



Fig. 72 Kelp beds, Thurloe Bay, Lower California, Mexico



Fig. 73 Turtle Bay, Lower California, Mexico

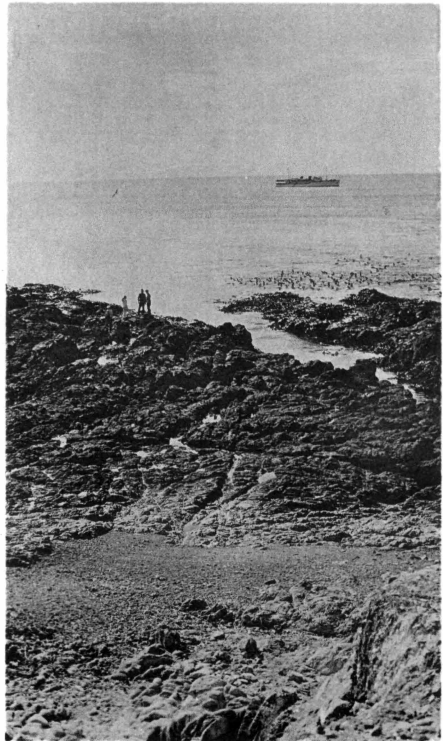


Fig. 74 (right) Asunción Island, Lower California, Mexico

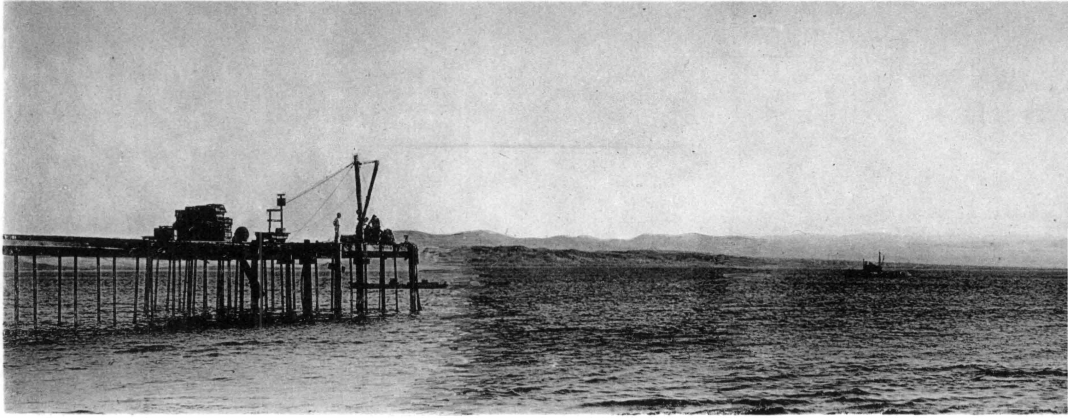


Fig. 75 Panorama of Turtle Bay, Lower California, Mexico

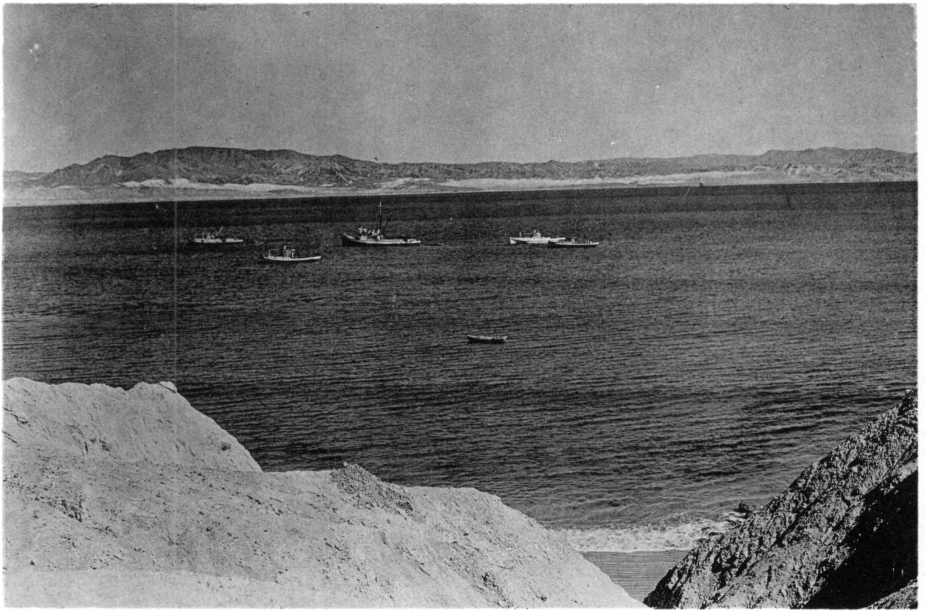


Fig. 76 Turtle Bay, Lower California

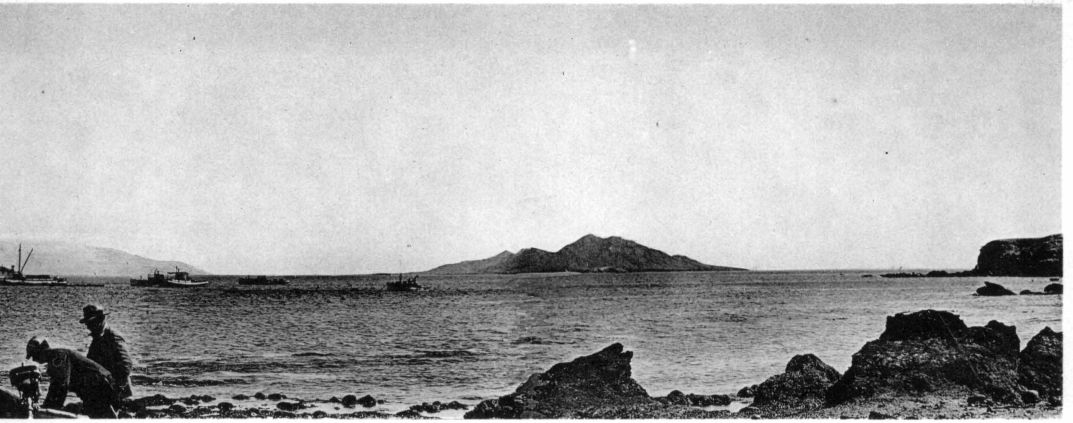


Fig. 77 Turtle Bay, Lower California

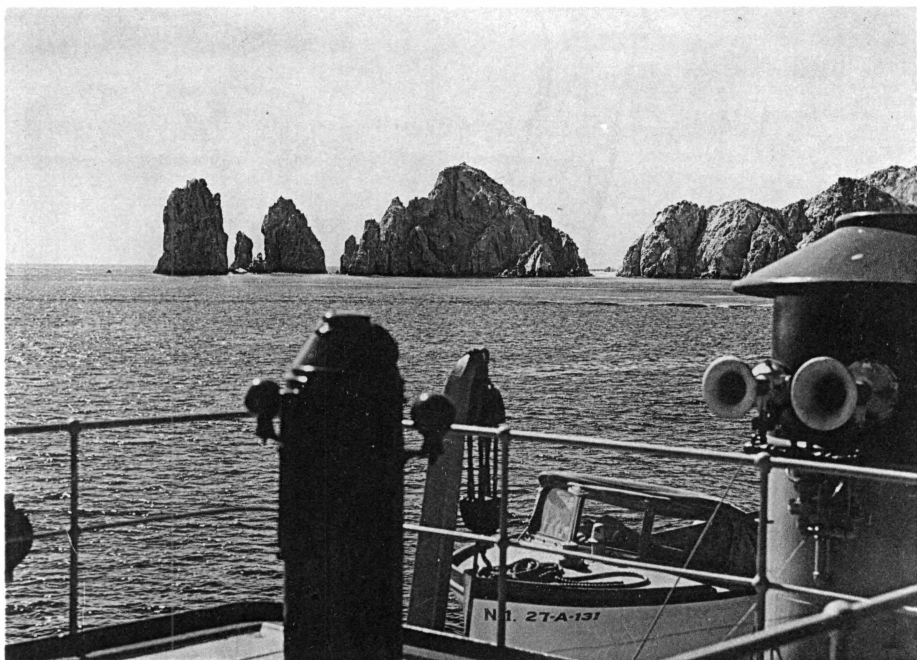


Fig. 78 Cape San Lucas, Lower California, looking west

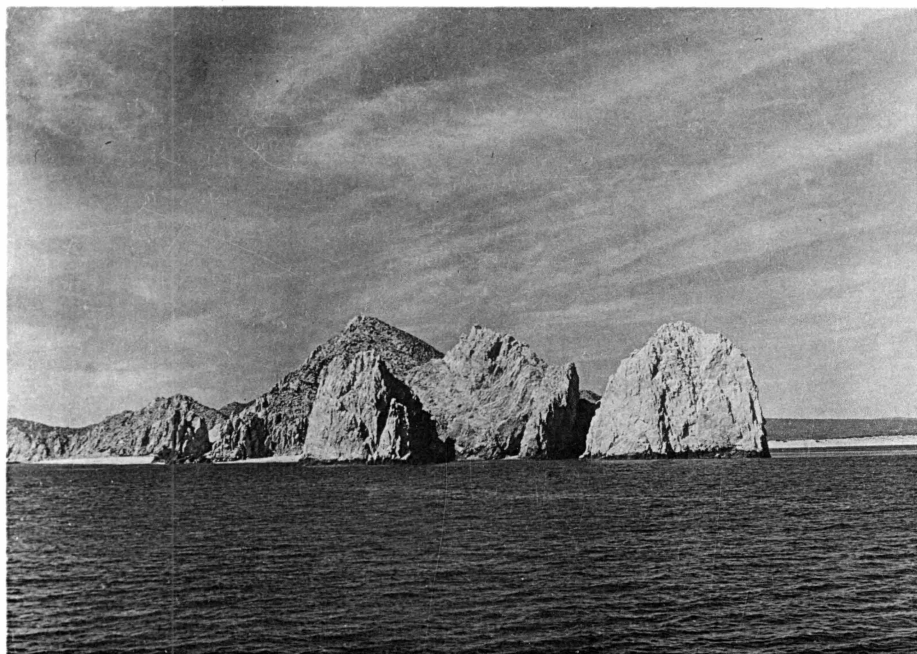


Fig. 79 Cape San Lucas, Lower California, looking north

PLATE 22

- Fig. 47 A view of the northwest side of Santa Barbara Island from a point near the summit. Colonies of California sea lions and an occasional sea elephant inhabit the rocky inlets, while beds of kelp extend for a mile or more off shore. Chart 29, p. 384. (Photographs, figs. 47, 52-55, L. A. Museum—Channel Islands Biol. Survey.)
- Fig. 48 North end of Santa Barbara Island as viewed from the southeast. (Photographs, figs. 48, 50, 51, by Marian B. Hollenbach.)
- Fig. 49 Landing at Santa Barbara Island, California. Stores for a biological survey party of the Los Angeles Museum are being hoisted by means of a temporary scaffolding. Pedestrians take a steep and narrow trail to the summit.

PLATE 23

- Fig. 50 Dutch Harbor, San Nicolas Island, as seen from the east. Chart 30, p. 385.
- Fig. 51 Surf breaking on the mile-long spit at the east end of San Nicolas Island. Here two currents meet, and the spray may be clearly seen for many miles on either side of the island. Chart 30, p. 385.
- Fig. 52 Looking toward the south end of San Nicolas Island from a point near the center of the island. The effects of overgrazing and consequent erosion are clearly seen in the picture.

PLATE 24

- Fig. 53 View of Pyramid Cove, San Clemente Island, showing the surf through which the members of the biological survey party of the Los Angeles Museum were landed from the *Velero III*. Chart 31, p. 385.
- Fig. 54 The south side of San Clemente Island, California, looking northwest from China Point.
- Fig. 55 China Point, the extreme southeast end of San Clemente Island, California, showing the effect of wave action on a level plateau.

PLATE 25

- Fig. 56 The southeast end of Santa Catalina Island, from Pebble Beach to Seal Rocks, has been much blasted to obtain a granitic rock used for building breakwaters. The slope of the island, naturally abrupt at this point, has been greatly steepened by these operations. Evidence that Santa Catalina Island is not rising is found in the absence of elevated beaches and former shore lines. Charts 27, 28, pp. 382, 383.
- Fig. 57 The *Velero III* as she appeared at what was perhaps her most frequented anchorage, at White Cove, south of Long Point, Santa Catalina Island. The wharf, outbuildings, and reservoir were used in connection with the operations of an old mine.

PLATE 26

- Fig. 58 Point San Vicente light as seen from a few hundred yards off shore. The precipitous bluff exposes Tertiary sediments. The Palos Verdes hills represent an uplifted Channel Island, several former shore lines being clearly visible. Chart 25, p. 380.
- Fig. 59 Rocky beach at Point Fermin, California, showing coarse rock shingle and wave-worn sections of uplifted Tertiary deposits. (Photograph by C. McLean Fraser.)

PLATE 27

- Fig. 60 Shore line south of Corona del Mar, California, showing the numerous reefs on which collecting was accomplished, as well as outlying sea stacks and arches. (Photograph by C. McLean Fraser.)
- Fig. 61 Beach south of Corona del Mar, California, a favorite collecting ground for marine zoologists. Chart 26, p. 381. (Photograph by C. McLean Fraser.)

PLATE 28

- Fig. 62 Rocky shore south of Laguna Beach, California, looking north. Chart 26, p. 381. (Photograph by C. McLean Fraser.)
- Fig. 63 Shore line north of Laguna Beach, California, consisting of a number of shallow bays separated by cliffed promontories. (Photograph by C. McLean Fraser.)

PLATE 29

- Fig. 64 Guadalupe Island dwellings constructed of native volcanic rock. The Mexican government maintains a garrison for the protection of the elephant seal herd on the other side of the island. Chart 13, p. 371.
- Fig. 65 The south end of Guadalupe Island affords a glimpse of the effects of volcanism. A cap of lava overlies the stratified deposits of earlier geological periods. It is as if one were viewing the inside of the rim of a crater, the major portion of which had been worn away, allowing access to the crater by the sea.

PLATE 30

- Fig. 66 A portion of a herd of nearly 1,500 of the northern elephant seal, basking on a lava beach at the foot of a talus slope. Behind them the shore of Guadalupe Island rises precipitously to a height of 4,500 feet.
- Fig. 67 The protected west shore of East San Benito Island, breeding ground for thousands of California sea lions. The sandy slopes to the right afford nesting places for western gulls and California brown pelicans. Chart 39, p. 391.

PLATE 31

- Fig. 68 Wreck of a south-bound tanker aground almost at the foot of the lighthouse on West San Benito Island. An ancient shore line is distinguishable at a higher level.
- Fig. 69 The village on the east side of Cedros Island, located on an alluvial fan which represents the third and last of 3 periods of fan formation, the long slope in the distance being the first. (The principal occupation of the inhabitants is the canning of lobster and abalone which abound on near-by rocky shores.)

PLATE 32

- Fig. 70 Algae on shore, South Bay, Cedros Island, Mexico. The conspicuous form with the branching stalk is *Eisenia*. The finer growth in the foreground is eel grass (*Zostera*). (Photograph by Wm. R. Taylor.)
- Fig. 71 The landing at South Bay, Cedros Island, a region of great interest to the geologist, who reports that its formations are precretaceous metamorphics and quaternary volcanics. Chart 40, p. 392.

PLATE 33

- Fig. 72 Beds of *Macrocystis* off shore, Thurloe Bay, Lower California, Mexico. Thurloe Bay marks the southern limit of large kelp beds. The rocks in the foreground represent a series of tilted sediments. (Photograph by Wm. R. Taylor.)
- Fig. 73 Turtle Bay, Lower California, Mexico, showing conglomerate rock in the background and beds of kelp among which collecting was accomplished on an early Hancock Expedition. Chart 42, p. 393.
- Fig. 74 Rocky coast of Asunción Island, Lower California, a favorite breeding ground of the California sea lion. The incessant barking of thousands of these animals made sleep impossible aboard the *Velero III* anchored a mile off shore.

PLATES 34, 35

- Fig. 75 Panorama of Turtle Bay, Lower California, showing Japanese fishing fleet at anchor in the middle distance and Expedition scientists preparing to launch skiff with outboard motor. The harbor entrance is shown at the right.
- Fig. 76 A view looking across the harbor of Turtle Bay, Lower California, from the north shore, showing a portion of the Japanese fishing fleet at anchor in the middle distance.
- Fig. 77 A view of Turtle Bay, Lower California, to the south looking across mud flats toward the beach, which was a favorite collecting ground for edible clams or cockles (*Chione*).

PLATE 36

- Fig. 78 The sea stacks at Cape San Lucas, an important landmark to navigators crossing the Gulf of California. The rocks are seen from the east, or Gulf side, the open Pacific lying beyond them. Chart 45, p. 394.
- Fig. 79 Cape San Lucas as seen from the south appears to be a continuous mass of granite. However, when seen from either west or east, it resolves itself into a number of well-separated stacks and arches allowing passage of the sea between.

Gulf of California—West Coast

Plates 37-60; Charts 48-62

The Gulf of California is an area of major importance in the work of the Allan Hancock Foundation, since it was the main base of operations for three of the winter expeditions, those of 1936, 1937, and 1940. In the attention paid to it, however, it falls relatively short of that paid to the Galapagos Islands, for, although slightly more time has been spent in the Gulf of California, the area included is more than twice as great as that included in the Galapagos area.

The Gulf, separated from the Pacific Ocean by the peninsula of Lower California, is 650 miles long from southeast to northwest and 50 to 120 miles wide. Gales from the northwest in the winter months and from the southeast in the summer months are not infrequent. In several places, especially in the channels between the islands and the mainland, the currents are strong and erratic, and for such an extensive coast line anchorages, safe in all weather, are comparatively few. There are few indications of foul ground such as are commonly present in the open ocean. Nevertheless, in fair weather and under favorable conditions generally, suitable spots for collecting can be found along the shore and on the sea bottom in almost all parts of the Gulf.

The east coast of Lower California, or the west coast of the Gulf, is most commonly high and precipitous, with mountains often rising abruptly close to the shore. There are sandy beaches, but they are seldom of any great length. Depth increases rapidly offshore, but there are numerous islands, often separated from the mainland and from each other by navigable channels. The coast itself, as well as the adjacent islands, has little precipitation; and, while there are some fertile valleys and arroyos, general barrenness is evident.

From the head of the Gulf southward, the east coast is very different from the west coast. Although there are still the high mountains in the background, the immediate foreground is, in the main, low and sandy; and, with the exception of those some distance from shore, most of the islands are in the nature of deltas.

Physical, chemical, and meteorological conditions change materially from the entrance of the Gulf to the head, and with these changes there is, of course, a change in the flora and fauna. The lower portion is tropical, with warm water and corresponding fauna, indicated, for instance, by the presence of coral masses. Toward the head it becomes much colder and less saline, and the tropical species are replaced by those that inhabit

more temperate regions. Such changes are to be expected in such a great extent of coast line, but the changes here are somewhat emphasized by the general configuration.

Following along the west coast of the Gulf from Cabo Falso, or Cape San Lucas, at the entrance, to the mouth of the Colorado River, at the head, consideration is given to the principal collecting locations.

While Cabo Falso is the southern limit of Lower California, it is little farther south than Cape San Lucas, 4 miles to the eastward. The coast between consists of a succession of sandy beaches and forbidding rocky bluffs. A gap in the hills connects one of these beaches, three quarters of a mile westward of Cape San Lucas, with San Lucas Bay, to cut off a high, steep, rocky mass which forms the tip of the Cape. Off this there are a number of outlying rocks, in one of which there is a conspicuous arch through which the sea rushes with great force.

From Cape San Lucas, the coast turns abruptly northward, and then eastward again to form the mile-wide San Lucas Bay, which provides a safe anchorage from northwest winds, but is wholly exposed to the southeast. Several species of commercial fish are plentiful here, and there is a cannery in the village of San Lucas on the shore of the bay. There is one dredging station off the mouth of the bay in 25 fathoms.

Eastward from the sandy beach of San Lucas Bay, a rocky coast extends for 2 miles to Cabeza Ballena, a rocky headland rising almost vertically from the water's edge. From the shore, reeflike, rocky ledges extend seaward, and on these there are some interesting tide pools from which collections have been made. There is one dredging station northeast of the point, close in, and one 3 miles farther to the northeast.

From Cabeza Ballena, the coast continues without any definite irregularity in a northeasterly direction for 10 miles to Palmilla Point. Toward the center of this part there is a low, sandy beach, $2\frac{1}{2}$ miles in length, but the remainder of the shore is rocky.

Palmilla Point, a low, bluff, rocky point, with numerous outlying sunken rocks, is the western limit of San José del Cabo Bay, a shallow bight extending for 9 miles to Gorda Point. The shore is rocky at both ends of the bay, but the remainder, the greater portion, is a sandy beach. The San José valley is one of the most fertile areas in Lower California. The San José River empties into the bay, with San José village situated on its bank, a mile from shore. There is a station on the rocky shore at the west end of the sand beach.

Gorda Point is of the same type as Palmilla Point, with similar outlying rocks. Lying 5 miles southeast of Gorda Point is the Inner Gorda Bank, with a least depth of 17 fathoms, and $2\frac{3}{4}$ miles farther out the Outer Gorda Bank, with a least depth of 34 fathoms. Considerable dredging has been done off Gorda Point and on or near the Inner and Outer banks in sand, rock, and coralline on the banks and in mud off the banks.

From Gorda Point to Los Frailes, 21 miles to the northeast, is a regular coast line trending first to the northeast and then directly to the north, forming a regular convexity, with sandy beaches and rocky patches, backed up by bluffs most of the way. Several arroyos break through the bluff to make connection with the coast. In the southern portion of this area the water deepens very gradually, so that the 100-fathom line may be 7 miles offshore, but the grade is much steeper in the northern part, so much so that this line may be less than a mile from shore. The only collecting done here, except that near Los Frailes, was dipnetting by electric light from the *Velero III* at anchor off Arroyo de San Luis, 10 miles from Gorda Point.

Los Frailes is a prominent, rocky bluff, 410 feet high. Directly to the south of it there is an indentation of the shore to form Los Frailes Bay. The depth of the water offshore increases rapidly. Shore seining in the bay, dredging in shallow water in the bay and off the point, dredging off the bay in 80 fathoms, and the collecting of land plants indicate the activities in this location.

From Los Frailes to Cape Pulmo, 4 miles, where there is a rocky bluff, and on to Arena Point, 7 miles, there is a sandy beach the most of the way with some rock patches ashore and offshore, and several shoals offshore.

From Arena Point the coast turns to the northwest and then to the north again to Pescadero Point, 21 miles along the shore, and 19 miles in a straight line from point to point, to form Palmas Bay, largely a stretch of sandy beach interrupted occasionally by rocky patches or bluffs, with deep water quite close to shore.

The only collecting along this coast from near Los Frailes to Pescadero Point was some dredging in 50-150 fathoms off Boca de la Trinidad, 5 miles north of Arena Point.

From Pescadero Point to Perico Point, 15 miles, there is another somewhat similar indentation, Muertos Bay. The southern portion of the shore is sandy, but the northern portion is more rocky. Not far south of

Perico Point is a secondary indentation to form Ensenada de Los Muertos, in which there is an anchorage, safer than most of those along this part of the coast. This Ensenada has afforded some shore collecting and some dredging in 5-40 fathoms, in sand, broken shell, and coralline.

Perico Point is a high, rocky bluff; and here the coast turns slightly west of north, 2 miles, to the low, sandy Point Arena de la Ventana, north of which is a deeper bight to form Ventana Bay. Point Gorda, 12 miles from Point de la Ventana, is the northwestern limit of the bay.

The repeated use of certain names along the whole Pacific coast of America, south of San Diego, is quite confusing at times. This Point Gorda is not more than 70 or 75 miles in a direct line from a Point Gorda recently mentioned.

Lying off Ventana Bay is the high, rocky, barren island, Ceralbo Island, 16 miles long, $4\frac{1}{2}$ miles wide, with Ceralbo Channel, 4 to 6 miles wide, separating it from the mainland.

From Point Gorda to Coyote Point, 16 miles, the bold, rocky coast extends northwesterly. The bays and the points between them in this distance are not significant.

No collecting has been done around Ceralbo Island or at any place between Perico Point and Coyote Point.

Coyote Point is the northeast point of a rectangular peninsula separating La Paz Bay from the open Gulf. The northwest point is San Lorenzo Point. The coast between, 5 miles, is mostly rocky, although there is a sand beach near the San Lorenzo end. This peninsula is separated from Espiritu Santo Island by San Lorenzo Channel, with a least width of $3\frac{1}{2}$ miles. The channel is foul with rocks and reefs, and the currents are strong and variable. Probably because of this condition the fauna is rich, and hence the extensive dredging here was very profitable.

Espiritu Santo Island, 8 miles long, 6 miles wide, has a coast line of bluffs and sandy beaches. It is separated from Isla Partida to the north of it by a narrow, shallow passage. On the west coast of the island are two indentations, neither very extensive—Port Ballena and San Gabriel Bay—the latter being much the larger. San Gabriel Bay has been a fertile collecting ground for all methods of collecting that have been used anywhere. Port Ballena has received some attention as well.

La Paz Bay is the largest bay on the east coast of Lower California. It is 43 miles long, north and south, with a greatest breadth of 18 miles. The main coast line is shaped like the letter "J" reversed, with the peninsula extending to San Lorenzo Channel supporting the short arm.

Espiritu Santo Island and Isla Partida shut off most of the remainder from the open Gulf. There is little sandy beach, the rocky shore forming high bluffs and projecting points in many places.

San Juan Nepomezeino Island, off the west side of the peninsula, 4 miles from San Lorenzo Point, serves to protect Pichilique Harbor to the south of it and helps to make this harbor one of the best on the coast. It is well that this is so, for the southern portion of La Paz Bay, affording approach to the city of La Paz, is all quite shallow. The southern extremity of the bay forms La Paz Harbor, on which the city of La Paz, the largest city in Lower California, is situated. A large lagoon, *Ensenada de Anpe*, extends southwestward from the harbor.

There are shore, electric light, and dredging stations at the entrance to Pichilique Harbor and off Prieta Point, a short distance south.

The only conspicuous point on the west shore of La Paz Bay is Coyote Point. The northern terminus is Mechudo Head, a bold, perpendicular, stratified cliff 300 feet high. There is one dredging station off this head in 43-44 fathoms, but none in the main portion of La Paz Bay.

From Mechudo Head the coast extends regularly to the northwest, 16 miles, to Nopolo Point. Off this portion of the coast and separated from it by San José Channel lies San José Island, 16½ miles long, 2 to 6 miles wide, with more vegetation than some of the other gulf islands. South of this island, 1½ miles, is San Francisco Island, 4½ miles off Mechudo Head. The channel between is shallow and is blocked to some extent by Coyote Rocks and others of smaller size. The area of the island is 1½ square miles. The coast consists mainly of rocky bluffs, but there is a low, sandy neck connecting the southern tip with the rest of the island. All around the island the water is comparatively shallow, but deepens rapidly to the eastward. This has been a favorite collecting area. Much dredging, shore collecting on the rocks and on shingle, and for coral masses, and dipping with electric light have all brought good results.

North of San José Island are the rocky islands or islets, San Diego and Santa Cruz.

From Nopolo Point to San Marcial Point, 32 miles, the coast continues regularly somewhat west of north, with but one conspicuous point between, Point Telmo. The coast is a succession of rocky bluffs and small sand beaches. There are a number of small islands and rocky islets a short distance offshore.

San Marcial Point is a rocky cliff with a long reef of rocks extending out from it, and $1\frac{1}{4}$ miles north-northeastward is San Marcial Rock. Just north of San Marcial Point, the coast turns abruptly westward, 2 miles, to Agua Verde Bay, where there is a fair anchorage. The bay is surrounded by rocky bluffs, but there are two small sandy beaches.

The San Marcial Point and Agua Verde Bay area has been a favorite collecting location; 26 stations are located here, with all types of equipment used. The work here consisted of shore collecting in the sand and on the rocks at low tide and with the use of a skiff, collecting on San Marcial Reef, seining, dipping and diving, dredging in the shallow water in sand, and in deeper water to 127 fathoms, mostly in mud.

West of Point San Pasquel, the western extremity of Agua Verde Bay, is a small bight, 5 miles across to San Cosme Point, and then another, larger bight to Candelero Point, 11 miles across, with a succession of rocky bluffs and sandy beaches. Off Candelero Point lie three pinnacle rocks, Los Candeleros.

Another bight extends from Candelero Point to Punta Coyote, 7 miles. There are some sandy beaches and outlying rocks. Punta Coyote is a steep, bluff headland, forming the eastern limit of a pear-shaped peninsula, joined by a narrow neck to the mainland, which forms a well-protected and almost landlocked harbor, Puerto Escondido. Here there is some shingle beach, rather a rarity in the Gulf. The bight is pretty well shut off from the open Gulf by Danzante Island, $3\frac{1}{2}$ miles long. Off Punta Coyote and in and off Puerto Escondido and in the channel between these and Danzante Island, there are 19 stations, at which practically all types of collecting were used. The bottom here is mostly sand.

From Punta Coyote the coast takes a regular sweep almost directly northward to Tierra Firme Point, 15 miles, with but one noticeable point between, Nopolo Point. Much of the coast here is low and sandy.

Opposite this part of the coast lies the large Carmen Island, $17\frac{1}{2}$ miles long and 6 miles in greatest width, with its southern point, Punta Baja, $3\frac{1}{2}$ miles from Punta Coyote. The general appearance of the island and of its coast does not differ materially from that of the near-by mainland. The northern portion of the island forms a rough square, and the remainder extends as a peninsula from 2 to 3 miles wide to Punta Baja. Between the base of the peninsula and Perico Point, the southeastern point of the main part of the island, is the well-protected Salinas Bay. There are one dredging station in Salinas Bay in sand bottom and two in mud bottom in the channel between the southern peninsula and the mainland.

A low, sandy bluff extends northward 2 miles from Point Tierra Firma, and lying off this bluff $1\frac{1}{2}$ miles is an irregular island, Coronados Island, $1\frac{3}{4}$ miles by $1\frac{1}{2}$ miles. Nearly all the coast of this island is steep and rocky, but a low, sandy, and stony spit extends to the southwestward. South of Coronados Island, there are dredging stations in coralline, sand, and broken shell.

From the north end of the Tierra Firma Point, the coast, mostly bold and rocky, extends slightly west of northward for 11 miles and then turns abruptly eastward to form Mangles Point, thus forming a shallow anchorage, Mangles Anchorage, where shore collecting and dredging in rather shallow water have been done.

From Mangles Point to Pulpito Point, 15 miles, there is a similar trend in the coast line except that the northern half of it recedes somewhat to form San Basilio Bay. Pulpito Point is conspicuous because of the fact that, although the headland is 500 feet high, the connection with the mainland is very much lower, so that at a distance it appears to be an island. The point protects an anchorage in much the same way as Mangles Point does. There are 2 dredging stations off the Point, one in 14 fathoms and the other in 55 fathoms.

North of Pulpito Point, $1\frac{1}{4}$ miles, is Santa Antonita Point, after which the coast recedes to the westward and then turns northward again to form San Nicolas Bay, terminating to the northward in Santa Teresa Point. The bay is 11 miles across the entrance. Opposite the center of the bay, 5 miles offshore, is Ildefonso Island, a barren rock, $1\frac{1}{4}$ by $\frac{1}{2}$ mile in extent. Collecting has been done on the rocky shore of the island, and dredging in 50 and in 190 fathoms between the island and the mainland.

From Santa Teresa Point, the coast extends northwesterly to Point Concepción, 20 miles, with only one sizable point between, Colorado Point, $4\frac{1}{2}$ miles from Santa Teresa Point.

Point Concepción is an ill-defined point at the extremity of a peninsula that lies between Concepción Bay and the open Gulf. Considerable dredging has been done off the end of the peninsula in bottom in which both live and dead shells (*Strombus*) were conspicuous.

Concepción Bay extends southward for 22 miles with an entrance channel 2 miles wide, but widening farther in to as much as 5 miles. The eastern shore and the head of the bay are regular in outline and consist mainly of sand and pebble beaches. The western shore is much more irregular, with one conspicuous indentation, Coyote Bay, and with many islands, islets, and shoals. There are numerous bluff points with sand

beaches between, but most of the coast near the entrance is bold and rocky. San Pedro Point, which forms the northern limit of Coyote Bay, is bold and rocky, but its connection with the mainland is low and sandy.

Collecting in Concepción Bay has been restricted to the Coyote Bay area, where shore collecting, dipping by electric light, and dredging received some attention.

From Galleto Point, the northwest extremity of Concepción Bay, it is 4 miles to Colorado Point, where the coast line makes a long sweep to form Santa Inez Bay, $8\frac{3}{4}$ miles across to Santa Inez Point, off which are the three Santa Inez Islands. The coast here is lower, and the headland bluffs are not so high. Most of the shore in Santa Inez Bay is sandy beach.

From Chivato Point, $1\frac{3}{4}$ miles from Santa Inez Point, to Santa Teresa Point, over 100 miles away, there are few distinctive geographic features. The coast, in general, is low and sandy, and even the points may be low, although some of them may be rocky. The depth of the water, as elsewhere, increases rapidly offshore. The only harbor of importance is at Santa Rosalia, 23 miles from Chivato Point, where two breakwaters serve as a protection. Santa Rosalia is an important mining town, with smelters.

Lying off the southern part of this coast, $2\frac{1}{2}$ miles from shore, is San Marcos Island, $5\frac{1}{2}$ miles long and $1\frac{1}{4}$ to $2\frac{1}{2}$ miles wide. The eastern and northeastern shores are bold and rocky, but the others are low, generally made up of sand beaches. A sandy shoal extends for some distance south from the south end of the island. There are dredging stations to the east, southeast, and south of the island.

Tortuga Island, 2 miles by 1 mile, lies 15 miles northeast of the northern end of San Marcos. It is rugged and barren, but some land plants were collected from it. A series of dredging stations extend southward from the southern shore, into 83 fathoms.

Santa Teresa Point is a rocky bluff with a high hill back of it, the whole forming a headland connected with the mainland by a low neck of land, with sand beaches on each side. This headland forms part of the boundary of two bays, Santa Teresa Bay to the south and San Francisquito Bay to the north. The northwest point of the headland is San Gabriel Point, forming the eastern point of San Francisquito Bay.

There are several dredging stations in and off San Francisquito Bay and off San Gabriel Point, in depths to 165 fathoms, and in a great variety of bottom.

There are 2 miles of steep, rocky bluffs from the western entrance of San Francisquito Bay to San Francisquito Point, where San Rafael Bay, a large open bay, opens up. Its shores are mostly low and sandy, but there are some rocky bluffs. It is 25 miles across the entrance. Three miles farther on is Las Animas Point at the entrance to Las Animas Bay, an indentation deeper than wide, $6\frac{1}{2}$ miles across. Opposite San Rafael Bay are the San Lorenzo Islands, three of them in a series from southeast to northwest, the southernmost one, the largest, nearly 10 miles long. Almost in line with these, but a little to the eastward, are Isla Raza, quite small, Isla Partida, somewhat larger, and, finally, the large island, Angel de la Guardia.

Isla Raza, 11 miles off the mainland, $\frac{3}{4}$ mile by $\frac{1}{2}$ mile, is whitened with guano. Around it and also around Isla Partida are several outlying rocks, some of them of considerable size. Isla Partida, $1\frac{1}{4}$ miles by $\frac{1}{2}$ mile, is $4\frac{1}{2}$ miles from Isla Raza, and 6 miles from the southern tip of Angel de la Guardia Island. Both islands are rocky and barren. Between them and around them there are, at times, strong currents and tide rips.

Angel de la Guardia is a high, rocky, barren island, 42 miles long, with a greatest width of 10 miles, separated from the mainland by Balenas Channel, with minimum width of 8 miles. The east side is deeply indented, but the west side is more regular, bold, and rocky, with no suitable anchorages. Four miles from the tip on the east side, the coast extends outward to form a point that is connected by a reef, covered in part, at high water, with Pond Island, 1 mile by $\frac{1}{4}$ mile. Between Pond Island and Rock Point, 13 miles to the northwestward, is an open bay, and there is another between Rock Point and Bluff Point, $14\frac{1}{4}$ miles farther on. Bluff Point is the tip of a bold, rocky headland, the north-eastern extremity of the island.

Nearly all the north end of the island is taken up with Puerto Refugio, which consists of two well-separated harbors. The eastern harbor is shut off to the northward, to some extent, by Granite Island, and the western harbor entirely so by the larger island, Mejia; an island over half a mile long, unnamed on the charts, separates the two harbors. The port and its shores provide a great variety of conditions—sandy beaches, rocky points, reefs, shoals, and deep water—and many picturesque views to attract the photographer.

The locations explored through collecting have been (1) the southern area on the east side of Angel de la Guardia Island, from Pond Island to the southern tip, and on to include the areas around Isla Partida and

Isla Raza (here there are 15 stations); and (2) the Puerto Refugio region, where there are over 30 stations. In both areas the fauna is rich, and much good material has been obtained by all methods of collecting.

Returning to the mainland, Las Animas Bay is separated from Angeles Bay, the next to the northwest, by a peninsula 5 miles across that terminates in a series of rocky bluffs and sharp, rocky points. Angeles Bay, 4 miles across, is well landlocked, as an extensive series of small islands, the largest of which is South Island, shuts it off from Balenas Channel. There are safe passages between the islands, however, and Angeles Bay provides a really safe harbor, although the water is not deep. Most of the shore consists of sandy beaches, but there are some rock and shingle. A long sandspit extends southwestward from the northern limit of the bay. Some shore collecting has been done here, but much more has been done by dredging, mostly in sand, in and off the bay.

From the northern extremity of Angeles Bay to Point Final, at the entrance of Gonzaga Bay, 46 miles, there is little variety in the coast line. It consists of regular, high, rocky bluffs, with the exception of the low, sandy portion at Remedios Bay and Remedios Point, 12 miles from Angeles Bay.

Bluff Point is opposite the north end of Angel de la Guardia Island. Gonzaga (San Luis Gonzales) Bay is a semicircular bay, with low, sandy, or gravelly shore, between Point Final and Willard Point, 8 miles. Just south of Willard Point there is a secondary indentation, Willard Bay. Separated from the head of the bay by a narrow strip of sand is a shallow lagoon. Shore collecting in sand, shingle, and rock and dredging in sand and mud have provided several stations in and near Willard Bay and Gonzaga Bay.

Along the coast from Willard Point to Point San Felipe, 78 miles, there are no special features. The coast is low and sandy, and even the two most important points, Fermin and Diggs, are not discernible at any great distance. Off the southern portion there are some small islands, the largest of which is San Luis Island, 13 miles from Point Final. It is volcanic, but a low sandspit extends for some distance from the southwestern end of the island. There is one station near this sandspit, where pectens were found in abundance in 10 fathoms, sand. Point San Felipe gives some protection to the shallow San Felipe Bay to the south of it. The shore is low and sandy, but there are some rocky bluffs. There are two dredging stations in the bay, one in sand and the other in mud.

The conspicuous Consag Rock (Ship Rock), whitened with guano, lies $18\frac{1}{2}$ miles east-northeastward of Point San Felipe. Around it are several outlying rocks. Near by the water is shallow everywhere, and is very muddy. Strong currents and tide rips are noticeable. Some shore collecting has been done here, and there are several dredging stations in the vicinity. In two of the hauls basketstars were abundant.

The *Velero III* has not gone farther toward the head of the Gulf than Consag Rock, but, according to the *Coast Pilot*,

The coast from Point San Felipe to Sargent Point, at the mouth of the Colorado River, about 38 miles to the northward, is low and backed by plains that rise gradually towards the mountains in the interior. Mud flats and shoals that dry at low water extend offshore $1\frac{1}{2}$ to 6 miles. Parts of this coast are subject to overflow at times during heavy freshets and at highest spring tides.

PLATE 37

- Fig. 80 The landing place at Los Frailes is a sandy beach behind the granite promontory which marks the northern limit of the bay. The ranch house is located a few hundred yards to the interior, and some of the higher mountains of the cape region are shown in the left background.
- Fig. 81 Promontory of massive granite which marks the anchorage at Los Frailes. Granitic rocks were encountered at the tip of the Lower California peninsula and again at Granite Island, off the north end of Angel de la Guardia Island, near the head of the Gulf.

PLATES 38, 39

- Fig. 82 A panorama showing the complete west side of Espiritu Santo Island, Gulf of California, and including within its scope Ballenas and San Gabriel bays. The picture was taken from a small, nameless island in La Paz Bay. Chart 52, p. 397.
- Fig. 83 Spectacular headland located on the west side of Espiritu Santo Island, Gulf of California, showing clearly the result of bedding.
- Fig. 84 The Isthmus of Espiritu Santo Island, Gulf of California, showing the bay at low tide and giant cacti in the foreground.
- Fig. 85 At extreme low tide heads of coral and encrustations of worm tubes are bared in the shallow bays along the east coast of Espiritu Santo Island, facing the larger La Paz Bay, Gulf of California. An Expedition member is here shown digging the hatchet clam or *Pinna*. Chart 51, p. 397.
- Fig. 86 Sandstone headland on the west side of Espiritu Santo Island, south of San Gabriel Bay, Gulf of California. The bluff shows stratification and brilliant coloration. Its flat top is suggestive of volcanic capping.

PLATE 40

- Fig. 87 San Gabriel Bay, Espiritu Santo Island, a shallow inlet of La Paz Bay backed by a mangrove-encircled lagoon, the outlet of which is shown at the right of the picture. A narrow arch of beach separates the lagoon from the bay.
- Fig. 88 San Gabriel Bay, Espiritu Santo Island, Gulf of California. The white sand is backed by mangrove trees behind which rise mountains of sedimentary origin capped by harder volcanic material which has retarded their disintegration.

PLATE 41

- Fig. 89 Lighthouse at Prieta Point, Lower California, marking the entrance to the harbor at La Paz. The mountains in the background were once continuous with those of Espiritu Santo Island to the north. Chart 51, p. 397.
- Fig. 90 Beach at La Paz, Lower California. The city itself is situated on a shallow lagoon shown at the right. Vessels of large draught must anchor outside, off Pichilique Harbor. Chart 51, p. 397.

PLATE 42

- Fig. 91 View of Agua Verde Bay, Lower California, from the north shore. One of the secluded bays in which collecting was done may be seen in the background, another in the background to the left of the *Velero III*.
- Fig. 92 View of Agua Verde Bay from the north shore showing village site along the margins of the wash in the right background. The slope in the foreground adequately represents the chief types of vegetation on the dry hillsides in the vicinity. Chart 54, p. 398.

PLATE 43

- Fig. 93 Sea stack which stands in the south cove at Agua Verde Bay, Gulf of California. An osprey's nest was built upon its topmost pinnacle.
- Fig. 94 The dock at Salinas Bay, Carmen Island, Gulf of California. An extensive salt works is served by a short railway upon which the sacked salt is transported to lighters which transfer it to cargo vessels. *Velero III* may be seen in the distance. Charts 54, 55, p. 398.

PLATE 44

- Fig. 95 A bold headland of metamorphic rock marks the entrance to Concepción Bay, Gulf of California, an indentation of the peninsula nearly twenty miles long and from one to several miles wide, with anchorage depths to seventeen fathoms. Chart 56, p. 399.
- Fig. 96 The Sierra de la Giganta rises almost vertically from the shores of Escondido Bay. The mile-high mountains consist of bedded sediments, the erosion being similar to that of the Grand Canyon.

PLATE 45

- Fig. 97 Canyon in the Sierra de la Giganta, Escondido Bay, Lower California, showing *Washingtonia* palms (*Washingtonia filifera*) and other characteristic vegetation of the region.
- Fig. 98 Escondido Bay, Gulf of California, seen from a mile or more inland. The island of Danzante is seen in the right background, Carmen Island in the left background. The estuary between the landlocked body of water at the left and the open bay to the right passes behind the hill in the middle distance.

PLATES 46, 47

- Fig. 99 (A panorama.) Escondido Bay, Lower California, showing Puerto Escondido in the extreme left, the islands of Carmen and Danzante in the middle distance and the Sierra de la Giganta to the right. The *Velero III* may be seen at anchor below the north end of Danzante Island.
- Fig. 100 The road from Mulege to La Paz follows the western shore of Concepción Bay and in places has been cut out of the rock. The formation shown is a breccia probably representing an ancient alluvial fan.
- Fig. 101 The region north of Puerto Escondido shows clearly the effects of submergence. The hills to the right are slowly being "drowned," their valleys becoming shallow bays. A typical hacienda is shown at the clearing at the left.

PLATE 48

- Fig. 102 San Marcos Island, Gulf of California, seen from the deck of *Velero III* during dredging operations. Chart 57, p. 399.
- Fig. 103 Tortuga Island, Gulf of California, viewed from the south side. The rim of the crater is of lava, the lighter-colored material ash. No recent volcanic activity has been observed. Chart 57, p. 399.
- Fig. 104 Interior of the crater at Tortuga Island, Gulf of California, showing alternate beds of lava and volcanic ash. The crater rim is unbroken and is half to three quarters of a mile in diameter.



Fig. 80 Los Frailes, Mexico, landing place



Fig. 81 Los Frailes, Mexico

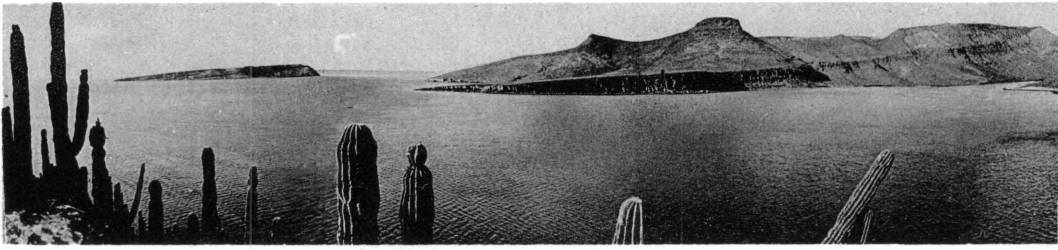


Fig. 82 Panorama, Espiritu Santo Island from the west

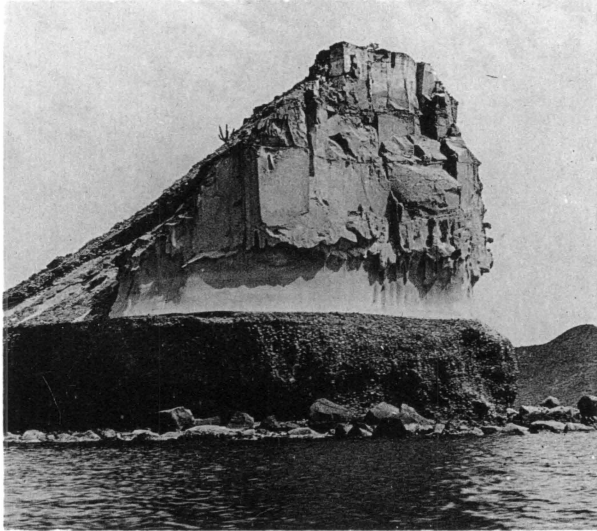


Fig. 83 Espiritu Santo Island, headland south of San Gabriel Bay



Fig. 84 Espiritu Santo Island looking toward La Paz Bay

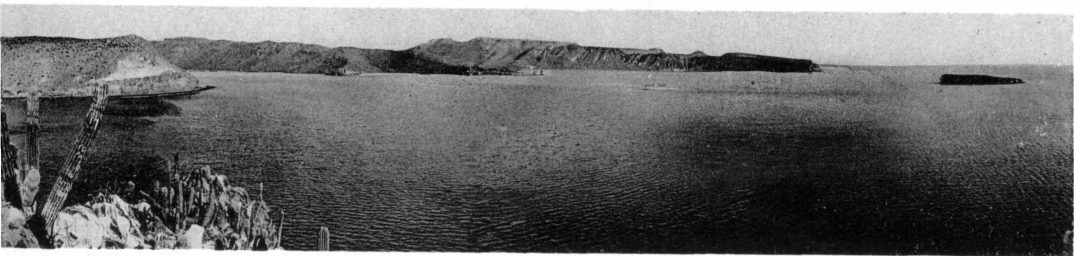
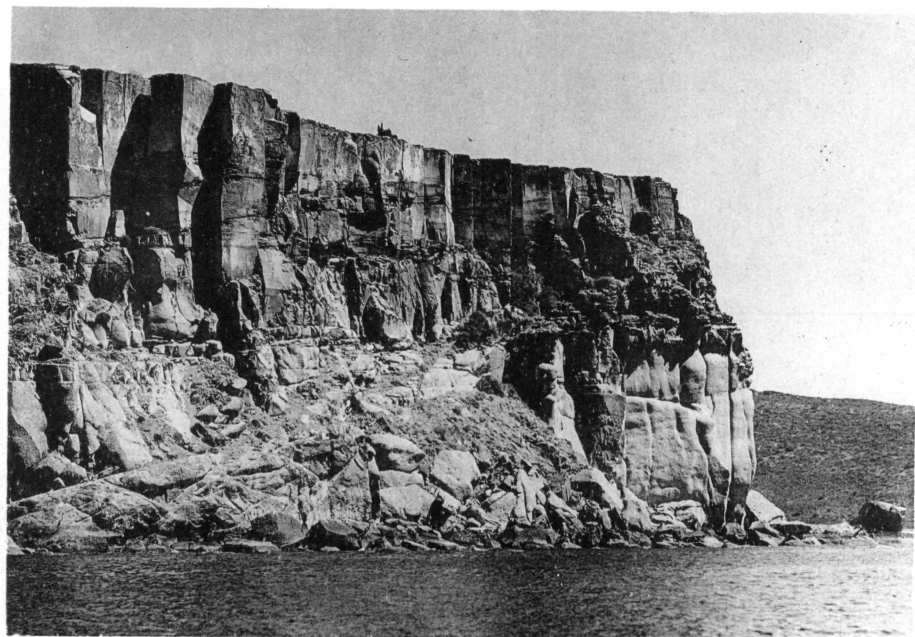


Fig. 85 (*above*) Espiritu Santo Island, coral heads, low tide
Fig. 86 Espiritu Santo Island, headland, San Gabriel Bay



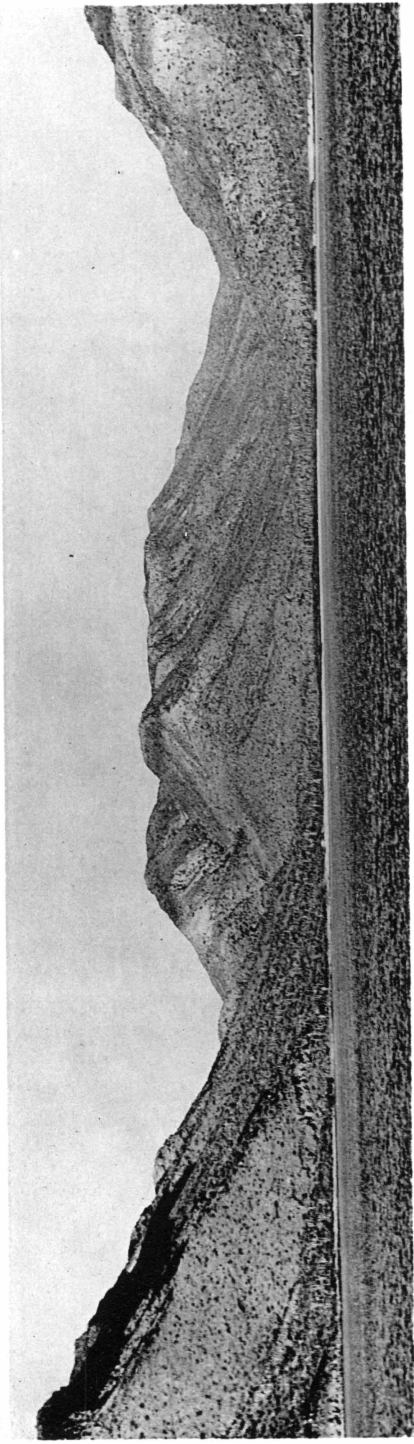
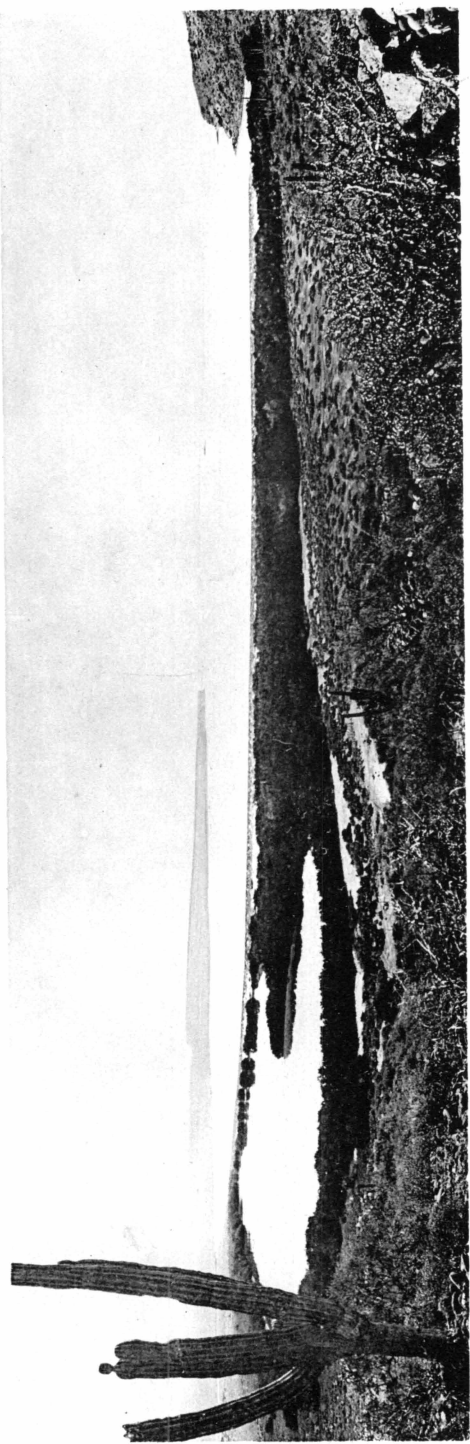


Fig. 87 (*above*) Espiritu Santo Island, panorama of San Gabriel Bay
Fig. 88 San Gabriel Bay, Espiritu Santo Island

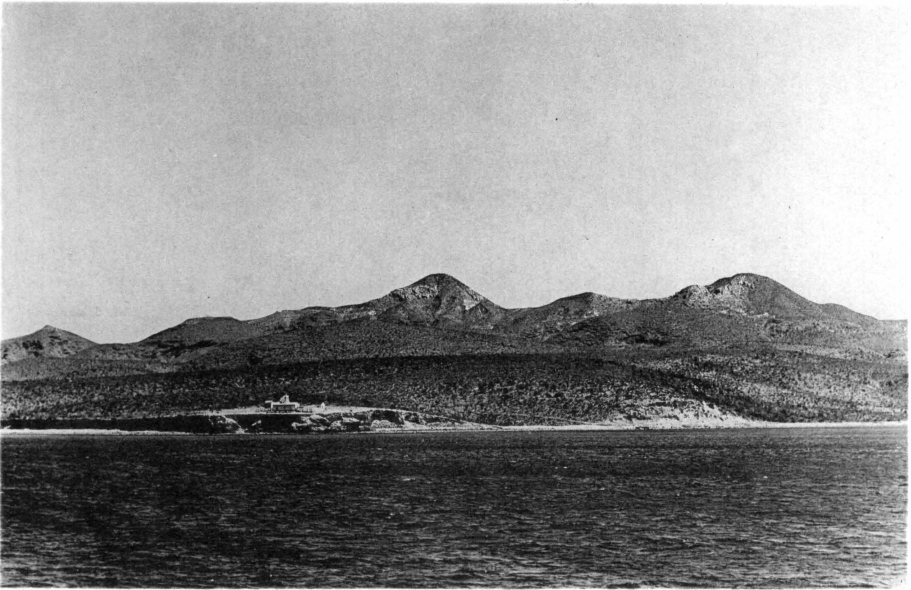


Fig. 89 Prieta Point, Lower California, Mexico

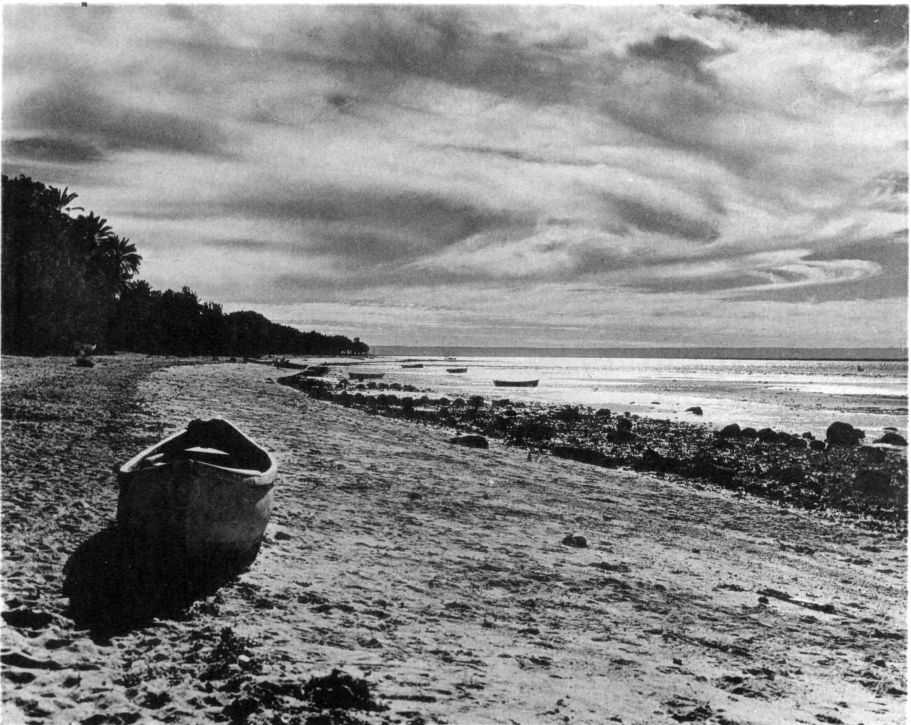


Fig. 90 La Paz, Lower California, Mexico



Fig. 91 Agua Verde Bay, north shore, Gulf of California



Fig. 92 Agua Verde Bay, north shore, Gulf of California

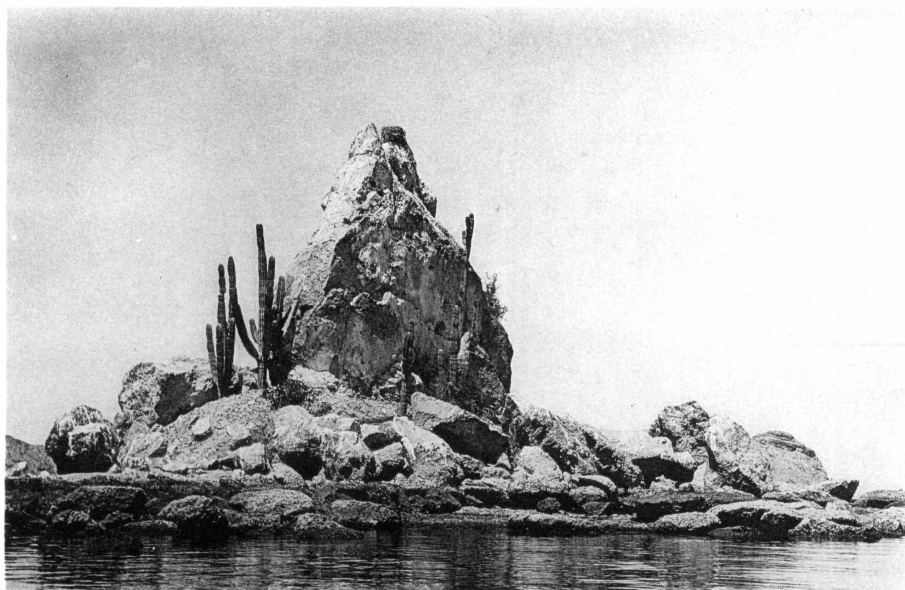


Fig. 93 Sea stack, Agua Verde Bay, Gulf of California



Fig. 94 Carmen Island, Salinas Bay, Gulf of California

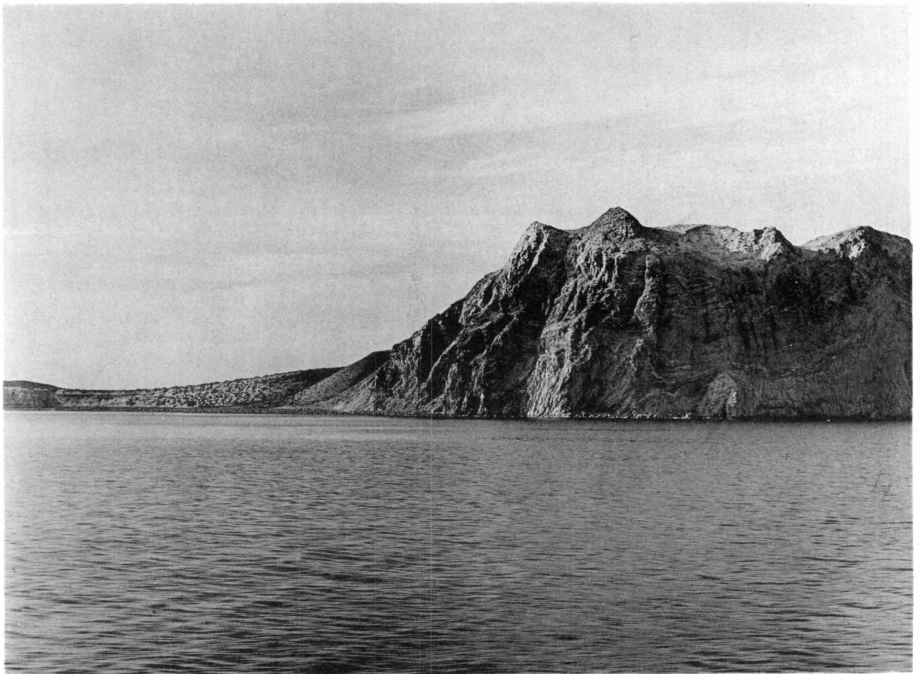


Fig. 95 Entrance to Concepción Bay, Gulf of California



Fig. 96 Sierra de la Giganta, Escondido Bay, Gulf of California

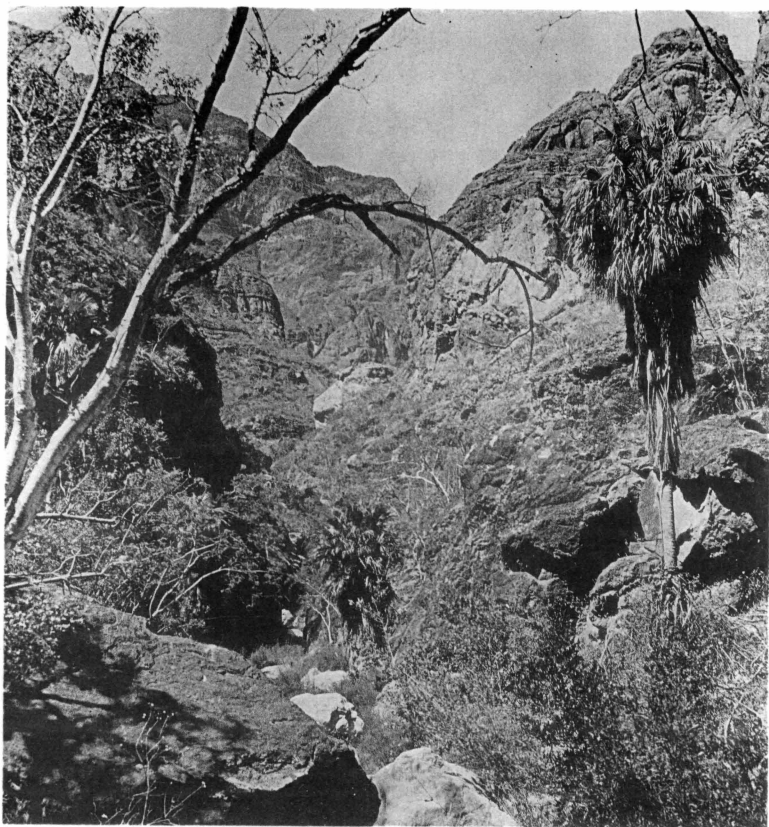


Fig. 97 Looking toward Sierra de la Giganta, Escondido Bay, Gulf of California



Fig. 98 Escondido Bay, Gulf of California

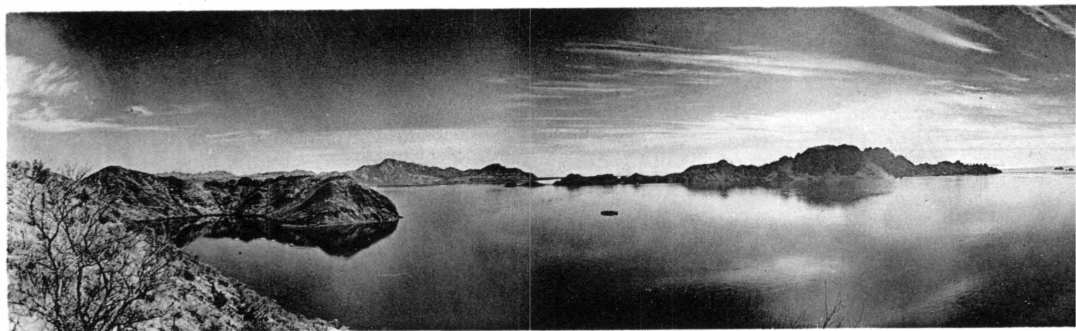


Fig. 99 Panorama, Escondido Bay, Gulf of California

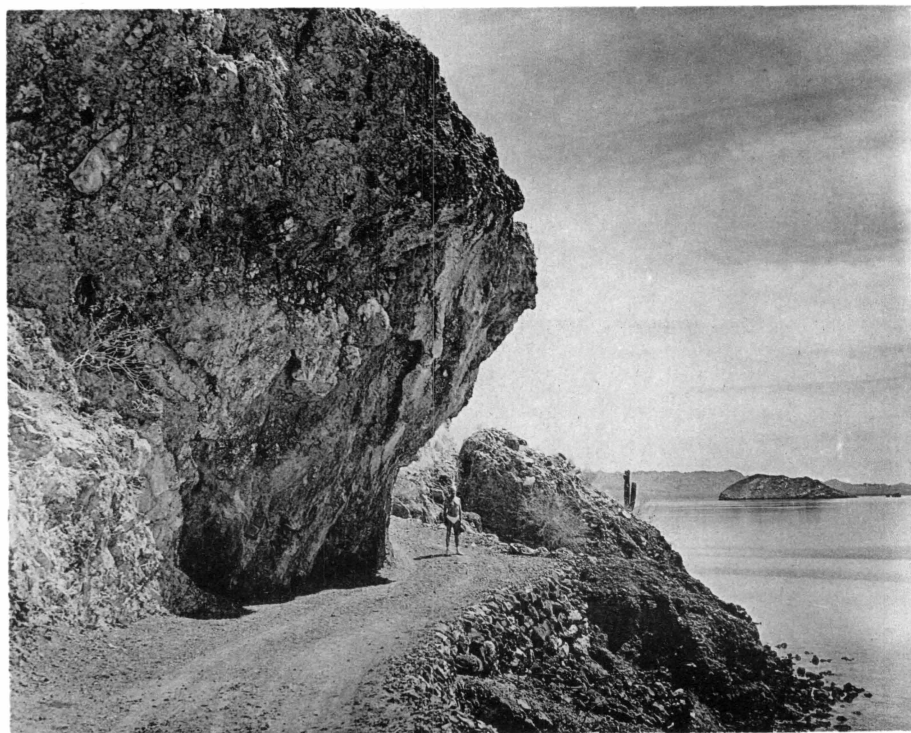


Fig. 100 Road from Mulege to La Paz, western shore, Concepción Bay, Gulf of California

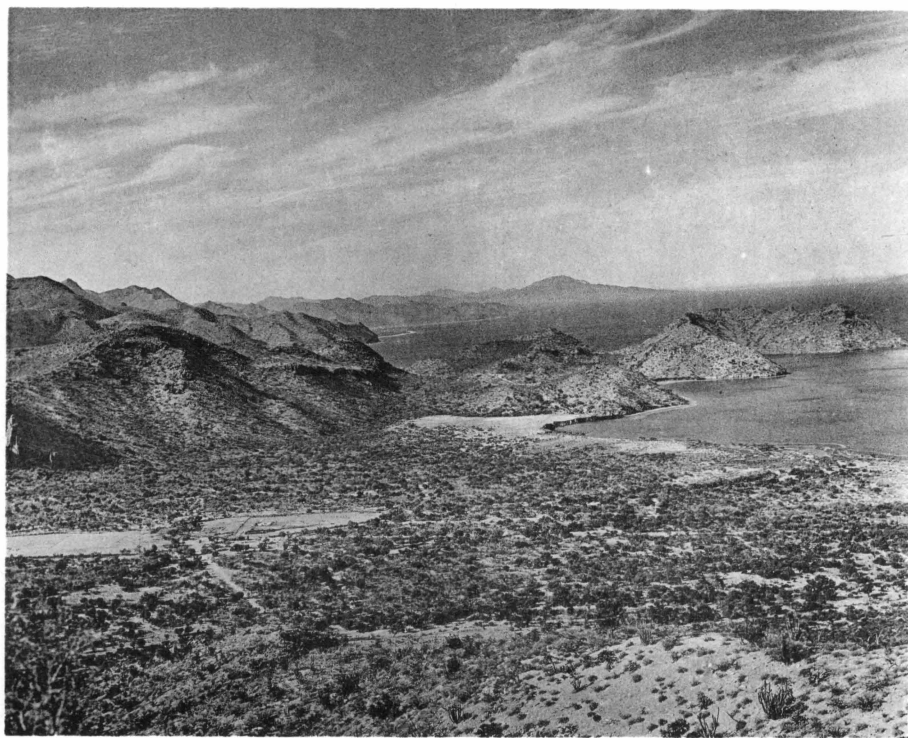
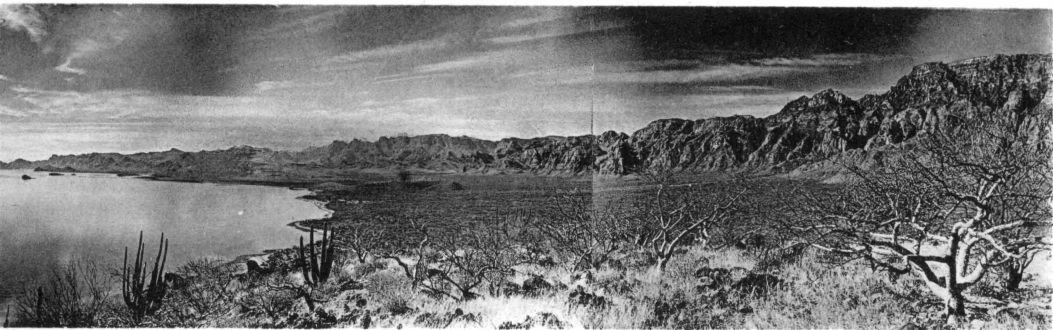


Fig. 101 Puerto Escondido, looking north, Gulf of California

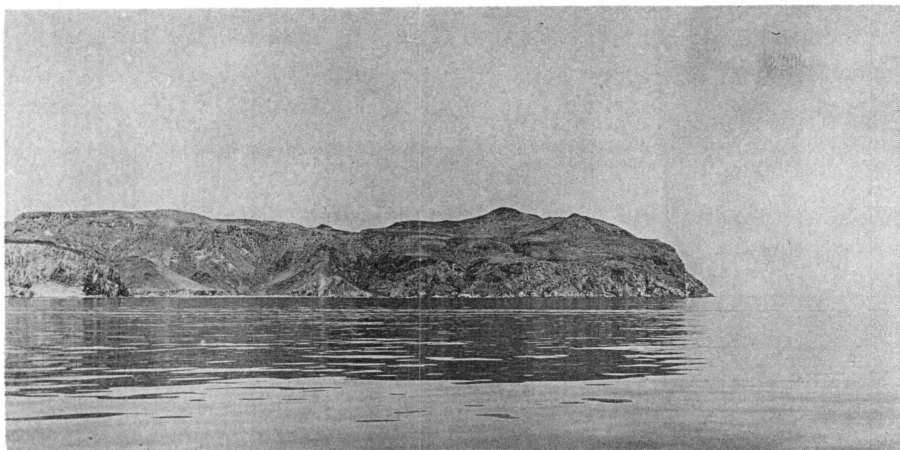


Fig. 102 San Marcos Island, Gulf of California



Fig. 103 Tortuga Island, Gulf of California

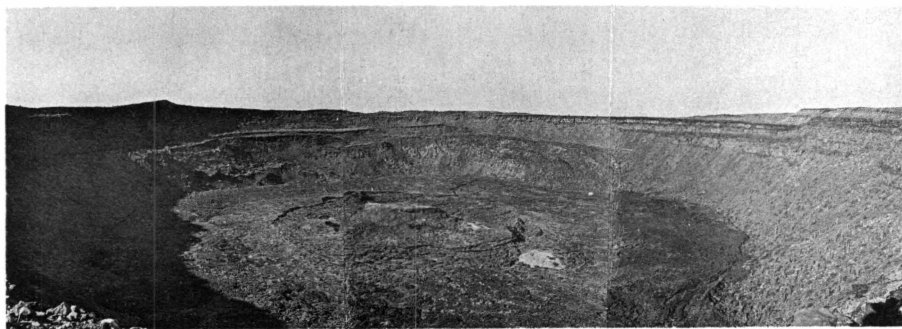


Fig. 104 Crater, Tortuga Island, Gulf of California

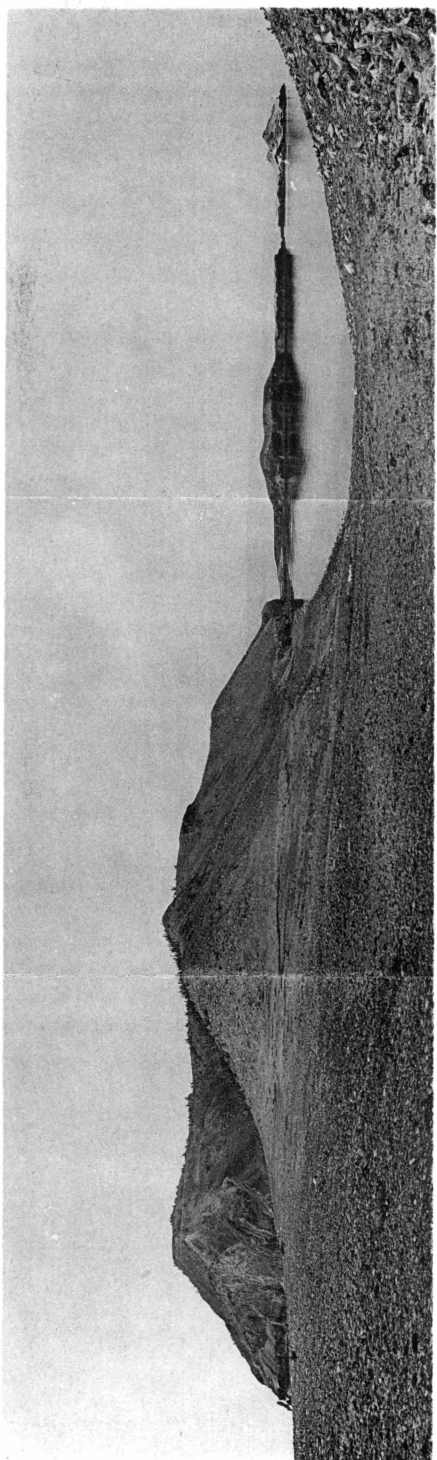
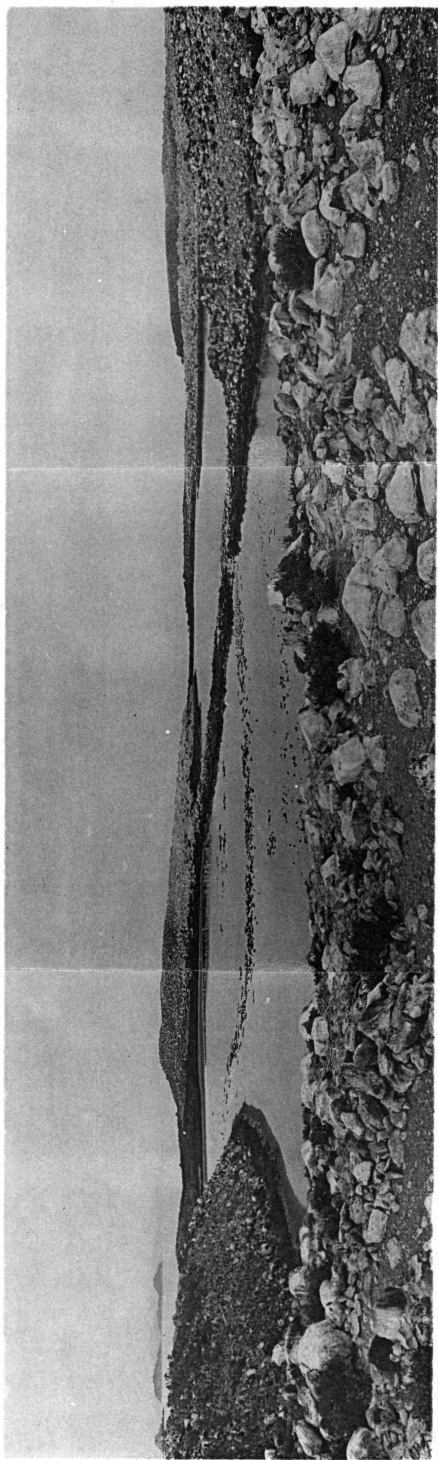


Fig. 105 (*above*) Isla Raza, Gulf of California, looking northward
Fig. 106 Isla Partida, Gulf of California

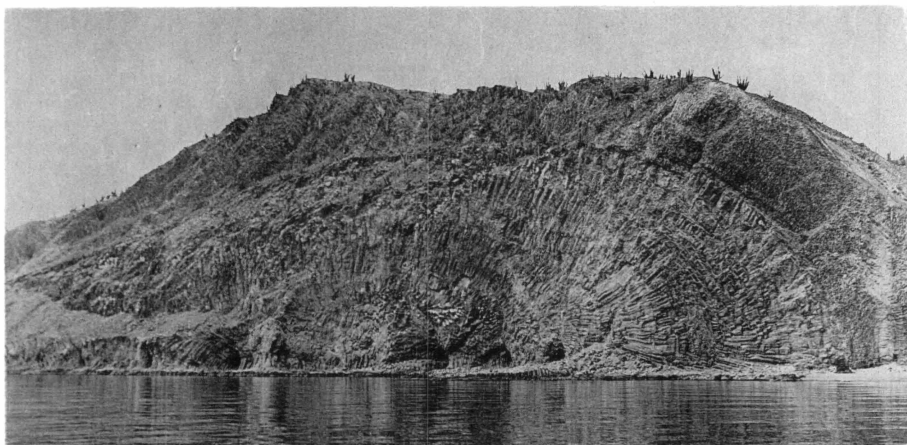


Fig. 107 Basaltic columns, Isla Partida, Gulf of California



Fig. 108 San Francisquito Bay, Gulf of California



Fig. 109 San Francisquito Bay, Gulf of California