the southward should steer a course between these two to reach the same position. During the ebb current the eastern side of the gulf is preferable because of the fairly strong southwesterly current. At night Isla Blanca Light, Isla Caño Light, and, later, Islas Negritas Light will probably be sighted, so no difficulty should arise in attempting to reach the position mentioned above. When Islas Negritas Light bears 270°, about 3¾ miles distant, the course should be changed to 340°, at which time Puntarenas Mole Light should be sighted. It is advisable to maintain a course of 340° until the light bears

314° and then steer for the light on that bearing, anchoring as desired.

The flood current occasionally has considerable strength and, as its tendency is toward Islas Negritas, in the vicinity of which the water is very deep, it should be guarded against. Some navigators prefer to make Punta Calderas and coast along in depths of 5 to 10 fathoms until the anchorage is reached. In heading for the light on Puntarenas Mole any westerly course is satisfactory, but care must be taken to avoid the telegraph cables in anchoring.

**8-130 Directions to Isla Chira Anchorage.**—Vessels bound for the anchorage off Isla Chira from the position 3 miles eastward of Islas Negritas steer course 323° to pass about 1 mile off Isla Aves and Isla San Lucas. When the northeastern extremity of the latter is abeam change course to 315°, and when the Islas Cortesi, off Punta Pato, are about ½ mile off the beam change course to 294° and continue on that course to the anchorage, in 5 or 6 fathoms of water ½ mile off Isla Chira.

**8-131 PUNTARENAS (9°59' N., 84°50' W., H. O. Chart 1060),** lying at the western extremity of a long, low, narrow peninsula about midway of the eastern side of Golfo de Nicoya, is the only port of entry on the gulf and the only place of importance on the Pacific coast of Costa Rica. Although it is a seaside resort, the town is supported principally by the transshipment of goods; about half of the foreign trade of the country passes through Puntarenas. In 1959 the town had a population of 28,546.

**Wharves.**—An L-shaped pier extends about 1,130 feet southward from the eastern part of the town. An arm extends about 490 feet westward from the end. Vessels can berth alongside the north and south sides of this arm. The south side affords 488 feet of berthing space, and the northern side 393 feet of berthing space. The greatest allowable draft at the pier is 26 feet although it is possible for a vessel with a greater draft to berth if it enters and leaves during high tide. Although there is approximately 28 feet of water in the southern berth, a 3-foot clearance is necessary during the months when the surge is strongest.

Cargo is loaded by a vessel's own gear, however, a 7-ton railroad crane is sometimes available. Mooring buoys are available to assist vessels in securing alongside; two buoys about 600 feet off the outer berth and two buoys about 400 feet off the inner berth.

A landing pier is located eastward of the L-shaped pier.

The Municipal Dock, in the inner harbor, is lighted at night and is good at all stages of the tide. For small boats, it offers a better landing place than the pier on the southern side of the town. The channel to this dock lies close to the shore of the peninsula.

There are several launches at the port.

**Repairs** of a minor nature can be carried out. There are two machine shops and one small foundry in the town. Two small marine railways in the port can accommodate only small wooden craft of length no greater than 60 feet.

**Supplies.**—Drinking water and boiler water of good quality can be obtained from hose connections on the pier. Fuel oil and diesel oil are available at the off-shore pipeline. Diesel oil is the only fuel available at the pier. Fresh provisions can be obtained in moderate quantities. Deck supplies are plentiful.

**Communication.**—Steamers of various lines make frequent calls at Puntarenas. A railroad line over which two trains are run daily connects Puntarenas and San José. There is telephone connection with San José. Air service is available.

**Sanitation and health.**—The health conditions of the town are fair, but sanitation is poor and sanitary regulations are not very carefully enforced. Amoebic dysentery is prevalent; malaria is endemic but not frequent. Visitors should not eat uncooked fruit or vegetables.

**Hospital.**—The San Rafael hospital, with a capacity of 300 beds, will accept seamen. Cases of serious illness, however, should be taken to San José where there are very good hospitals.

**8-132 COAST (H. O. Chart 1017).** — The coast between Punta Judas and Llorena Point, 73 miles to the southeastward, curves to the eastward in a great bight, which at Uvita Point, 32 miles northward of Llorena, extends in for a distance of 21 miles within the points first named. From Llorena Point the general trend is east-southeastward for 29 miles to Matapalo Head at the entrance to the Gulf of Dulce.

The Herradura Mountains and Cerro Grande de Turubales, with its small conical summit, near the entrance to Golfo de Nicoya, have been described in sec. 8-128. At about 20 miles east-southeastward of Cerro Grande de Turubales and 14 miles from the coast there is an extinct volcano 7,938 feet high, the crater of which, nearly 2 miles across, has a number of regular elevations along the brink, giving the summit the appearance of a lofty serrated ridge. Four miles southward of the volcano is a dome-shaped mountain, 7,115 feet high. Still farther eastward the range presents some of the loftiest summits in Central America, among which is Mount Walker, 24 miles northeastward of Uvita Point, rising to a height of 12,413 feet; but these summits are

partially concealed by the coast range behind Uvita Point, and are not easily distinguished. This is of little consequence to the navigator, however, as the bight of the coast between Punta Judas and Llorena Point could not be entered in clear weather without sighting Cerro Grande de Turubales and the other mountains to the northward, or Caño Island, off San Pedro Point, and the Cerros de Sierpe to the eastward. Making the land below the bight, vessels will have Caño Island or the headland of Llorena Point in sight above or the Gulf of Dulce and Punta Búrica below.

The coast from Punta Judas trends about  $101^{\circ}$  for nearly 23 miles to the Viejo River, and then about  $191^{\circ}$  for 2 miles to Punta Quepos. The land immediately behind the beach is low, and the ascent toward the mountains in the interior for the first few miles is gradual. Vessels may anchor anywhere, as there are no dangers over  $\frac{1}{2}$  mile from the shore and the soundings increase regularly.

**8-133 Punta Quepos** ( $9^{\circ}24' N.$ ,  $84^{\circ}10' W.$ , H. O. Chart 5618) is a bold and prominent point at the western end of a line of densely wooded bluffs, nearly 500 feet high, that rise abruptly from the shore to the eastward. Near the point and to the northward of it are a number of outlying rocks. Flat rock, the westernmost danger off Punta Quepos, lies about 700 yards southwestward of the point; it is awash at low water.

A light is shown from a steel framework tower, 40 feet high, which stands on Punta Quepos.

**8-134 Anchorage—Shoal.**—Vessels anchor anywhere in the bay, usually  $\frac{1}{2}$  to 1 mile off the wharf in depths of about 16 fathoms. A  $1\frac{1}{4}$ -fathom shoal which breaks at half tide lies about 800 yards northwestward of the northwestern side of Punta Quepos. During the rainy season—May through December—a strong current flows out of the Boca Vieja River (creek) through the anchorage area.

From September through January heavy swells are reported, which when in combination with the current just mentioned, impede the anchorage approach. During the dry season the river current is negligible.

**8-135 Lights.**—Two lights, vertically disposed, are shown at the head of the wharf at Quepos.

**Pilotage.**—Pilotage is not compulsory but advisable if berthing at the wharf. An unlicensed pilot boards about 1 mile off the wharf from a white motor boat. Weather permitting the pilot will take a vessel in at night.

**8-136 QUEPOS.** lies about  $1\frac{1}{2}$  miles northward of Punta Quepos. The port is used for exporting bananas grown in the vicinity. The population of Quepos was 10,416 in 1950. An American Consular Agent is stationed here.

**Wharf.**—A wharf, protected by a breakwater, extends 458 feet west-southwestward from two islets lying close offshore at Quepos. A trestle extending over both islets connects the wharf to the mainland. There are depths of 35 feet at the outer end of the wharf and 17 feet at the inshore end; vessels not exceeding 500 feet can berth alongside. There is a smaller wharf used for discharging lighters. Ship's boats are recommended to land at this wharf.

Cargo is worked from vessels breastasted from 15 to 25 feet off the northern side of the large wharf. However, the swell and the undertow at times make it necessary to work cargo from the anchorage in a depth of 15 fathoms off the wharf; a mooring buoy is available at this anchorage. The large wharf is equipped with four conveyors for loading bananas. There are also blocks and cargo runners for assisting in the discharge of general cargo. Tractors can also be obtained. Launches and tugs are available. A launch is used to run lines to the mooring buoy. There are several lighters and oil barges at the port. Both at the anchorage and the wharf, vessels lie with their heads to the southwestward because of the swell from that direction. The wharf is equipped with heavy springs and wires for making vessels fast when there is a heavy swell running. There are two buoys about 600 feet off the wharf used to help keep vessels breastasted off. A breakwater also protects vessels at the wharf.

**Repairs.**—There is one machine shop in which limited repairs may be undertaken. There are two 15-ton cranes.

**Supplies.**—A stock of fuel and Diesel oil can be obtained by prior notice and in emergency only. Water can be obtained from a hose on the wharf at a rate of 15 tons per hour. Limited amounts of provisions are available.

**Communication.**—Frequent steamer communication is available; telephonic and telegraphic facilities are also available.

The United Fruit Company operates a radio station. A railroad connects Quepos with the inland settlement of Parrita.

**Hospital.**—There is a hospital at the port which will receive seamen.

**8-137 Punta Serrucho (Naranjo)** lies  $3\frac{1}{2}$  miles east-southeastward of Punta Quepos. The bluffs terminate here, and the coast recedes to the northward 1 mile to the mouth of the Rio Naranjo.

Isla de los Quepos, with the exception of one wooded island east of Punta Serrucho, consist of a chain of bare, rocky islets and detached rocks, the westernmost of which lies about 1,600 yards southeastward of Punta Quepos and the southeasternmost about  $1\frac{1}{4}$  miles southward of Punta Serrucho. The southeasternmost danger is a rock, awash at low water, situated about 750 yards southward of Isla Toro Amarillo and nearly  $1\frac{1}{2}$  miles southward of Punta Serrucho. Because of this and other dangers it is advisable to give the group a good berth. Should the land hereabout be sighted in thick weather, Isla Toro Amarillo, situated near the southeastern end of the Quepos island group and about 1,800 yards southward of Punta Serrucho, can easily be recognized; this islet is of a reddish color and 100 feet high.

**8-138 Coast.**—From Punta Serrucho the coast trends southeastward for nearly 25 miles to Uvita Point. At first hills of moderate elevation and long rounded ridges parallel with the shore are met with, but farther on the spurs of the Cerros Uvita rise abruptly from the sea. Dominical Point,  $6\frac{3}{4}$  miles northwestward of Uvita, projects slightly and is not very noticeable, but may be distinguished by its dark color. A reef extends southeastward from this point for over 1 mile, but is close to the shore. About midway between Dominical and Uvita Points and  $1\frac{3}{4}$  miles offshore is a rock above water, and  $\frac{3}{4}$  mile southward of this rock and  $2\frac{1}{4}$  miles offshore is a rock awash.

**Uvita Point** ( $9^{\circ}09' N.$ ,  $83^{\circ}46' W.$ , H. O. Chart 1035), at the northwestern end of Uvita Bay, is connected to Uvita Island, nearly 400 yards to the southwestward, by a sand spit that uncovers at half tide. Uvita Island, small and circular, has two rocky reefs extending out from it, one in a westerly and the other in a southeasterly direction.

**The bay westward of Uvita Point**, formed by the sand spit and the arm of the reef making out to the westward from Uvita Island, has a number of sunken rocks off the entrance and is exposed to a westerly wind and sea. The reef, through which there are several openings toward the outer end, projects  $2\frac{1}{2}$  miles from the island, the direction being indicated by Barrel Rock, a cylindrical rock, 21 feet high, lying  $1\frac{1}{4}$  mile westward of Uvita Island.

**8-139 Uvita Bay.**—Behind the hook formed by the point, the sand spit, and the southeastern arm of the reef is Uvita Bay, which, as the coast a few miles below sweeps around to the southward, affords a tolerably secure anchorage during all winds. The reef is 1,700 yards long, and the end, which is fairly well marked by the rocks that show above water, can be safely rounded at a distance of 400 yards. Round Rock, a few feet high, which marks the southern side of the passage leading into the bay, lies about 1 mile west-northwestward of Ballena Island. The depths are irregular, but within the entrance they shoal gradually to 4 fathoms near the head of the bay.

On Uvita Island are two or three huts that can be distinguished several miles; and as there are no others near the shores of the bay, they serve to mark the anchorage and the position of the reefs.

From Uvita Point the sand beach, with a strip of low land between it and the mountains, curves around nearly 2 miles to the southeastward and then ends at a bluff.

**8-140 Ballena Island**, which lies a little over 1 mile from the coast and nearly 1 mile east-southeastward of Round Rock, with which it is connected by a reef on which the sea often breaks, is the best mark for Uvita Bay. It is a mass of whitish rock, 400 yards long and 116 feet high and shows distinctly against the wooded slope of the mountain behind it, being often mistaken at a distance for a cliff or hillside left bare by a land slip. As seen from the south-

ward or southwestward, the island shows three points of equal elevation, but from the westward only two. The Ballenitas are three pointed rocks, 59 feet high, 1 mile eastward of Ballena and about  $\frac{1}{2}$  mile from shore. There are many sunken rocks in this vicinity, and the anchorage at Uvita is therefore not accessible except by the channel already described.

**8-141 Tides.**—The mean high water interval at Uvita Bay is 2h. 23m.; spring range 9.2 feet, mean range 7.5 feet.

**8-142 Directions.**—Vessels bound for Uvita Bay from the northward steer for Ballena Island on course  $112^{\circ}$  until Uvita Island bears  $006^{\circ}$ , then change course to  $062^{\circ}$ , the reef on the northern side of the entrance being in sight. When on the line between Uvita and Ballena Island, just past the end of the reef, haul up to  $349^{\circ}$  and anchor in  $6\frac{1}{2}$  fathoms, sand, with the houses on Uvita Island bearing  $287^{\circ}$ .

From the southward, steer for Ballena Island until Round Rock is sighted and then steer to round the rock at a distance of  $\frac{1}{2}$  mile.

Having passed the line between Round Rock and Uvita Island, which is also the line of the northern reef, steer  $354^{\circ}$  for the anchorage given above.

In approaching the entrance, Barrel Rock to the northward, the Ballenitas to the southward, and the bluff at the end of the sand beach within the bay may be of use as marks.

**8-143 Mala Point** ( $9^{\circ}05' N.$ ,  $83^{\circ}41' W.$ , *H. O. Chart 1017*), 6 miles southeastward of Uvita Point and 3 miles from Ballena Island, lies under the mountains and is characterized by bold cliffs.

**8-144 Coast.**—From Mala Point the coast trends east-southeastward about  $1\frac{1}{4}$  miles and then sharply southward for 15 miles to Guajamal Bay, where it turns sharply to the westward to Violin Point. The coastal range preserves its southeasterly direction, and the coast, curving away from it, skirts a low plain covered with

a growth of mangroves and traversed by several sluggish rivers. Southward of this plain the Cerros Sierpe rise to a height of 2,255 feet. The depression between the two ranges extends across to the head of the Gulf of Dulce, but the narrowest part of the neck of the peninsula, 10 miles wide, is a little farther southward, where the mountain ridge intervenes.

**SACATE ISLANDS**, 3 miles northward of Violin Point and 2 miles from shore, are two flat rocks, 30 feet high, so close together that they generally appear as one. It would be prudent to keep 1 mile to the westward of a line between them and the Violin Islands.

8-145 **GUAJAMAL BAY**, northeastward of Violin Point, is shoal, and the low coast northward of it must be approached with caution, especially off the river mouths, as the soundings diminish rapidly inside of 15 fathoms.

A group of mooring buoys is located in the outer part of the bay.

**VIOLIN POINT**, which is steep and rugged, has several small wooded islands, known as the Violin Islands, so close under it that they can be made out clearly only when approached along the coast. The Sierpe River enters the sea southward of Violin Point.

8-146 **C O A S T.**—From Violin Point the coast trends southward for 5 3/4 miles to the mouth of the Aguja River, and then bends sharply to the westward for 3 1/4 miles to San Jose Point; there is good anchorage in Sierpe Bay, the bight thus formed. San Jose Point is a bluff headland with deep water at a moderate distance from the rocks at its base. It may be recognized by a large green patch, bare of trees. San Pedro Point, which has been reported to give good radar returns up to 12 miles, 3 miles south-southwestward of San Jose Point, is a cliff having submerged rocks off it. Between these points the shore recedes a little, and midway between them, nearly 1 mile offshore, is Lowrock Reef.

The coast from San Pedro Point to Llorena Point, 3 miles to the southward, curves seaward, and is bordered by a rocky reef along which a number of islets rise, the largest of which is San Pedro Rock, 217 feet high. At the upper end of the reef only low black rocks are visible, but near Llorena Point the islets

are high and wooded, like the bluffs from which they have evidently been detached. Vessels will avoid all danger in this vicinity by keeping 1 mile from the shore.

8-147 **CANO ISLAND**, lying 10 miles westward of San Pedro Point, the nearest land, and 10 3/4 miles northwestward of Llorena Point, is 1 1/2 miles long, northeastward and southwestward, and 1,750 yards wide. It is covered with trees, rises on all sides with a steep ascent to a height of 404 feet, and the surface of the island is so level that the tree tops when first sighted, 20 miles away, present the appearance of low and marshy land. It is surrounded by rocks which extend from its western side for upward of 1/2 mile; reefs also extend out some distance from the northeastern and southeastern points. Outside the reefs the water deepens rapidly to 10 to 15 fathoms. The best anchorage is northeastward of the island, but under no circumstances should a vessel go inside of 15 fathoms without sending a boat ahead.

Cano Island has been reported to give good radar returns up to 25 miles.

8-148 A **LIGHT** is shown on the western end of Cano Island.

Depths of 18 and 22 fathoms have been reported about 18 and 21 1/2 miles west-northwestward of Cano Island Light.

8-149 **LLORENA (LLORONA) POINT** (8° 36' N., 83° 44' W., H.O. Chart 1017), at the western extremity of the peninsula westward of the Gulf of Dulce, is a high, steep, and almost perpendicular headland at the termination of a well-wooded plain 500 feet above the sea, and can be easily distinguished for more than 15 miles; on nearer approach, a number of red patches on the face of the cliffs will be seen among the trees. Llorena Point has been reported to give good radar returns up to 25 miles. At 1 mile eastward of the point there is a little waterfall, with a descent of nearly 100 feet. The coast at Llorena Point turns sharply to the eastward for 1 3/4 miles and thence trends southeastward for 12 miles to Sal-si-puedes Point; this stretch of coast is low and sandy, presenting no prominent marks. The Sirena, a small river discharges into the sea 7 1/2 southeastward of Llorena Point.

8-150 DANGERS.—Corcovado Rock, about midway between Llorena and Sal-si-puedes Points and 2 miles off the mouth of the Sirena River, is dome-shaped and 60 feet high, standing out very prominently from the coast when viewed from a moderate offing.

Falconer Rock, a prominent rock, was reported (1961) to lie about 1/2 mile northeastward of Corcovado Rock.

Two rocks, about 20 feet high, were reported (1963) to lie about 300 yards and 600 yards, respectively, east-southeastward of Corcovado Rock.

A group of rocks awash lie, about 1 1/2 miles offshore, midway between Corcovado Rock and Sal-si-puedes Point.

A reef, with rocks above water and awash, extends about 1,200 yards southward and southwestward from Sal-si-puedes Point.

CHANCHA PELONA, a circular rock with a rounded top, lies about 1,100 yards south-southeastward of Sal-si-puedes Point; within 2 miles southward of this rock the depths increase from 10 to 120 fathoms.

Currents off Sal-si-puedes Point sometime set northward and westward at a rate of 1 1/2 knots.

8-151 OFFLYING BANK.—A bank, the extent of which is unknown, lies about 10 to 19 miles southwestward of Sal-si-puedes Point. Soundings obtained in about 8° 15' N., 83° 48' W., indicated depths of 6 to 11 fathoms, and depths of 13 to 19 fathoms were found near 8° 19' N., 83° 42' W.

The positions of these soundings are approximate and less water may exist. Therefore, mariners are advised to use caution in this area.

8-152 SAL-SI-PUEDES POINT is high and precipitous, and, from a position about 5 miles to the westward, appears abrupt. It will be easily recognized from the northward or southward by a natural terrace behind it.

From Sal-si-puedes Point the coast trends first eastward and then gradually east-southeastward for a distance of 17 3/4 miles to Matapalo Head, at the entrance to the Gulf of Dulce. It is low and sandy and covered with trees all the way; immediately behind it a high and thickly wooded ridge overlooks the shore and terminates abruptly in Mata-

palo Head. The beach, on which there is usually a heavy surf, is steep-to, with 10 and 15 fathoms just outside the surf and 100 fathoms at about 2 miles offshore.

8-153 GULF OF DULCE.—The Gulf of Dulce extends northward about 10 miles and then northwestward 15 miles, with a width varying from 5 1/4 to 10 3/4 miles, the width at the entrance, between Matapalo Head and Banco Point, being about 8 1/2 miles. It is seldom visited by vessels, and the adjacent country is but sparsely settled. Although very deep, it possesses numerous anchorages and has no known dangers at more than 1 mile from the land, with the exception of the bank off the mouth of the Coto River. This is the principal danger in the gulf, but as the sea generally breaks upon it there is very little difficulty in avoiding it.

The upper and larger portion of the gulf is a remarkable basin, with depths of more than 100 fathoms in a large area; as there is deep water close to the shores, navigation here by sailing vessels in the season of squalls and calms is attended with some risk.

MATAPALO HEAD (8° 23' N., 83° 18' W., H.O. Chart 1037), the western entrance point, is high, steep, and covered with trees, terminating a mountain range which attains a height of over 2,000 feet. Just off the point is Cape Rock, a conical rock that stands out prominently when seen from the westward.

Matapalo Head has been reported to give good radar returns up to 22 miles.

MATAPALO ROCK, dark colored and 10 feet high, lies 1/2 miles southeastward of the head; it is very conspicuous when viewed from southwestward or northeastward. Between this rock and the shore there are shoal patches and sunken rocks, and two 3-fathom patches lie, respectively, 330 yards southward and 850 yards westward of Matapalo Rock. The rock should be given a berth of at least 1/4 mile.

THE WESTERN SHORE of the gulf consists of a flat, well-wooded country at the foot of the hills, sandy as far as Arenitas Point and afterwards alluvial. At about 1 mile northeastward of Matapalo Head, where the shore changes direction to the northward, there is a low point at 300 yards

off which there is a sunken rock. Sombrero Point, 2 1/2 miles farther northward, is bordered by a reef extending off about 1/2 mile, with a number of black rocks noticeable at low tide. Tigrito Point, 2 1/4 miles northward of Sombrero, has a reef extending from it 3/4 mile.

ARENITAS POINT, nearly 10 miles northward of Matapalo Head, is a low, narrow, sandy point or spit projecting out about 1/2 mile in a northwesterly direction. A coral reef, with less than 1 fathom of water over it and steep-to at its outer edge, lies 600 yards eastward of the spit; close to its northern end the depth is 40 fathoms.

Behind the point, and just at the mouth of a small creek that enters from the southward, is the village of San (Santo) Domingo, with a population of about 200. Only two or three houses can be seen from outside the point, and even after rounding it a vessel can not easily distinguish the village against the woods. Except in thick weather, the anchorage may be easily found by the marks on the opposite shore near Golfito, Adams Peak bearing 047°.

8-154 ANCHORAGE may be taken either southeastward or northwestward of Arenitas Point, but the former, being exposed to the sea breezes and therefore free of the excessive heat which is felt farther northward, is the preferable anchorage. A good position is in a depth of 10 fathoms, with Arenitas Point bearing 303° and Tigrito Point bearing 175°.

A vessel making this anchorage from the southward should keep more than 1/2 mile from the shore until Arenitas Point bears southward of 225°; it will then be past the upper end of the coral bank and can steer for the anchorage. The mud flats extend out nearly 300 yards, and 1/4 mile farther out the depth is 20 to 25 fathoms; the lead should therefore be kept going, and the anchor dropped as soon as 12 or 15 fathoms is obtained.

8-155 EL RINCON HARBOR (8° 42' N., 83° 29' W., H.O. Chart 1035).—Tigre Point lies at the mouth of the Tigre River, 2 3/4 miles northwestward of Arenitas Point, and at 8 miles farther, in the same general direction, is Palmas Point, the shore between them receding 1 1/2 miles. At 4 1/2 miles beyond

Palmas Point, at the northwestern extremity of the gulf, is El Rincon Harbor, formed behind a low tree-covered point, which projects from the southwestern shore 1/2 mile to the northward, the little bay thus formed affording the only secure anchorage above Golfito. From the end of the point a sand spit extends northward about 200 yards, part of it above high-water, with depths of 20 fathoms just outside it. El Rincon River empties into the bay here, dividing the point into two unequal parts, that to the eastward being called Isadora Point; at low tide the water of the river is fresh nearly to the mouth. There are a few huts on the northern and western shores of the harbor, with a little cleared land about them. The bay is surrounded by the spurs of Cerros Sierpe, the distance across the ridge to the sea being only about 10 miles.

Two piers are located on the southwestern shore of the harbor.

8-156 LANDMARK.—On one of the bluffs close eastward of El Rincon Harbor is a prominent yellow patch, which is visible to a vessel entering the Gulf of Dulce.

A conspicuous tank is located on the southwestern shore of the harbor, about 1 1/4 miles west southwestward of Isadora Point.

8-157 SHOAL.—A shoal with 1 foot of water over it, 20 fathoms close outside, extends out 800 yards from the coast off a small point 2 1/2 miles southeastward of Isadora Point and 1 3/4 miles northwestward of Palmas Point. With this exception the shore between Arenitas Point and El Rincon Harbor is free from danger and may be safely approached to within a distance of 1/2 mile, the soundings at that distance varying from 20 to 50 fathoms.

8-158 TIDES.—The mean high water interval at El Rincon Harbor is 2h. 48m.; spring range 9.2 feet, mean range 5 feet.

8-159 EL RINCON HARBOR TO ESQUINAS RIVER.—From El Rincon Harbor the shore line at the head of the gulf has a general easterly trend to the Esquinas River, which enters the gulf at its northeastern angle. Bluffs of moderate elevation rise abruptly, and the shore is indented by several small bays where the water is shoal

enough in places to anchor, but vessels without a chart and lacking local knowledge should not attempt feeling in with the lead, as some of the reefs have 50 fathoms close to their edges. The islets marked on the chart show distinctly against the bluffs and will assist in finding an anchorage. The valley of the Esquinas is 1 mile wide, and across the end are mud flats and sand bars that choke the several mouths of the river and make it difficult for even boats to enter.

**8-160 ESQUINAS RIVER TO GOLFITO.**—From the principal mouth of the Esquinas River the shore trends southward 2 1/4 miles to Esquinas Point, thence southeastward 2 1/2 miles to Copaiba Point, thence eastward and southward about 4 1/2 miles to San Juan Point, and thence eastward 3 1/3 miles to the northern entrance point of Golfito; between these prominent points the shore recedes in successive bays or bights, two of the indentations being of considerable extent, and a bold mountain ridge rises from the shore along this whole stretch of coast. Deep water lies close to shore, the soundings increasing in some places to 100 fathoms at 1/2 mile from the beach.

A large rock lies close off San Juan Point, and 400 yards farther out is a small black rock that hardly shows at high water.

**8-161 GOLFITO (8° 38' N., 83° 11' W., H.O. Charts 6163 and 1037),** though small in the extent of its anchorage, is a landlocked harbor lying opposite Arenitas Point and 15 miles northward of Banco Point. The entrance, open to the southwestward, nearly 1 mile long and 650 yards wide, leads into the northwestern end of the bay, which extends 3 1/2 miles to the southeastward with an average width of over 1 mile. The water is shoal throughout the southern half of the bay, the head being bordered by mud flats which dry at low water. A small islet, 175 feet high, lies in the center of the southern part of the bay. A wooded hill, 862 feet high, rises from the low sandy peninsula bordering the south side of the entrance, and as

the shore on the north side is high and abrupt, the entrance looks like a canyon or mountain pass. Southward of the hill a low, flat, narrow neck of land separates the southern end of the bay from the gulf. Another hill stands close to the beach a little over 1 mile below the neck, similar in appearance but slightly higher and more conspicuous to vessels running up the gulf, as the coast below it is comparatively flat for some miles. Behind the bay is a steep ridge, about 1,400 feet high, and near the northwestern end, rising 300 feet above the crest, is the conical summit of Adams Peak, 1,726 feet high.

**8-162 CHANNEL—DEPTH—DANGERS.**—The channel leading into Golfito Harbor is entered southwestward of Voladera Point, a point on the northern side of the entrance. The fairway of the channel leads first in a 047° direction to a position about 1/2 mile eastward of Voladera Point, and then in a 036° direction into the harbor. Southward of Voladera Point the channel is about 1/3 mile wide between the 30-foot curves, but further in, at the entrance to the harbor, it narrows to slightly over 200 yards. General depths in the fairway of the 047° section of the channel are from 33 to over 70 feet, the 33-foot depth lying close southeastward of the entrance range line in a position about 3/4 mile south-southwestward of Voladera Point. General depths in the fairway of the 036° or harbor section of the channel are from 36 to 67 feet. A draft of 26 feet can be taken to the pier and 33 feet to the anchorage.

Depths of less than 24 feet were reported (1955) on the entrance range line, however, a vessel running this range line in 1966 reported a least of 44 feet.

A detached shoal with a depth of 22 feet lies on the northwestern side of the entrance in a position about 450 yards south-southwestward of Voladera Point. About 1/2 mile northeastward of the point a shoal flat with depths of 24 feet and less extends nearly 500 yards offshore in a northeasterly direction. This latter shoal has been reported (1964) to be extending eastward.

Shoal flats extend from 100 to 150 yards off the northwestern shore of the peninsula that forms the southeastern side of the entrance. Another flat, on which the depths are very shallow, extends about 800 yards northeastward from the northwestern end of the peninsula. Close westward of the latter flat is a shoal area with depths of 24 to 30 feet.

8-163 RANGE LIGHTS.—The front light of the entrance range is shown from a structure standing in the water about 650 yards north-northeastward of the northern end of the peninsula that forms the southeastern side of the entrance. The structure consists of a stake surmounted by a white diamond daymark with a black vertical stripe. The rear light of the range is shown from a white diamond marker with a black vertical stripe standing on the shore about 950 yards 047° from the front light. A light beacon consisting of a similar white diamond marker with a black vertical stripe stands about 40 yards 047° from the rear light.

The front light of the harbor range is shown from a white marker on the pier roof at Golfito. The rear light is shown from a red and white checkered marker standing about 550 yards 036° from the front light.

8-164 LIGHT BEACONS.—A light is shown from a steel tower fitted with reflectors standing close southward of Voladera Point.

A light is shown from a similar structure, equipped with a radar reflector, standing about 350 yards offshore in a position about 1,100 yards southward of Voladera Point.

A light is shown from a stake fitted with reflectors standing near the edge of the shoal flats that extend out from the shore about 1/2 mile northeastward of Voladera Point.

A light is shown from a stake standing in shoal water in the harbor in a position about 750 yards southward of the end of the pier. The light is near the end of the shallow flat that extends northeastward from the end of the peninsula previously mentioned.

Lights are shown from two stakes standing in shoal water on the northern side of the harbor, and a light is shown from a stake standing in shoal water on the northeastern side of the harbor.

8-165 Paragraph deleted.

8-166 ANCHORAGE.—There is anchorage room for about three or four large vessels in Golfito Harbor. Holding ground is good, and the anchorage is well sheltered. Vessels anchor in the northwestern part of the harbor.

8-167 TIDES.—The mean highwater interval at Golfito is 2h. 45m.; mean range 10 1/2 feet.

There is a fairly strong flow of current at the anchorage. The tide was reported (1956) to run parallel with the wharf and to be treacherous at times. The times of high and low water are about the same as El Rincon.

In 1945 a vessel reported a strong southerly current as she was coming out of the channel to Golfito.

8-168 DIRECTIONS.—The coast southward of the entrance to Golfito is bordered by a shoal that extends out 1/2 to 1 1/2 miles, with depths of 20 to 50 fathoms just outside. A vessel running up the gulf should keep in the middle until the entrance to Golfito is well open. Thence a vessel should enter with the entrance range in line 047°, continuing on that course until the harbor range comes in line 036°, thence alter course to that heading and proceed into the harbor.

On account of the great depth of water in the approach to the entrance and the shallow water on the steep-to bank to the southward of the entrance to Golfito, the lead cannot be depended upon when the landmarks are obscured; therefore vessels should in such cases anchor in Pavon Bay, northward of Banco Point, and wait for the weather to clear.

8-169 Golfito is located on the eastern shore of the Gulf of Dulce, and near the Panamanian border. The small cluster of port buildings is on the northern side of the harbor and almost due south of Adams Peak.

**Wharf.**—The main wharf at Golfito, located in the northern part of the harbor, is 1,100 feet in length with two berths, each 550 feet in length. Depths alongside range from 20 to 35 feet with a least depth of 26 feet in the outer berth. There are four conveyors for loading bananas at the fruit berth. Several lighters and two low-powered tugs are available. The tugs are not used for berthing. A 15-ton travelling crane is located on the wharf.

**Repairs.**—Minor emergency repairs can be made in the company shops.

**Supplies.**—Fresh beef and tropical fruits are available in quantity; vegetables are in limited supply. Deck and engine supplies are sometimes supplied in case of emergency and subject to prior arrangement. Drinking and boiler water can be obtained by pipe line; no treatment required. Diesel and fuel oil are supplied in case of emergency and subject to prior arrangement from 6 and 8 inch pipe lines on the wharf.

**Communications.**—Steamers of the United Fruit Co. call at the port. There is air mail service at the port. The United Fruit Company operates a radio transmitter and a telephone system. A railroad connects Golfito with the interior. Telegraphic service to all parts of the world is available.

**Hospital.**—A modern and fully equipped hospital is maintained by the United Fruit Company.

8-170 **Coto River** discharges into the gulf at a position 4 miles southeastward of the entrance of Golfito. The village of Coto stands on its bank at about 10 miles above its mouth. The shoal at the mouth extends out 1½ miles, and most of it uncovers at low tide, leaving two narrow passages with less than ½ fathom of water leading into the river, one along the northern shore and the other across the shoals in an easterly direction, a little to the left of a hut on Coto Point. The sea generally breaks on the bar, and, as sharks are numerous, the attempt to cross it is attended with considerable danger. Outside the shoal the water deepens at once to 30 and 40 fathoms.

8-171 **Pavon Bay** is a bight 10½ miles wide between Coto and Banco Points and extending within them 3¼ miles. The 3-fathom curve lies at ¼ to ½ mile from the shore, and outside of it there are no dangers, the water deepening very gradually to 10 fathoms at 5 to 6 miles from the head of the bay. There is good anchorage, mud bottom, anywhere on this great bank, but it is exposed to southwesterly winds.

Costa Rican Government regulations require a vessel to clear customs at Golfito, prior to anchoring in Pavon Bay.

8-172 **Banco Point (Punta Banco)** ( $8^{\circ}23'N.$ ,  $83^{\circ}09'W.$ , *H. O. Chart 1037*), the eastern entrance point of the Gulf of Dulce, lying  $8\frac{1}{4}$  miles almost due eastward from Matapalo Head, is not very prominent, but as the entrance is neared it will be made out at the foot of the northwestern slope of Platanal Point. There are a few detached, breaking rocks off the point, and shoal water extends from it about  $\frac{1}{2}$  mile; vessels should therefore give it a berth of at least 1 mile, at which distance there are depths of 11 to 16 fathoms.

8-173 **Directions.**—The Gulf of Dulce lies in the great projection of the coast between Llorena and Burica Points, so that navigators without observations for several days and missing the entrance on either side by 30 miles would know by the direction of the coast their position with respect to the entrance. From the offing the Cerro Sal-si-puedes is the best mark, as it rises abruptly at Matapalo Head and runs northwestward 15 miles, gradually increasing in height from 1,200 to 2,200 feet. After rounding Burica Point, 25 miles southeastward of the entrance, Platanal Point will be easily distinguished.

For vessels entering the gulf at night the most convenient anchorage is in Pavon Bay, the 10-fathom curve of soundings running about northward from Banco Point. Should it, however, be blowing heavily from the southwestward, a vessel having run inside the heads 2 or 3 miles may steer about  $327^{\circ}$  for an anchorage on the western side of the gulf, in depths of 10 to 12 fathoms, more than 1 mile from any danger. A vessel running in from the westward at nightfall and being anxious to keep hold of the land, must take care not to mistake Cape Rock, just off Matapalo Head, for Matapalo Rock.

8-174 **Platanal Point**,  $3\frac{1}{4}$  miles southeastward of Banco Point, rises abruptly from the shore to a height of 1,170 feet; at a distance it appears to mark the eastern side of the entrance to the gulf. The mountains behind it are 2,300 feet high, and, as the descent to the beach on each side is gradual, the flat top is very conspicuous.