ALLAN HANCOCK FOUNDATION PUBLICATIONS

OF

THE UNIVERSITY OF SOUTHERN CALIFORNIA

FIRST SERIES

ALLAN HANCOCK PACIFIC EXPEDITIONS

VOLUME 1, PARTS I, II, III
1943

THE UNIVERSITY OF SOUTHERN CALIFORNIA PRESS
LOS ANGELES 7, CALIFORNIA
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P. 72. For Port Luis Obispo read Port San Luis Obispo

P. 93. For Fig. 53 read Fig. 54

P. 93. For Fig. 54 read Fig. 55

P. 93. For Fig. 55 read Fig. 53

P. 149. Topolobampo Harbor not Topalobampo Harbor

P. 159. Cabo Blanco not Cabo Blanca

ALLAN HANCOCK PACIFIC EXPEDITIONS

VOLUME 1 NUMBER 1

GENERAL ACCOUNT OF THE SCIENTIFIC WORK OF THE *VELERO III* IN THE EASTERN PACIFIC, 1931-41

PART I

Historical Introduction, *Velero III*, Personnel

harles

BY

C. McLEAN FRASER

PROFESSOR OF ZOOLOGY EMERITUS

UNIVERSITY OF BRITISH COLUMBIA

MEMBER OF ALLAN HANCOCK PACIFIC EXPEDITIONS OF 1934 AND 1941

THE UNIVERSITY OF SOUTHERN CALIFORNIA PRESS

LOS ANGELES, CALIFORNIA

1943

A PRELIMINARY ANNOUNCEMENT CONCERNING

REPORTS ON SCIENTIFIC RESULTS

OF

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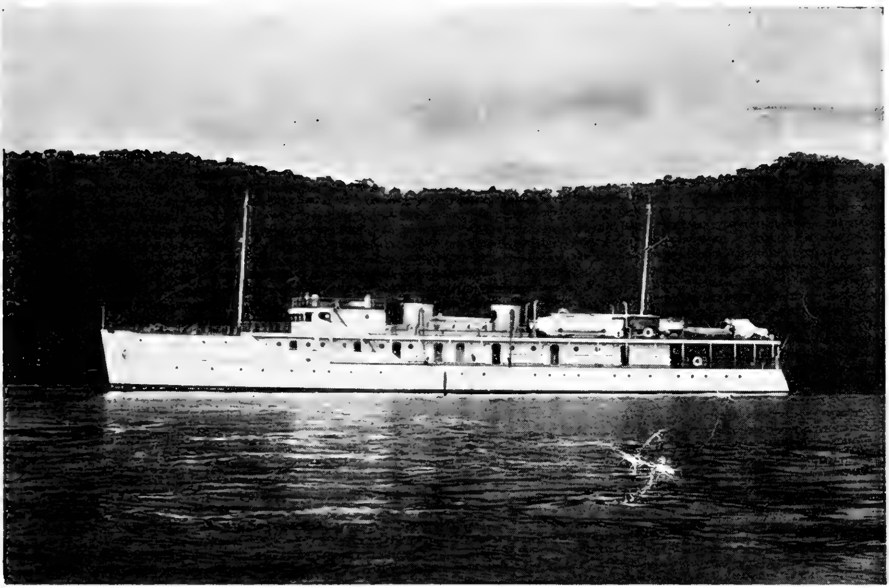
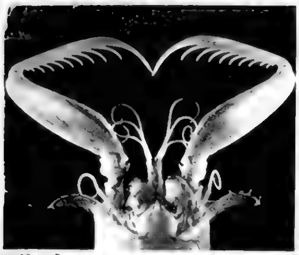
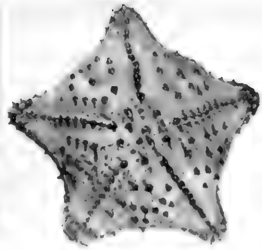


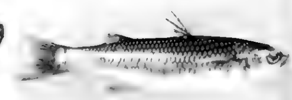
MOTOR CRUISER VELERO III

Under the direction of Captain Allan Hancock, master owner, VELERO III has been making expeditions to tropical American waters since 1931. By systematically covering the coast line of Mexico, Central America, northern South America, and the Galapagos Islands with a series of stations now numbering 775, the Allan Hancock Pacific Expeditions are summarizing effectively the work of the last hundred years of marine exploration in this area.

VELERO III is an all-steel Diesel cruiser, 195 feet in length, with a cruising radius of 12,000 miles, capable of operating independent of supplies for a three months' period. Laboratory facilities, photographic darkroom, 4 auxiliary craft, dredging and sounding equipment, modern navigation aids, live tanks, commodius quarters for 14 scientists in addition to a crew of 18 make VELERO III ideally equipped for undertaking marine biological exploration.







Ecuador: Fishing boat ... Cape San L...

Peru: Breeding colony ... nives (*Phalacrocorax ... ongainvillei*) at Santa Rosa Island

The photographs on this ... were taken by H. Chas. Swett, who has ... companied each Hancock cruise and whose photographs will be used to illustrate the Allan Hancock Pacific Expeditions series

... portion of the Tropical Pacific Ocean has received the perso... of the greatest naturalists of all time, beginning with Humboldt, who in 1799-1804 ... the Andes after ascending the Amazon and gave to posterity the first comprehensive account ... the oceanographic and meteorologic features of the coast of Ecuador and Peru. In 1835 Da... ...aling around Cape Horn in the *Beagle*, added to this record his pertinent observations up... origin of life in the Galapagos Islands. The father of biology in America, Louis Aga... the region in 1872 aboard the *Hassler*, and was followed a few years later by his equally ill... trious son, Alexander, naturalist in charge of the U. S. Fisheries Steamer *Albat...* ... 1891. Definitely restricted to the field of physical oceanography and to the study of the pe... and abyssmal faunas, the *Albatross* left the littoral or tidal zone an open field for subsequent ...tigation. The cruise sponsored by Stanford University in 1898-99, an... of representatives of the California Academy of Sciences in 1905-6 in the Galapagos, ... tain of the Mexican islands also largely avoided this intermediate area ... ...llection of terrestrial forms of which magnificent series were obtained.

Until the collections of the Allan Hancock Pacific E... ...nt aggregation of marine invertebrate material from this region made its appearance on the ...st of North America. It is scarcely an exaggeration to say that nowhere in the world wil... ...more complete representation of the lower marine forms of the equatorial western Am... ... The University of Southern California, where the collections will be available...

... With ... of terrestrial forms ...

... publications, The University of Southern California is confident that the A... Hancock Pacific Expeditions have made an ... contribution ...

ALLAN HANCOCK PACIFIC EXPEDITIONS

VOLUME I ...

... John S. Garth ...

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1. A NEW BRITTLE STAR FROM THE GALAPAGOS ISLANDS. Fred Ziesenhenne. 4 ... (With one plate.) Paper, 25c. 1935.
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1. HYDROIDS OF THE 1934 HANCOCK EXPEDITION. C. MacLean Fraser. Approximately 100 pp. (With 15 plates.) (Describes 173 species of which 73 are new.) $2.50.

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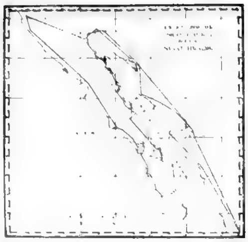
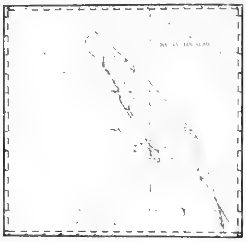




Six major cruises, [illegible] have been made by VELERO III [illegible] the Galapagos Archipelago, with visits to [illegible] the Gulf of California, Mexico. Over 400 [illegible] have been spent [illegible] the Galapagos Archipelago [illegible] depths not exceeding 200 [illegible] the major activities. A total of 16 scientists representing 11 institutions have accompanied the cruises for the purpose of observing and collecting specimens and data. Some of the men who have participated in one or more of the expeditions, [illegible] fields of investigation, and the institutions represented are as follows:

C. McLean Fraser, [illegible] University of British Columbia [illegible]

John S. Garth, zoologist, The University of Southern California, [illegible]

Leo G. Hertlein, [illegible] Academy of Sciences, *fossil and recent mollusks*

Harold W. Manter, parasitologist, University of Nebraska, [illegible]

C. B. Perkins, [illegible] San Diego Zoological Society, *reptiles*

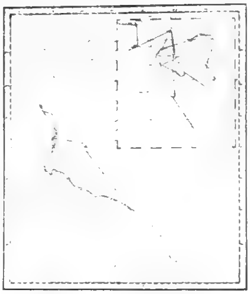
Waldo L. Schmitt, curator of marine invertebrates, [illegible]

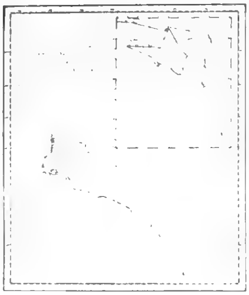
Alvin Seale, superintendent, Steinhart Aquarium, *fishes*

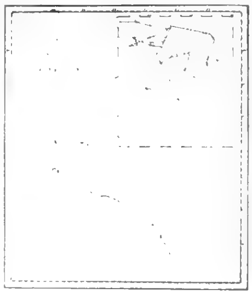
Wm. Randolph Taylor, [illegible] University of Michigan, *marine algae*

H. M. Wegeforth, president, San Diego Zoological Society, [illegible]

Fred C. Ziesenhenne, [illegible] The University of Southern California, [illegible]







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FRONTISPIECE

Dr. Allan Hancock, Chairman of the Board of Trustees and Director of the Hancock Foundation for Scientific Research of The University of Southern California. (Photograph by Lansdowne, Los Angeles.)

Dr. Allan Hancock

GENERAL ACCOUNT OF THE SCIENTIFIC WORK OF THE *VELERO III* IN THE EASTERN PACIFIC, 1931-41

PART I

Historical Introduction, *Velero III*, Personnel

By C. McLEAN FRASER

The University of Southern California Publications
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GENERAL ACCOUNT OF THE SCIENTIFIC WORK OF THE *VELERO III* IN THE EASTERN PACIFIC

HISTORICAL INTRODUCTION

Brief Account of Previous Expeditions

Previous to the year 1931 the possibilities afforded by the Eastern Tropical Pacific for successful marine biological investigation were little appreciated, or, if they were appreciated, opportunities to explore these possibilities were few and far between.

For centuries the waters of this region have been navigated, but for long little notice was taken of anything of biological interest concerning the organisms inhabiting this vast marine expanse, across which were carried the riches of the Orient, often much detoured en route.

The buccaneers became well acquainted with the configuration of the coast, since it was necessary to be familiar with the geographic features in order that safe anchorage might be available in which to lurk when looking for rich galleons to plunder, or to sort and divide the booty when the plundering was successfully carried out. When buccaneering passed into history, it was natural that the geographical information obtained, and to some extent disseminated, should be turned to good account as a basis for exploration of some of the commercially valuable natural resources. Even during buccaneering days some observations looking to such exploitation must have been made on such conspicuous species as the fishes, whales, turtles, and tortoises; but, when the days of piracy were over, these resources became quite important in and around the Galapagos Islands, later in the Gulf of California, and to a lesser extent along other parts of the coast.

Commonly, the ships engaged in the industrial ventures arising out of this exploitation remained at sea for a long period of time. Many, if not most, of these fishermen doubtless had little interest in anything apart from their vocation, but some of them had sufficient curiosity to observe some of the plants and animals that came within their field of vision, particularly when they were ashore. In time some of these observations were reported, biologists became interested enough to provide for the collection of the more easily obtained specimens, and, on occasion, arrangements were made for naturalists to accompany some of the expeditions. In general, the collecting was confined to the shore or to the land not far from shore; but, in time, this collecting provided much information on such land forms as birds, reptiles, amphibians, and insects, and such shore forms as mollusks and crustacea. The plant collecting was confined, almost entirely, to the terrestrial species. When the results of this collecting were reported, a wider interest in the Eastern Tropical Pacific was aroused, and scientific expeditions were organized to carry investigation further; for by this time the sea had become definitely established as a suitable medium for biological investigation, although, as yet, ecological relationships and detailed distribution came into consideration very little. For that reason, the itinerary usually provided for but a short stay in any locality, and there was little variety added to the type of information obtained, even though the amount of information was materially increased.

With some significant exceptions then, the expeditions previous to 1931 supplied little information on organisms living farther out in the sea than the low-water mark, unless these organisms were exploited for commercial purposes. In the case of the exceptions, e.g., some of the *Albatross* expeditions, when dredging was done, it was done in deeper water, or when bottom samples were taken, they were also from the deep. The most fertile area in the ocean, lying between the low-tide mark and the 100-fathom line, was almost untouched. It was into this rich faunal and floral area that the *Velero III* entered in 1931, and it is in this area that most of the biological investigation has been continued for these ten years, with special emphasis on the Gulf of California and the Galapagos.

Since this exploration was started, some other expeditions have spent some time in the Eastern Pacific doing very serviceable work, but the region is so extensive that there is little likelihood of overlapping, or danger of overcrowding for generations to come. As yet, there has not been time to appraise in detail the results of these recent expeditions; hence they will not be further mentioned in this report. They will all report for themselves in the near future.

The observations made during many of these earlier expeditions have little bearing on the work of the Allan Hancock Pacific Expeditions, and no attempt has been made to make a complete list of them. A reference to a few of the more important, selected without prejudice, of these expeditions that have paid particular attention to the Galapagos, and/or the Gulf of California, will serve to give some idea of the nature of the explorations. The remainder of the Eastern Tropical Pacific has been almost entirely neglected by these, comparatively speaking, casual explorations.

The history of the Galapagos Islands dates back to 1535, when Fray Tomás de Berlanga, Bishop of Panama, visited the islands, but apparently they remained little known until the buccaneers made use of them during the period between 1675 and 1775. When the last of the buccaneers disappeared, their place was taken by the whalers, who continued operations here until 1858. The whalers, and probably also the buccaneers, made use of the large tortoises (galápagos) for food, thus beginning the slaughter that lasted for long, and has led to the near extermination of these animals.

In the meantime, in 1831, Ecuador secured possession of the islands and proceeded to establish a penal colony that remained in existence for some time, during which horses, donkeys, cattle, and goats were introduced, and their descendants, since gone wild, have done much to disturb the biological equilibrium of the islands. In 1832 a small settlement was established on Charles Island, on the shore at Post Office Bay, where an oil rendering plant gave an added impetus to the slaughter of galápagos, and probably accounted for the total extermination of these tortoises on Charles Island. This settlement has long since disappeared, but the office, the oil-drum lighthouse (now no longer lighted), and the "Barrel Post Office" still remain as evidences of habitation. In 1869, Manuel Cobos started a settlement on Chatham Island, which has developed into "Progreso," the only sizable settlement in the Galapagos.

In 1826 the yacht *Discoverer* set out from Valparaiso with the pioneer conchologist Hugh Cuming aboard. Included in the itinerary, according to the Report of the British Association for the Advancement of Science for 1856, were five of the Galagapos Islands, which were reached in 1827. For so early a cruise, that of the *Discoverer* is remarkable in that dredging in shallow water was accomplished. Cuming's collections of Crustacea and Mollusca were extensive and contained a high proportion of species new to science.

In 1830, Alcide d'Orbigny spent three months, February through April, between Valparaiso and Arica, stopping at Cobija en route. After extensive travel overland, he returned to the coast in July, 1833, and proceeded to Callao via Islay, remaining in the environs of Lima until September of that year. The historical account of his voyages, in three volumes, appeared between 1835 and 1844. The reports on specimens collected by him form the basis of all subsequent work in marine zoology of coastal Peru.

From the scientific angle, the year 1835 stands out by itself, for in that year the *Beagle* sailed northward along the coast of Chile and Peru and west to the Galapagos, with Charles Darwin on board. One month, September 15 to October 15, was spent among the islands, a short time indeed; but Darwin could make more accurate observations on natural phenomena in a month than most other people could in a much longer period. Without flourish or exaggeration he gave in the *Voyages of the Beagle* a simple, unvarnished description of what he saw and heard that for clarity and exactitude remains unequaled. His observations were confined mainly to the terrestrial species, the birds taking much of his attention, but the marine iguana could not go unobserved. Marine shells from the beaches and fish from the sea comprise his contribution to marine zoology.

In 1859 the Austrian frigate *Novara,* commanded by Commodore B. von Wüllerstorf-Urbair, left Valparaiso for Europe via Cape Horn on the last leg of a three-year voyage around the world. One of the scientists, Dr. Karl Scherzer, made a leisurely journey home via the Isthmus of Panama, stopping at Coquimbo, Caldera, Cobija, Iquique, Arica, Port d'Islay, Chala, Pisco, Chinchas, Callao, Lima, Lambajeque, Payta, and Taboga Island. The narrative describing this cruise appeared in 1861.

In 1872 the *Hassler,* Louis Agassiz in charge, visited the Galapagos briefly on a cruise from Boston to San Francisco via Cape Horn. An account of the expedition appears in *Nature* (London) for 1872, and a popular article by Elizabeth Agassiz in the *Atlantic Monthly* of the same year.

It might be well to mention the voyage of the *Peterel,* Commander W. E. Cookson, in June, 1875, during which Abingdon, Charles, and Albemarle (Tagus and Iguana coves) were visited and birds, reptiles, myriapods, arachnids, insects, fishes, mollusks, crustaceans, and echinoderms were collected. Reports on the collections by various authors appeared in the *Proceedings* of the Zoological Society of London, in 1877.

In the following year, 1876, W. J. Fisher of San Francisco chartered a small vessel to make an investigation of the shores of Lower California, as well as of the islands near these shores, and the Gulf of California as far south as the Tres Marias Islands, in the interest of natural history. The mollusks were written up by Robert E. C. Stearns in *Proceedings* of the United States National Museum, Volume XVIII, 1894, but there is no information available as to what was done with the other collections.

In 1883 the Italian frigate *Vettor Pisani* spent six months, from January until June, along the west coast of South America between Valparaiso and the Gulf of Guayaquil, collecting marine invertebrates at Coquimbo, Calderas, Mexillones, Callao, and Puná. In 1884 the months of January and February were spent in the Gulf of Panama and in March the Galapagos Islands were visited. An extensive list of the Crustacea collected appears in the *Bulletin* of the Nature Society of Naples for 1889.

In the early months of 1888—January to May—the United States Fish Commission Steamer *Albatross*, Lieutenant Z. L. Tanner commanding, with Charles H. Townsend on board, made a cruise northward from the Strait of Magellan to Panama, to the Galapagos Islands, to Acapulco, Mexico, into the Gulf of California, and along the coast of Lower California, collecting at several stations in the Galapagos, and north of Acapulco, en route. Much of the collecting was done with the beam trawl in shallow water (as little as 5½ fathoms). There was much shore and land collecting. The dredge was used for only eight hauls. An account of the cruise by Lieutenant Commander Tanner appeared in the Commissioner's *Report*, United States Fish Commission for 1887, published in 1891.

Again in 1889—February to April—the *Albatross*, Lieutenant Z. L. Tanner commanding, with C. H. Townsend and C. H. Gilbert on board, did some exploring in this general region. The route lay south from San Diego along the west coast of Lower California, out to the Revilla Gigedo Islands, back to Cape San Lucas, into the Gulf of California, and back to San Diego via the west coast of Lower California. Here again the beam trawl was in general use in water less than 100 fathoms. Very little dredging was done. Fish made up an important part of most of the catches. The *Report* of Commander Tanner appeared in the same publication in 1892.

In 1891 marine investigation on the *Albatross* was in charge of Alexander Agassiz, with C. H. Townsend assisting, and Lieutenant Z. L. Tanner in command of the ship. Operations were carried on off the west coast of Central America, the Galapagos Islands, the west coast of Mexico, and the Gulf of California. This time much more dredging was done, but nearly all in deep water; out of the 100 stations, only 8 were in less than 100 fathoms, and none was in less than 50 fathoms. Pelagic collecting occupied much time, and numerous observations were made on topography, currents, temperatures, specific gravity, and bottom configuration. Agassiz gave a general sketch of the Expedition in the *Bulletin* of the Museum of Comparative Zoology, Harvard, XXIII, 1891, and Commander Tanner's Report appeared in 1893.

In 1898, under the patronage of Timothy Hopkins, Menlo Park, California, the Schooner *Julia E. Whalen,* Captain William C. Noyes, set out on the Hopkins-Stanford Galapagos Expedition, with Edmund Heller and R. E. Snodgrass in charge of operations that lasted for ten months—October 30, 1898, to August 30, 1899. On the way, Guadalupe, Clarion, and Cocos islands were visited, and in the Galapagos, Culpepper, Wenman, Albemarle, Narborough, James, North Seymour, South Seymour, Duncan, Charles, Hood, Chatham, Barrington, Bindloe, Abingdon, and Tower islands. Except for some echinoderms, crustaceans, and mollusks collected along shore, and insects collected in the interior, all attention was applied to vertebrates. The itinerary was recorded by Edmund Heller in his paper on Reptiles (XII) of the expedition, published in the *Proceedings* of the Washington Academy of Science, V, in 1903.

In 1904 Alexander Agassiz took charge of another expedition to the Eastern Tropical and Subtropical Pacific—October, 1904, to March, 1905. All dredge and trawl hauls were made in deep water. There were only six of them at a depth of less than 1,000 fathoms—2 off Panama, 1 off Aguja Point, Peru, and 3 in the vicinity of Hood Island, Galapagos. Of these, one was at 100 fathoms, one at 300 fathoms, and one at 500 fathoms. As in the previous cruise, much pelagic collecting was done.

In 1905-1906, a party headed by Joseph R. Slevin, representing the California Academy of Sciences, made a cruise to the Galapagos Islands in the schooner *Academy,* R. H. Beck, Master and Chief of party. The cruise lasted from June 28, 1905, to November 29, 1906. Over a year was spent in the Galapagos, a greater length of time than that of any other expedition. All the larger islands and almost all of the smaller islands were visited. On the way to the Galapagos calls were made at several locations on the outer coast of Lower California, and at Socorro Island, Clipperton Island, and Cocos Island. Evidently the main object of the expedition was to study the galápagos in detail in order to determine all the specific differences existing in these tortoises from the different islands. No other expedition has made even an approach to the number of shells brought out. Apart from these, valuable and extensive collections, especially birds and reptiles, were obtained. The vertebrate marine fauna received some attention, but any that the invertebrate marine fauna or the marine flora received was merely incidental. The account of the expedition by Joseph R. Slevin was not published by the Academy until 1931. (*Occasional Papers* of the California Academy of Sciences, XVII, pp. 1-162.)

In 1906-1908 Dr. Robert E. Coker of the U.S. Fish Commission made an extensive survey of the fisheries resources of Peru at the invitation of the Peruvian government. Collecting along the coast between latitudes 3° 30′ and 17° S. was accomplished, both ashore, on sand beaches and salt marshes with the seine, and in shallow water, to a depth of several fathoms, with dredge and trawl. The collections were large, the Crustacea alone numbering 80 species. Reports on the findings of the survey, published in the *Proceedings* of the U.S. National Museum for 1909-10, not only served as a basis for the regulation of fisheries by the Peruvian government, but aided in the rehabilitation of the guano industry as well.

In 1911—February 23 to April 29—the *Albatross,* with C. H. Townsend on board, cruised along the coast of Lower California, calling at Guadalupe Island, and in the Gulf of California. There was much shore collecting but comparatively little dredging. There were four hauls in less than 400 fathoms, but only one of them in less than 250 fathoms.

In the year 1921, the California Academy of Sciences sent an expedition to the Gulf of California. The collecting was entirely terrestrial, but a good map of the Gulf of California was published, with information as to anchorages, etc. The Report was published in 1923 in the *Proceedings* of the California Academy of Sciences (4), XII, No. 6.

In 1923, William Beebe, with several associates, on the yacht *Noma,* spent 100 hours in the Galapagos. Observations were mainly on the terrestrial fauna—birds, reptiles, and insects—and on fish, although marine invertebrates were collected and reported upon. The popular account was published as *Galapagos, World's End,* in 1924. The scientific accounts appeared in *Zoologica,* V, 1924.

In 1925, William Beebe again visited the Galapagos, this time on the steam yacht *Arcturus* and with a larger scientific staff. The *Arcturus* was in the Pacific from March 28, 1925, to June 21, 1925. The route was from Panama to the Galapagos Islands, to Balboa, to Cocos Island, to Galapagos Islands, to Balboa. Much attention was given to fishes, birds, and insects, and there was extensive plankton collecting. The diving helmet was used in shallow water. Some dredging was done, but this mostly in deeper water. The popular account, including the "Log of the Arcturus," was published as *"Arcturus Adventure"* in 1926. The scientific accounts comprise volumes VII and VIII of *Zoologica,* 1926 and 1927.

In 1925, the steam yacht *St. George,* with Dr. Cyril Crossland, naturalist, aboard, visited the islands of Taboga, Gorgona, and the Galapagos en route to the Marquesas. An important contribution to the geology of the region, by Chubb, appears in the *Geological Magazine* (London) for 1925, and the Crossland report, stressing the marine ecology and coral formations in the regions visited, appeared in the *Transactions* of the Royal Society of Edinburgh for 1927.

In 1929, Gifford Pinchot, in his trip to the South Seas, traveled through the Pacific area from Panama to the islands of the South Seas, with other scientists on board. In his book *To the South Seas,* he gives some general information about the species (mostly terrestrial) to be found in the Galapagos, but little new or of scientific interest concerning the marine fauna.

In 1930, the scientific portion of the Astor Expedition to the Galapagos Islands, in the *Nourmahal,* was organized by C. H. Townsend, who had for his assistants Kermit Roosevelt and Henry K. Svenson. The work done was largely confined to Indefatigable Island. Birds, reptiles, insects, and plants were collected, but there was no special marine investigation. The general Report was published in the *Bulletin* of the New York Zoological Society, in July, August, 1930.

Preparation for the Allan Hancock Pacific Expeditions

This brief account is sufficient to indicate that, from a scientific viewpoint, the shallow-water area along the coast of the mainland and of the numerous islands of the Eastern Tropical and Subtropical Pacific had received but little attention, when, in 1931, Captain Allan Hancock, in the newly commissioned *Velero III,* turned his attention to the exploration of this area.

The venture was the result of no hasty decision, for, directly or indirectly, there were years of preparation for this very expedition, but even the Captain, as on December 3 he set his course southward from Los Angeles Harbor, could scarcely have dreamed of the immensity of the project that would develop from this unpretentious embarkation. Looking back over ten years of operation, it is an easy matter to see the manner in which the whole plan has unfolded and developed. It is only after having obtained a full appreciation of the comprehensiveness of the work that has been done, and the results that have been obtained, that due credit can be given to the man who had the foresight to plan the first expedition and, as experience indicated, to continue the expansion of the project, always ready and willing to "take occasion by the hand" in making the most of his own experience and the experience of the scientists who were brought from hither and yon to assist in carrying out the exploration, year after year, to the greatest advantage.

This is not the place to refer to Captain Hancock's multifarious activities. That has been done and can be done by others who have more carefully followed these activities; but it is appropriate here to say something concerning the development of his enthusiasm and aptitude for navigation and marine investigation. To make the story complete, it is necessary to say it. (Illustrations, plates 1-3.)

The story begins back in boyhood days on the Rancho La Brea, when Allan Hancock built for himself and his brother Bertram a punt, still intact beside the old ranch house, with which to explore the tar pits. This is of importance because it is the first association of navigation and biology in Allan's experience. The La Brea pits were soon to become famous as the great depository of fossil remains, in which, of course, Allan took much interest. This interest in the La Brea fossils has developed to include animal life in general, especially as it appears in its own habitat. The other side of the association, navigation, has developed and has been nurtured until it has become one of the Captain's major activities.

PLATE 1

Fig. 1 Capt. Hancock and his younger brother exploring one of the larger pools of Rancho La Brea in his first boat, a punt built about 1890.

Fig. 2 The *Cricket*, a 54-foot boat.

PLATE 2

Fig. 3 *Velero I*, a 99-foot cruiser, after her lengthening by the insertion of a 21-foot section amidships.

Fig. 4 The *Velero II*, a 125-foot cruiser.

PLATE 3

Fig. 5 *S. S. Oaxaca*, operated by Capt. Hancock between San Pedro and Mazatlan, Mexico, and used by him on Galapagos and Alaskan cruises prior to the advent of the *Velero III.*

Fig. 6 Capt. Hancock on the bridge of the motor cruiser *Velero III.*

PLATE 4

Fig. 7 *Velero III* of Allan Hancock Pacific Expeditions, 1931-42, approximately 195-foot cruiser.

Fig. 1 Punt in La Brea Tar Pits

Fig. 2 *Cricket*

Fig. 3 *Velero I*

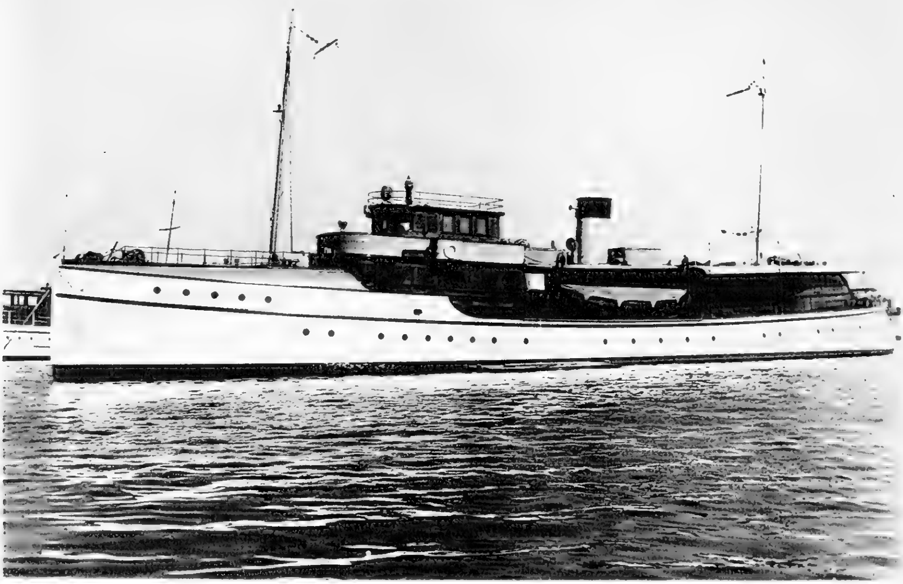


Fig. 4 *Velero II*

Figs. 5 *Oaxaca;* 6 Captain Allan Hancock

PLATE 4

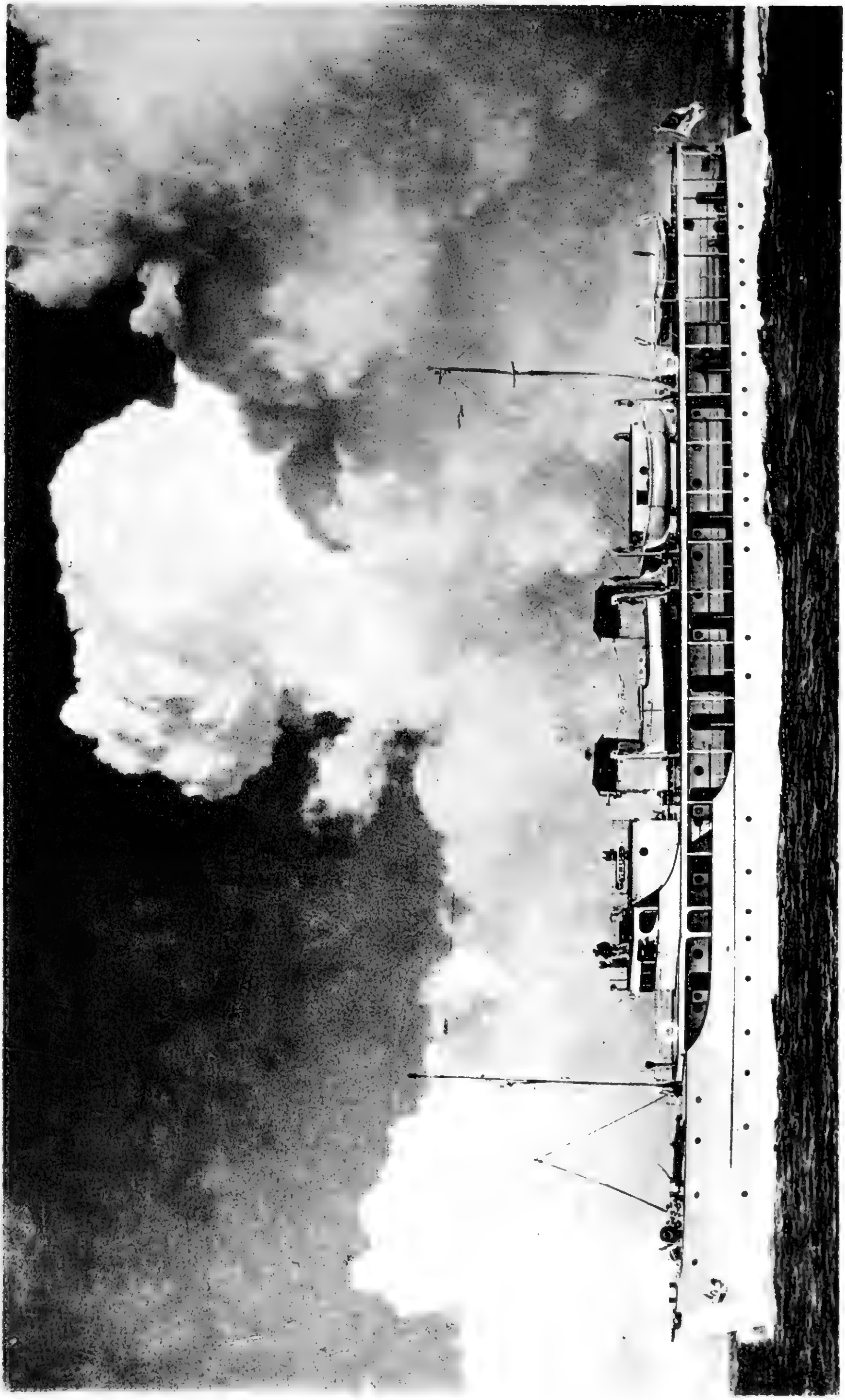


Fig. 7 *Velero III*

Fig. 8 Winch and cable in dredge boat

Fig. 9 Dredge boat, deck of *Velero III*

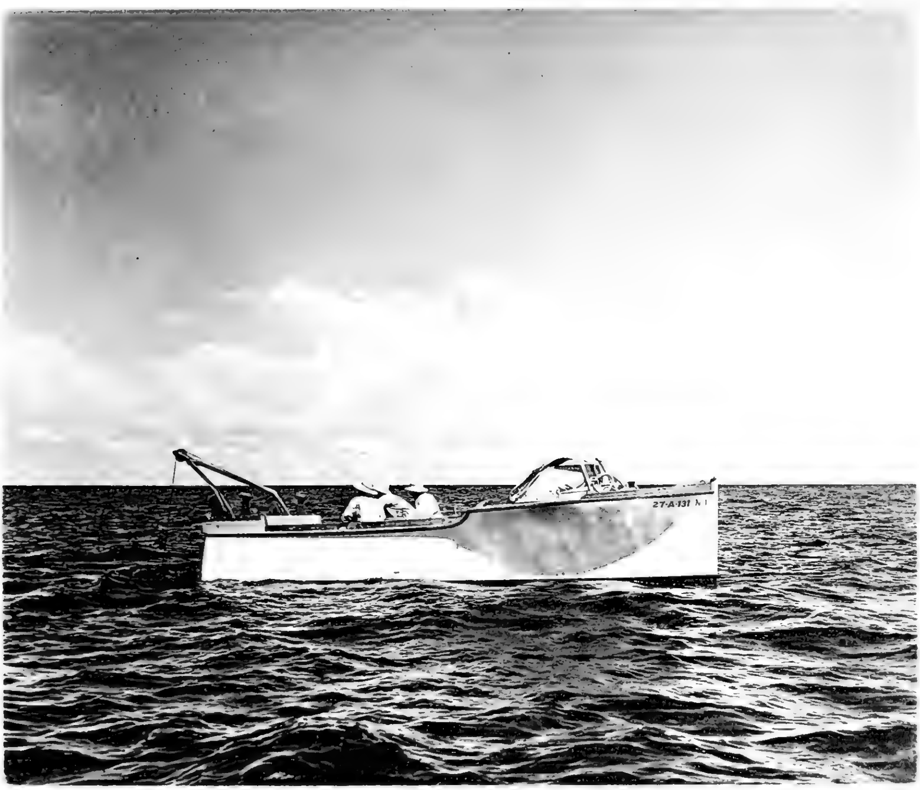


Fig. 10 Dredge boat in operation

Fig. 11 Old dredge boat

Fig. 12 Motor launch

Fig. 13 Boat deck of *Velero III*

Fig. 14 Deck load of animals

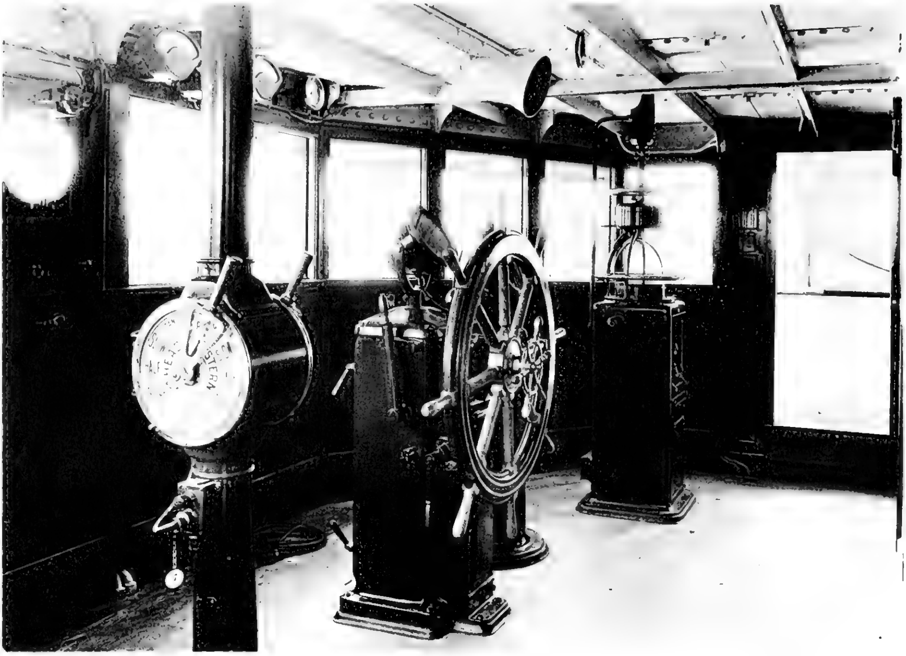


Fig. 15 Pilot house showing steering gear

Fig. 16 Chart table and indicator board

PLATE 5

Fig. 8 Winch of the small dredge boat being operated by Alec Campbell, engineer aboard the *Velero III.*

Fig. 9 Dredge boat, deck of *Velero III.*

Fig. 10 Dredge boat converted from auxiliary launch, in operation in Gulf of California waters.

PLATE 6

Fig. 11 Whale boat converted into an efficient dredger for use at moderate depths. Dr. Schmitt and Dr. Fraser occupy positions adjacent to the dredging table.

Fig. 12 Ship's launch used for deep-sea fishing and in transporting scientists from the *Velero III* to shore.

PLATE 7

Fig. 13 View of the boat deck of *Velero III* from the wharf at San Diego showing animal cages, scientists' working space, and auxiliary craft under cover.

Fig. 14 The exploration cruiser *Velero III* at dockside with a deckload of live animals for the San Diego Zoological Society.

PLATE 8

Fig. 15 The bridge of *Velero III* showing from left to right automatic windshield wiper, ship's telegraph, and gyroscopic steering device, and radio beacon detector.

Fig. 16 The chart room of *Velero III* showing panel indicator board, telephone, electric ship's log, and other navigational aids on the commodious chart table.

As the plan for marine exploration has developed step by step, and as practically all of the Captain's other activities have developed, navigation plans and facilities developed step by step. Each successive vessel, owned or built, must show an increase in magnitude or in efficiency or in both, as experience in navigation goes on "from strength to strength." To test his mettle in sailing on the open ocean, Allan Hancock, in partnership with his friend, Hancock Banning, purchased the *Cricket,* a 54-foot boat, large enough to travel extensively in the waters between Los Angeles and Santa Catalina Island. Later Allan became sole possessor. The range of operation was somewhat limited, and inevitably the *Cricket* soon had to give place to a larger, speedier rival.

The Captain had a new vessel built to his own design, the *Velero I,* a 78-foot cruiser, with 300 horsepower to take it along at a speed of 11 knots. In 1915 the *Velero I* was put into commission, the fastest and trimmest cruiser on the coast. Although it sailed with a crew of two, the Captain and an engine-room assistant, it was eminently suitable for exploring any or all of the Channel Islands, or all of the waters between Point Conception and San Diego.

The satisfaction in sailing this craft was not complete for long. The engine room and galley were cramped for space, and in other respects there was much lack of room; hence, after two years of service, in 1917 the *Velero I* was put on the ways and cut in two, so that a 21-foot section could be introduced between the two parts. Now the vessel, with a length of 99 feet, had more generous engine-room and galley space, and a fair-sized recreation hall. The additional equipment included a complete wireless apparatus. While World War I was raging, the field of operation was not extended; but, after the war was over, the Channel area was no longer sufficient. Mexico called, and the Captain answered.

Although Lower California and the Gulf of California lie so near southern California, there was a woeful lack of information about any portion of this area, unless, possibly, the ports of occasional call. To acquire such information and to learn something of the conditions for navigation, Captain Hancock planned an expedition to that part of Mexico in which the shore line and suitable locations for anchorage could be investigated.

On January 30, 1921, the *Velero I* left the home port on a 3,000-mile cruise, southward along the west coast of Lower California and into the Gulf of California, as far as Tiburon Island. This cruise was important for its immediate intrinsic value, but even more so because the information obtained had so much to do with the success of the later expeditions into the same region for more definitely scientific exploration.

Satisfactory as this cruise was, it was only enough to whet the appetite for more. To satisfy this appetite even temporarily, a larger vessel was required, and so the *Velero II* was designed and constructed in 1922. This 125-foot, 195-ton cruiser, equipped with twin Winton-Diesel, six-cylinder engines, developed a speed of ten knots, with a cruising radius of 5,000 miles.

With the *Velero II* in commission, a much more extensive expedition was soon initiated, and this one had a somewhat stronger biological tinge than the previous expedition. Calls were made at Guadalupe Island, Cerros Island, Magdalena Bay, Cape San Lucas, Clarion Island, Socorro Island, Clipperton Island, several points in the Gulf of California, Mazatlan and other points on the mainland coast of Mexico, La Union, El Salvador, and Panama, and, on the return, Cape San Lucas and Mazatlan.

As a follow-up of this cruise, Captain Hancock purchased the Hacienda Barron, a short distance inland from Mazatlan, with the idea of introducing more modern methods of agriculture into this region. This is mentioned because it had much to do with the next distinct development in navigation.

There was little to be gained by an increase in agricultural production in western Mexico unless some means were provided to carry the produce, still in good condition, to northern markets. To overcome this difficulty the steamer *Oaxaca* was purchased from the British Admiralty. The *Oaxaca* was much larger and more powerful than *Velero II*. It was 255 feet in length, with a beam of 35 feet, and a normal draft of 18 feet 6 inches, gross tonnage 1,683, normal horsepower 1,800, extreme speed 16 knots, normal cruising speed 12.5 knots, cruising radius 4;500 miles. There were large cargo space and passenger accommodation. Air-cooled facilities for the preservation of fruit and vegetables were installed, and, for easier navigation, a gyro compass, and a "Metal Mike."

The ship was put into service as a produce transport, operating under the West Coast Transportation Company. As to its vocation nothing more need be said, as it was its avocation that is of scientific interest. Produce transport is a seasonal occupation. In off seasons, the *Oaxaca* could be, and actually was, used for extended expeditions.

For some time, Captain Hancock had been nurturing the desire to sponsor a scientific expedition to the Galapagos Islands. Now, with the

Oaxaca, he was well equipped to do so. At this time the California Academy of Sciences was particularly eager to obtain specimens of some of the characteristic species of animals of the Galapagos. The synchronism was perfect. On November 27, 1927, the *Oaxaca*, with a crew of 35 men and a passenger list of 12, left San Pedro, Galapagos bound, on a seven weeks' cruise. Joseph Slevin, who was with the *Academy* party in 1905, and Frank Tose represented the California Academy of Sciences. The route followed the mainland coast to Panama, and then, by way of Cocos Island, to the Galapagos. The principal faunal attraction consisted of birds and reptiles, but observations were made more or less incidentally on many of the other groups. For this first visit to the Galapagos, the islands put on a special display of fireworks. From the channel between Albemarle and Narborough the ship's company had a grandstand view of the violent volcanic eruption on Narborough Island.

In the following summer, after carrying a load of freight to New Westminster, B.C., the *Oaxaca* was outfitted for a cruise in Alaskan waters, and a pilot familiar with local waters was engaged. Northward, the trip ended at Skagway. On the return, owing to faulty beacon marking, the *Oaxaca* piled up on Burnt Island Reef in Wrangel Narrows. Later she was released and with some temporary repairs was taken south to Vancouver for a thorough examination. The damage was extensive and rather than contract for repairs that would not give assurance that the ship could be made seaworthy, she was sold without further ado.

The *Velero II* was still available for cruising, and she continued in use for that purpose, but she was scarcely large enough or well enough equipped for the longer scientific expeditions that the Captain now had in mind. An association with the late Dr. Harry Wegeforth, who was doing so much to increase interest in the Zoological Gardens in Balboa Park, San Diego, could not fail to arouse enthusiasm in the expansion of this institution. Hence there was another incentive to visit the southern seas and southern lands, to bring back animals alive for the San Diego Zoo.

No mention has been made of the extra time that Captain Hancock had put in with the Merchant Marine, to gain experience and to obtain the necessary papers to permit him to take command, as Master, of ships of any size on any ocean.

With his familiarity with navigation in the Eastern Pacific and with his experience in sponsoring expeditions, it is not surprising that he had some very definite ideas as to the essentials necessary to provide a ship that, with safety and convenience, would meet any emergency likely to arise in carrying out the expanding program of marine exploration that he had in mind.

Now was the time to put these ideas to the test in building a new cruiser, which became *Velero III,* with Naval Architect, G. Bruce Newby, commissioned to carry out the plans. In June, 1930, the keel was laid in the Craig Shipbuilding Yards at Long Beach. The work was carried out expeditiously, so that everything was ready for launching on April 2, 1931, and it was not long until the *Velero III* was ready for her trial trip to San Francisco, on which she embarked July 11, 1931. Her performance was well up to expectations, but before starting on her first long cruise in the interest of science shorter cruises were made to the Channel Islands, San Francisco, San Diego, Guadalupe Island, and Cerros Island. Every test was met so successfully that there was no necessity of any further delay in starting out on the First Allan Hancock Pacific Expedition. How well the *Velero III* behaved on these expeditions is told elsewhere in this volume.

The Velero III

Plates 4-16

The *Velero III* is a steel, Diesel-propelled cruiser, 195′ 1¼″ in overall length, with 30′ beam and 11′ 9″ draft. Her dead weight is 1,300 tons and she has a net cargo capacity of 293 tons. She is driven by twin, air-injection, full Diesel, six-cylinder, four-cycle Winton engines; each, developing 850 horsepower at 250 R.P.M., is directly connected to a propeller shaft. There are fuel oil capacity of 54,000 gallons and water capacity of 18,000 gallons, which gives a cruising radius of 9,500 miles at 14 knots. The trimness of her lines can be better appreciated from a photograph than from any description that might be given.

Within the compass of the hull, the ship may be said to consist of a flying bridge, an upper deck divided into fo'c's'le deck forward and boat deck aft, a main deck, a lower or A deck, and a hold or B deck. To give some idea of the structure and equipment of the ship, these deck levels will be described in turn.

Flying bridge. The bridge is provided with steering pedestal and steering wheel of the electric contact type, magnetic binnacle, gyro repeater, two telegraphs, rudder indicator, speaking tubes, public address system to after deck, searchlight mountable on either port or starboard base, and the customary running lights.

Fo'c's'le deck. The forward extension of the boat deck, at a little lower level, is the fo'c's'le deck, with fore mast reaching 39 feet above deck. This mast has an 18-foot yard arm and a cargo boom. The deck is provided with anchors (four of them, 1,764, 1,596, 1,428, and 448 pounds), anchor windlass with 20-horsepower motor, winch, and cable drum, with the necessary equipment for their operation, and on the starboard side, a set of three screens for sorting the dredge material.

Boat deck. Well forward on the boat deck is the pilothouse, with its eleven windows forming an arc to give wide range of vision. In one window is set a clear vision screen. The forward portion of the pilothouse is provided with Sperry gyro metal mike, electric and hand steering gear, gyroscopic and magnetic compasses, radio direction finder, rudder indicator, telegraph, signal bell, buzzer, speaking tube to the engine room, and field glasses. The after part is supplied with chart table, chart lockers, indicator board, with running light switches, water-tight door indicators, and electric ship's log, flag locker, fathometer, automatic course recorder, gyrocompass alarm, chronometer, desks, and cupboards. To the left of the chart table is located the compass of the "Southern Cross," the plane used by the late Sir Charles Kingsford-Smith in making the pioneer flight across the Pacific, sponsored by Captain Hancock. In the floor of the pilothouse is located a trapdoor, through which entrance may be gained from the galley below in the event heavy seas prevent use of the outside passages. Immediately aft of the pilot room are the Captain's quarters.

Aft the Captain's quarters, the fidley is above the engine room, and is largely taken up with the skylights, the two stacks, and four cowl ventilators. Aft the fidley is the electric hoist for lifting the motor boats. Farther aft is the radio house, provided with three complete transmitting units, long, intermediate, and short-wave, a standard receiving set, a loud speaker, table, drawers, instrument table, two bunks, cabinet, and wash basin. Immediately aft the radio house is a recess that has been used as a laboratory and at other times for stores.

A short distance aft again are another outdoor laboratory or sorting table, over which may be stretched a canvas for protection from the tropical sun, an electric drying cupboard, an 1,800-gallon gasoline tank for fueling the launches, and the mainmast, the same height as the foremast, the two of them serving as supports for wireless antennae. After these there is considerable deck area, a portion of which is taken up by the life raft (8′ 0″ by 4′ 6″). All of the available space here is commonly taken up on the return voyage by live animal cages.

To port is the electrically operated sounding cable of 280 fathoms, used for water and mud samples. Much of the deck space, both port and starboard, is taken up with the chocks and davits for the auxiliary craft, and with the boats themselves, when they are in place. There are two twin-screw, 26-foot motor boats, two single-screw, 20-foot metal life boats, and three 14-foot skiffs, each of which can be used with one of the four outboard motors, one of which is electric, operating from storage batteries. The four larger boats are raised or lowered by mechanical davits, run by a 15-horsepower motor, and the three smaller by ordinary hand davits.

Main deck. Forward on the main deck, i.e., below the fo'c's'le deck, from the peak aft are tanks of oil for calming rough seas, emergency anchor cable, Bo's'n's locker, and carpenter shop, after which there is a hatch to the stores below. From the carpenter shop a passage extends aft to the cross passage forward of the dining saloon. On the port side of this passage are paint locker, two staterooms, a shower and toilet, and a small deck locker; on the starboard are laundry, equipped with electric washing machine, two staterooms, and a lamp locker. The cross passage opens to the outside deck passages.

PLATE 9

Fig. 17 Pilot house of *Velero III* showing the ship's telegraph, gyroscopic and magnetic compasses, steering wheel, and radio beacon detector.

Fig. 18 Radio equipment of the *Velero III* consisting of long, short, and intermediate wave transmitters and receiving sets.

PLATE 10

Fig. 19 Dining room of *Velero III* showing ship model complete in every detail and capable of propulsion by means of storage batteries.

Fig. 20 General view of recreation hall of the *Velero III* showing the open type of construction exposing steel girders and conduits. The companionway to the right leads to the staterooms.

PLATE 11

Fig. 21 Engine room of *Velero III* showing twin Winton-Diesel engines and their controls.

Fig. 22 Engine room of *Velero III* showing two of the auxiliary generators and other mechanical installations.

PLATE 12

Fig. 23 Members of the crew of *Velero III* at the controls of the dredging winch located on the bow of the vessel. The guide wheel registers the number of fathoms of cable out.

Fig. 24 Dr. Hubert Lyman Clark of Harvard University sorting a collection of echinoderms obtained at a shore collecting station in the open-air laboratory located on the after deck of *Velero III*.

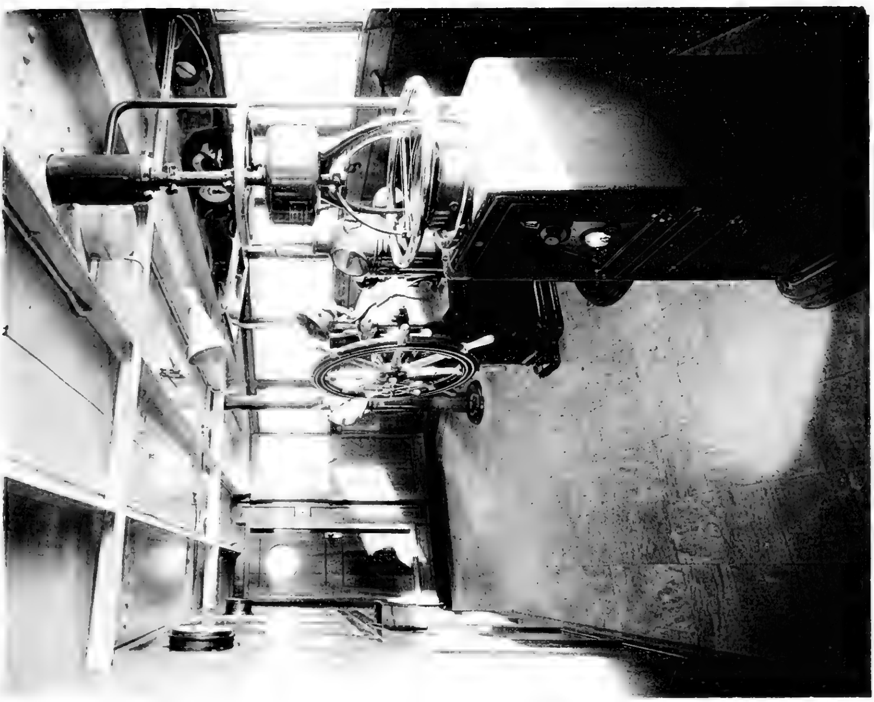


Fig. 17 Pilot house showing steering gear

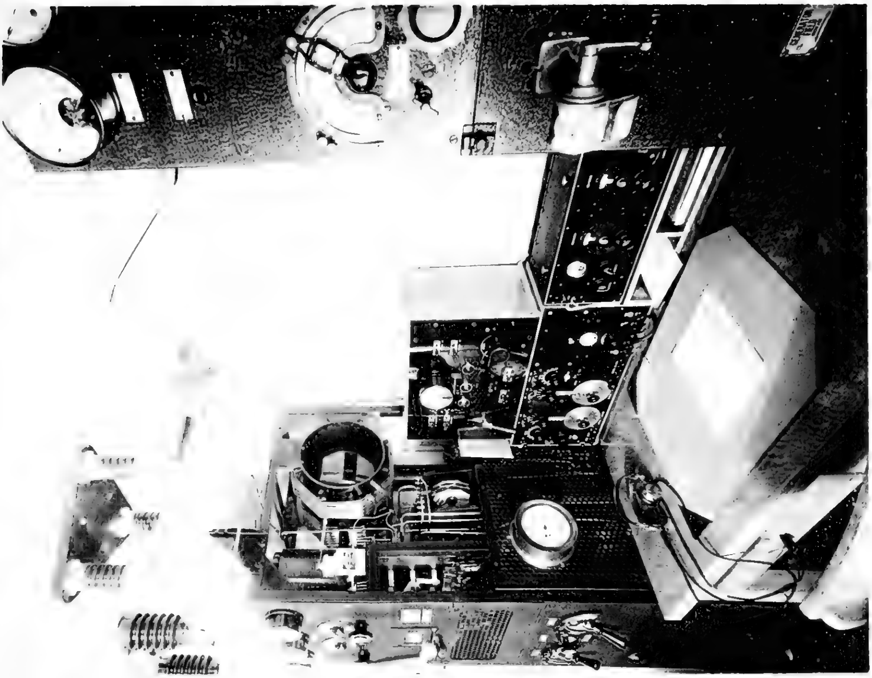


Fig. 18 Radio equipment

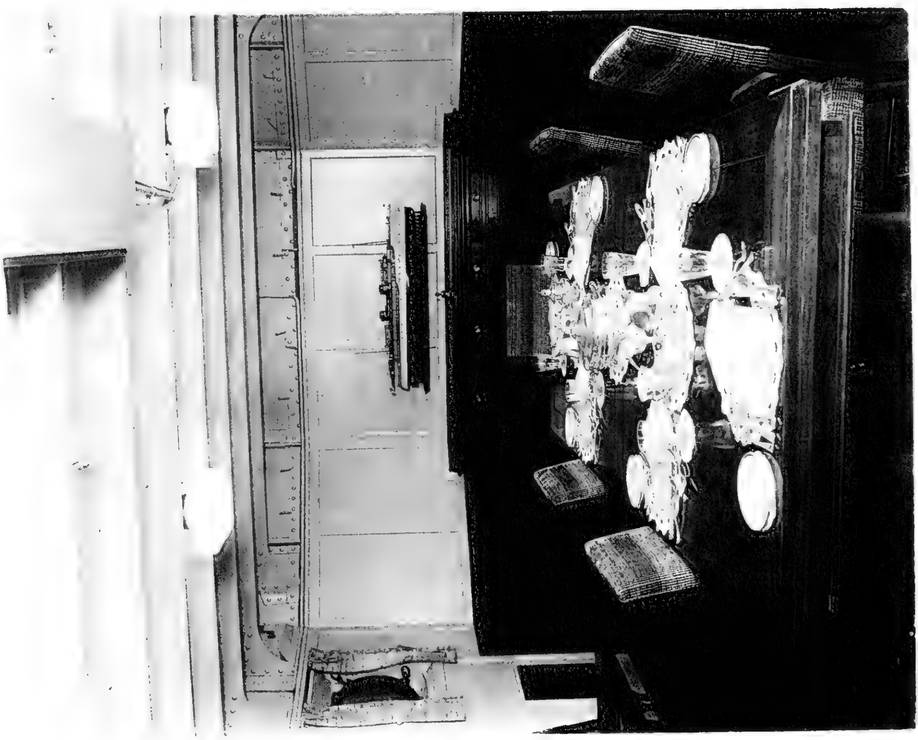
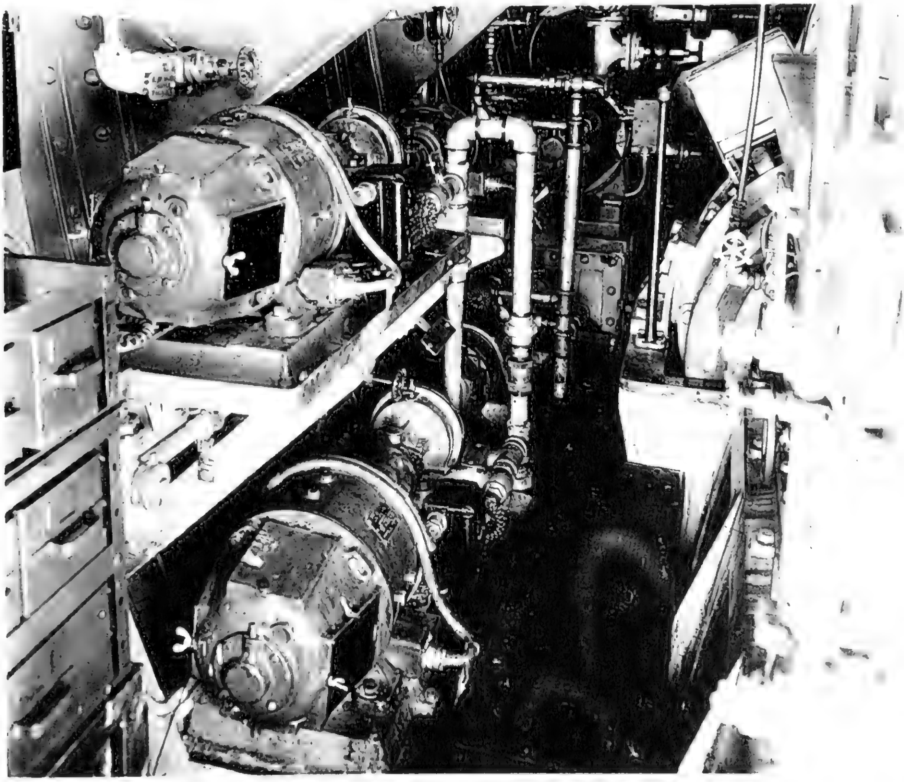
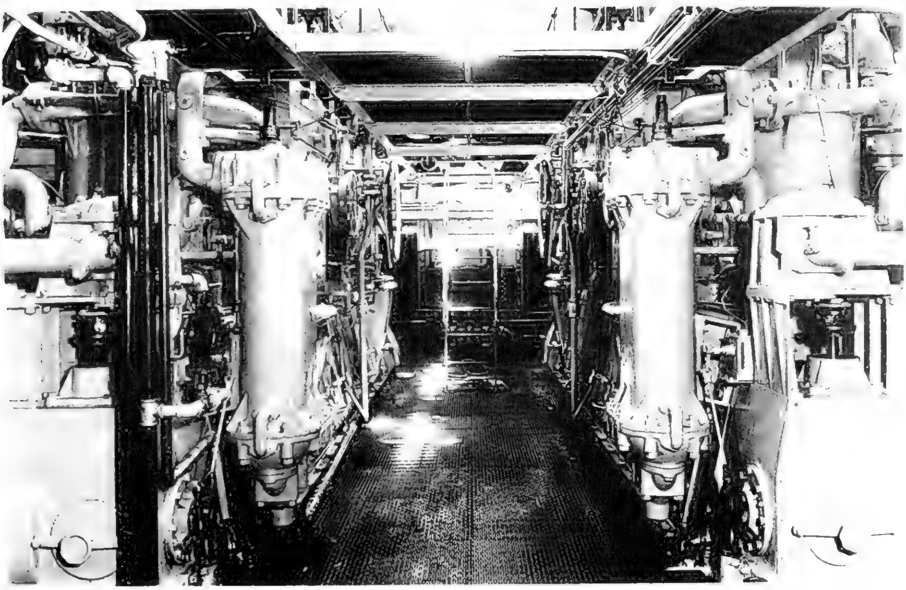


Fig. 19 (*left*) Dining room with model of *Velero III*
Fig. 20 (*above*) Recreation room





Figs. 21, 22 Engine room

Fig. 23 Winch with cable, deck of *Velero III*

Fig. 24 Dr. Hubert Lyman Clark in deck laboratory

Fig. 25 A and B Dredge in operation in Gulf of California

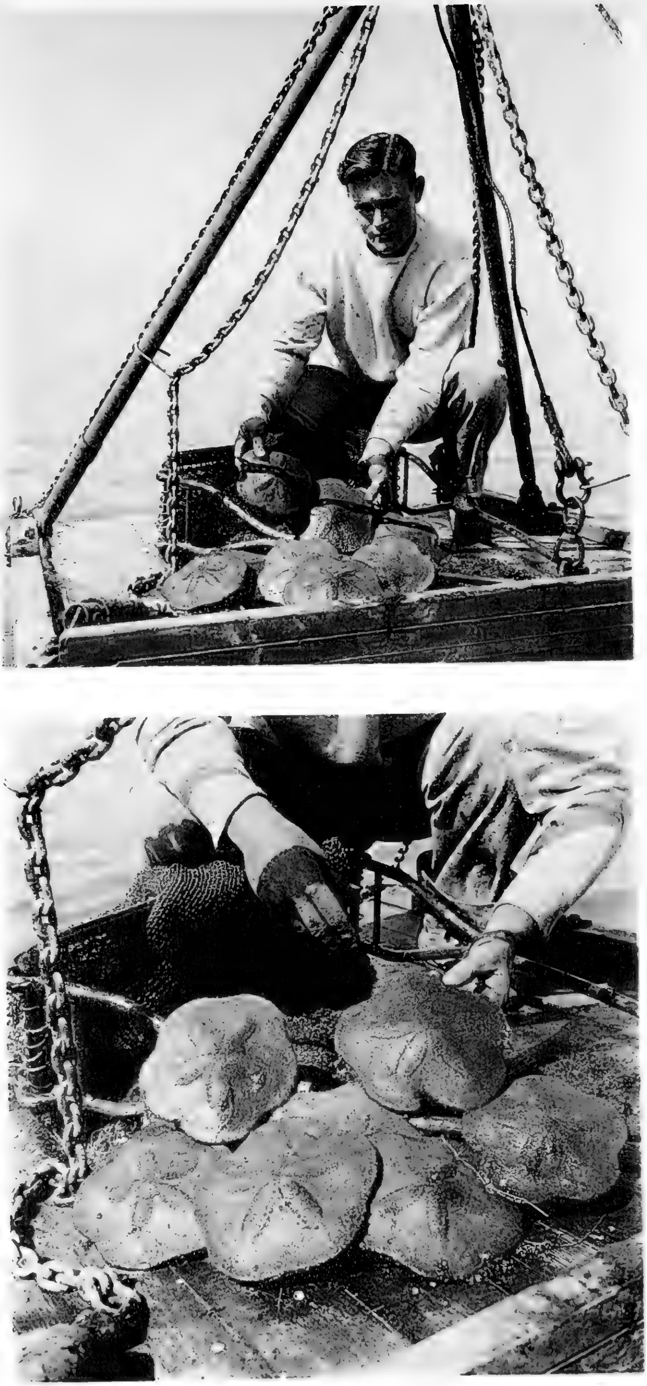


Fig. 26 A and B Dredge in operation in Gulf of California

Fig. 27 Capt. Hancock, Dr. Schmitt examine tangles

Fig. 28 Recording oceanographic data, Humboldt Current

Fig. 29 Core apparatus going into operation

Fig. 30 Core being studied on deck of *Velero III*

PLATES 13, 14

Figs. 25, 26 A series of pictures showing the successive steps in landing a dredge haul on the platform of the small dredge boat. The specimens are giant sand dollars from the Gulf of California.

PLATE 15

Fig. 27 Capt. Hancock and Dr. Schmitt examining deep-sea tangle.

Fig. 28 Dr. Fraser recording and Dr. Schmitt supervising water sampling operations in the Humboldt Current on the Expedition of 1934.

PLATE 16

Fig. 29 Coring device being hoisted by the boom preparatory to removing the core.

Fig. 30 Dr. Thomas R. Clements examining a 6-foot core obtained from a depth of several hundred fathoms by means of the coring device previously shown.

Aft the cross passage mentioned above, but not communicating with it, is the well-lighted dining saloon, occupying the full width of the ship with the exception of the outside passages. The dining table accommodates 16 people. On the forward wall is a scale model of the *Velero III*. On the starboard side leading aft is an inside passageway to the recreation hall. On the port side aft of the dining saloon are the galley and pantry, both well equipped and convenient in every respect. Cooking may be done on either of two ranges, one electric, the other oil-burning. Refrigerators large enough to hold supplies for the day are located in both galley and pantry.

The engine room, amidships, extends from the hold or B deck through the lower or A deck and the main deck to the fidley on the boat deck. On the main deck level forward are the steering gear shaft, oil filter, gravity fuel oil tank, and ventilators. On the port side are the galley, range fuel tank, ship's blueprints, emergency electric panel board, storage space for three outboard motors, gasoline auxiliary generator, and two DC-AC motor converters for radio sending equipment. On the starboard are the ventilating fans, a door to the dining saloon passage, large CO_2 fire extinguisher with 60 feet of hose, and numerous DC-AC converters for radios and motion picture machines. Aft are the manual controls for the watertight bulkhead doors on the B deck level, roll indicator, and another fire extinguisher. Directly over the main engines are "I" beams with traveling chain hoists for emergency repairs. Opening off the port outside passage, aft of the doors to the galley and pantry, are a deck toilet and a small deck locker.

The recreation hall, or music room, is located aft of the engine room well. Like the dining saloon, it occupies the full width of the ship with the exception of the outside passages. It is provided with grand piano, radio, and sound motion picture projection equipment, two couches, easy chairs, music and instrument cabinets, an exhibit case containing specimens and photograph albums representative of expedition work, and a serviceable library. A large globe, the gift of the people of Santa Maria to Captain Hancock, enables expedition members to follow the course of the *Velero III* without recourse to the pilothouse. From the recreation hall a grand stairway leads to the owner's rooms and guest rooms on the lower deck.

Abaft the music room, running athwart the ship, is the well-equipped fish and tackle room. The starboard portion is used extensively for sorting and preserving specimens, particularly in bad weather, since it is the only place protected in all weather in which such work can be done. The fish room is provided with a sink, running sea and fresh water, a gravity flow alcohol tank, four lockers for glassware, and a work table running the full width of the room providing space for five workers. Beneath the table are eight tiers of drawers, four in a tier, and on the after wall are eight cabinets. The drawers are stocked with fishing tackle and ammunition, the cabinets with rods, reels, and firearms. Overhead storage space provides for the long-handled dipnets and harpoons used from the ship's side or from the launches.

Finally, aft of the fish and tackle room, there is the windbreak, a recess, open astern but otherwise walled in, that was formerly used as sleeping accommodation. As the need for laboratory space increased, the four bunks were removed, and in their place were built tables for three additional workers. The locker accommodation overhead is used extensively for collecting equipment.

In the open deck space astern are the capstan, run by a 5-horsepower motor, the escape hatch, and the lazarette hatch.

Forward on the starboard side is the pump locker with heating controls and filters and five 60-gallon sea-water tanks for living marine specimens. Amidships is a gangway, not used very extensively, since in ordinary operations the men board the small boats over the ship's side. A rope ladder is available for use at any point. There are 32-foot booms for both port and starboard sides, for use when the ship is at anchor and several of the boats are in the water. The port boom is stored on the fidley when not in use.

Lower or A deck. Below the main deck level the ship is divided by four watertight bulkheads into five watertight compartments, any three of which will keep the ship afloat. In the peak of the lower or A deck there are a water-trim tank, the chain locker, and officers' and crew's lavatories and showers, immediately after which is a hatch at the forward end of the passage that goes aft to the engine room gallery. On the port side there are four staterooms (crew's quarters), officers' messroom and library, linen lockers, storeroom for machine parts, room for the master gyro compass, and battery room with Exide ironclad batteries of 900 ampere-hour capacity; on the starboard, four staterooms (crew's quarters), crew's messroom, crew's pantry, well-equipped photographic darkroom, refrigerator room, and milling machine. The staterooms are certified for either two or three seamen.

The engine room, amidships, is large, 46 feet in length, with a six-foot balcony on the lower or A deck surrounding the main engines. On the hold or B deck level the central portion is occupied by the two main engines, and forward are the two 75-kilowatt generators, each driven by a 125-horsepower Diesel engine. On the forward bulkhead is the 11′ x 7′ master switchboard. In addition there are two 20-kilowatt generators driven from the main shafts. On the B deck portside there are in succession fuel oil valve manifold, fuel oil transfer pump, lubricating oil pump, fuel oil pump, 250-gallon oil filter in two separate units, two large freshwater pressure tanks and filters, bilge manifold, bilge pump, auxiliary air compressor, septic tank, and, on the bulkhead, the compressed air bottles. On the B deck starboard side there are in succession fuel oil manifold, fuel oil transfer pump, bilge manifold, sea-water sanitary pressure tank, two fuel oil pumps, volt booster set, two sea-water pumps, fuel oil centrifuge, lubricating oil filters, emergency sea-water pump, fire pump, auxiliary air compressor, air bottles, spare water cooler, spare oil pump, and a refrigeration unit for the cold stores forward.

On the lower or A deck portside from the battery room aft are day fuel oil tank, 1,000-gallon lubricating oil storage tank, electrician's workshop, lubricating oil heater and centrifuge, machine shop equipped with a turning lathe, two drill presses, emery wheels, and a complete set of machine tools, as well as welding equipment. On the starboard side from the milling machine room aft are day fuel oil tank, 1,000-gallon lubricating oil storage tank, spare cylinder head, spare valves and seats, five tanks for various oils, a 125-KW AC-DC converter for the use of shoreside utility power on the *Velero III,* an automatic air compressor, an electric freshwater still, a toilet, and a large spare-parts storeroom.

Aft of the engine room on the lower A deck level are the owner's two rooms, each with twin beds, with lavatories, dressing tables, and closets forward and closets aft. The grand stairway, descending from the main deck, reaches a landing midway, from which a stairway passes on either side to each stateroom of the owner, while the main stairway continues aft to a passage, on either side of which are located three guest staterooms for scientists, two double and one single. The four double staterooms are provided, like the owner's rooms, with twin beds, chest of drawers, clothes closet, lavatory with toilet and shower, and are equipped with forced-draft ventilation. The two single staterooms are provided with bunks, one of which may be used as an operating table. A sterilizer for surgical instruments and a complete stock of medical, dental, and surgical supplies are kept in lockers in this room, which is occupied by the ship's surgeon on long cruises. Aft the single staterooms there are a laundry room on the port side and a laboratory room on the starboard side which is used for the chemical analysis of sea water. Above the extreme after end of the central passage is an emergency escape hatch. Finally, there is the lazarette for the quadrant and other steering equipment to be used in case of a failure of the shafts between the pilothouse and the engine room.

The hold or B deck. From the peak of the ship aft on the hold or B deck level are located the forward trim tank, the refrigerators, with two cold boxes on the port side and three on the starboard, and the dry stores. Between the dry stores and the engine room are located the deep oil tanks, port and starboard. Each is divided into three compartments to prevent slopping with the roll and pitch of the ship. With one or two exceptions, there are no shell tanks. Aft the watertight bulkhead is the main deck of the engine room, previously described in connection with lower deck A. Aft the engine room are the shaft alleys, each allowing inspection of any part of the shaft, and between them are two double-bottom fresh-water tanks of 4,000-gallon capacity each. A passageway connects the shaft alleys aft the water tanks. It is followed by a watertight bulkhead, another fresh-water tank, and the after trim tank. Outside the shafts are four fuel oil wing tanks, two on either side. Below the cold stores is a fresh-water tank, below dry stores two double-bottom oil tanks. Under the engine room deck are an oil cooler and six double-bottom oil tanks, and below these are the bilges. While the ship is running, fuel oil is often pumped from tank to tank to keep her on an even keel.

General. All decks are of steel plate. On the flying bridge, the boat deck, and all boat deckhouse coverings, over the steel there is a joiner deck of Douglas fir, separated by a space through which there is air circulation, and over this, a canvas covering. In the boat deckhouses, the canvas is replaced by battleship linoleum. On the exposed portions of the upper deck, and in the principal compartments of the upper and lower decks, mastic replaces the joiner deck, and battleship linoleum is used for covering. On the fo'c's'le deck and the various workrooms, paint is used in place of linoleum. The galley, pantry, and toilet and washrooms are tiled. The staterooms are insulated at shipside with two inches of cork.

The bilge, ballast, and fire systems are handled separately. There are two fresh-water systems, one for drinking and cooking, and one for lavatory, shower, and laundry purposes. The capacity of each system is 9,000 gallons. Fresh water is circulated by automatic pumps and pressure tank. The water is heated electrically (all heat is electrically produced), and for this heating the ship is divided into three zones, each with a separate heater. The salt-water sanitary system and salt water for showers are also circulated by automatic pump and pressure tank. In case of a breakdown of the engine pumps, an auxiliary system with a 250-gallon centrifugal pump may be placed in use. Purifiers are used for fuel oil and for lubricating oil.

The ship is artificially ventilated. Separate systems are used for all the staterooms and other watertight compartments to avoid the necessity of puncturing the watertight bulkheads. Fresh air is supplied to each stateroom. The galley and the pantry have the air exhausted rapidly enough to have a complete change every three minutes. All toilets have the air exhausted.

There are four watertight bulkheads between all compartments below the boat deck. Watertight bulkhead doors are manually operated, with indicator in the pilothouse showing whether they are open or closed. All outside doors are watertight; all openings through the lower deck are closed by watertight hatches. All air and light openings, with the exception of the skylights and those in the pilothouse front are heavy, bronze-framed portlights with extra thick glass.

There is a telephone system with telephones in the Captain's room, the dining saloon, the recreation room, the pantry, one stateroom in the fo'c's'le head, the owner's room, the engine room, and the Chief Engineer's room. All wiring is in conduits or flexible U.S. Navy marine cable. There is a general alarm system, having fire stations, controlled from the bridge. A navy standard blinker light is installed on top of the foremast, with key box arranged for portable operation from the bridge.

The auxiliary 7½-kilowatt, gasoline-driven generator on the engine room main deck level is a special safety fixture, as it can be put into use to supply light or radio power even if the engine room is flooded.

Extra equipment for scientific work. Besides such regular equipment as nets, seines, townets, dipnets, diving helmet, harpoons, and fishing tackle, there are available two sizes of dredge, a beam trawl, a sounding machine (as well as the fathometer in the pilothouse), 6 reversing water bottles, 12 deep-sea thermometers, several types of bottom samplers, and bottom "core" apparatus.

The larger dredge (at least one extra always kept on the forward deck ready for use) is handled from the forward deck of the *Velero III* with a winch and cargo boom. The ⅝-inch steel cable from the dredge passes through a sheave, near the stem head, through a metal guide, and then through a second guide, by which the lateral position can be controlled, to a 1,000-fathom cable capacity drum, operated by a winch, which allows for different speeds and is controlled by shift gears. A contact wheel meter is used to record the amount of cable let out or hauled in.

To lower the dredge to the surface of the water, or to raise it and bring it inboard so that the contents may be dumped on the screens, the cargo boom is used over the starboard side.

The dredge itself is much the usual type. It consists of two steel jaws, 3′ 6″ long, held 12″ apart by steel bars near each end. The steel arms are attached to the crossbars in such a way that they may swing through an arc. Eyes at the other end of the arms are lashed together by heavy twine, and the shackle from the cable is attached to one of the eyes.

The inner bag of the dredge is of ½-inch mesh, the outer of 1-inch heavy mesh. Both are closed at the bottom, when in use, by a rip cord. Within the larger inner net is a smaller burlap net, fastened to the inner net near its mouth, to retain some of the finer material that would pass through the meshes of both inner and outer nets, and a sample of the sand or mud through which the dredge may be hauled. The nets are protected by a steel chain net. Commonly (in recent trips, almost always), tangles are attached to the free edge of the chain net, instead of being used separately.

The screens used for sorting are three in number, the frame of one fitting exactly to the frame of the one below. The topmost has the coarsest mesh, and the lowest, the finest. The material is washed with a sea-water hose, and the usable material is picked out from each screen in turn and roughly sorted before it is taken to the laboratories for further sorting and preservation. If much fine stuff collects on the lowest screen, it may be put into buckets or jars for tray washing, so that as much of the material as is possible may be saved.

The small dredge, with jaws 2′ 6″ long and 8″ apart, is similar to the large dredge, but has not the inner bag. It is operated from one of the motor boats that has been especially fitted for the purpose with a winch and drum of 250 fathoms of cable, platform table, and an A-frame, movable through an arc, the block for the cable being at the angle of the A-frame. Aft of the winch there is a cockpit in which the dredge operators may stand, with the sorting table at suitable height. A small beam trawl, 6′ 0″ long, with an opening 15″ wide, is handled from the motorboat in the same way as the dredge, when bottom conditions are suitable.

The deep-sea water bottles with their reversing thermometers and the bottom samplers are operated from the port side of the *Velero III*.

The piano wire reeling apparatus and the meter are placed on the boat deck, but the instruments and the messengers are handled from the deck below.

Recently, a "core" sampler was constructed and is giving satisfactory results. It is handled from the forward deck in much the same way as the dredge; but, as it is heavier, more adjustment is necessary in getting it outboard and inboard. So far only a six-foot tube of 2½-inch diameter has been used, and samples have been obtained of almost that length; but a twelve-foot tube has been constructed in the hope of getting longer cores.

One of the 26-foot launches is especially fitted for fishing, but fishing is not confined to this boat. To bring live marine animals, e.g., fishes, back to port, there are aquaria available, where the water supply can be continuously renewed and temperature controlled. Mention has already been made of the space on the after boat deck that is used for terrestrial species.

It is not necessary to go further into detail of the structure and the equipment of the ship. Enough has been said to indicate that every provision possible has been made for the safety, convenience, and comfort of everyone who has gone to sea, or will go, to help make the expeditions of the *Velero III* a success.

The motor cruiser *Velero III,* together with equipment just described, was presented to The University of Southern California as a floating research laboratory in January, 1939. Captain Hancock continued to serve as Master of the ship and Director of subsequent expeditions conducted under University auspices.

Personnel

Crew

The ship was constructed and ready for action; but, although she was well built and well equipped, of herself she could do nothing—the human element had to come into the operation. This job was too great, even for Captain Hancock. He may have been able to handle the *Cricket* alone, but the *Velero III* was not the *Cricket*. By taking some of the officers and operating crew that had served him on other vessels, and by making some additions, the Captain had a capable ship's company, ready for action when the ship was ready. Some of those men may boast of twenty-five years of service with Captain on these ships. They were fully familiar with their ship's duties from the start, but making proper use of the scientific equipment was something new. It did not long remain so, for soon everything was running without a hitch. During these years of experience, they became such masters of the situation as to be able and ready to make many a suggestion for the improvement of the apparatus, or of its operation, and, better still, have carried out these suggestions to the greater success of the operations.

To anyone who has recently watched these operations for the first time, they serve as a fine object lesson of how efficient work can be carried on smoothly and uninterruptedly. No one who has not been on one of the longer cruises can really appreciate how much this capable, cheerful attention to every need contributed to the success of the expeditions.

On the longer cruises, the full complement of officers and men consisted of two or three qualified officers, three mates, one radio operator, three engineers, three oilers, three seamen, two stewards, two cooks, and one messman, a total of eighteen persons. In home waters the number was slightly reduced.

Scientists

Needless to say, much of the success of the Expeditions depends upon the scientific personnel. This has included a rather extensive list of men who have had practical experience in marine investigation. Apart from those who are, or have been, directly connected with the Allan Hancock Foundation, very few have found it possible to leave their duties at their home institutions to take part in more than one expedition. This may be considered as either fortunate or unfortunate: fortunate because, with extensive changes from year to year, specialists in a greater number of groups of animals and plants have been included; unfortunate because the experience gained in investigation on one expedition in the Eastern Pacific is all the more valuable for further work in this area.

Most of the members of the staff of the Foundation are younger men, and these men, going out year after year, obtain cumulative experience that helps much toward related continuity of the exploration.

On all the longer cruises, with the exception of the 1940 Expedition to the Gulf of California, there was a ship's doctor aboard to look after the health of the ship's company. Even though his duties were seldom onerous, the company would have been far from complete without him.

Photography has been an integral part of the work of the Expeditions. There was always an official photographer along, but amateur photography was not neglected.

First Expedition—December 3, 1931, to February 27, 1932.
John S. Garth, Leo G. Hertlein, Karl Koch, Edwin O. Palmer, Cyrus B. Perkins, Alvin Seale, George E. Stone. (See Chart 1 for route of Expedition 1, vol. 1, no. 3.)

Second Expedition—December 29, 1932, to March 23, 1933.
John S. Garth, Cyrus B. Perkins, Waldo L. Schmitt, Harry W. Wegeforth, Fred Ziesenhenne. (Chart 2, vol. 1, no. 3.)

Third Expedition—Decembr 30, 1933, to March 14, 1934.
C. McLean Fraser, John S. Garth, Emory Johnson, Harold W. Manter, Edwin O. Palmer, Waldo L. Schmitt, Wm. Randolph Taylor, Fred Ziesenhenne. (Chart 3, vol. 1, no. 3.)

Fourth Expedition—November 23, 1934, to April 12, 1935.
R. W. Craft, John S. Garth, Waldo L. Schmitt, Fred Ziesenhenne. (Chart 4, vol. 1, no. 3.)

Fifth Expedition—February 14, 1936, to March 26, 1936.
John S. Garth, J. Alex Hill, Emory Johnson, Edwin O. Palmer, Chas. Towers, Fred Ziesenhenne. (Chart 5, vol. 1, no. 3.)

Sixth Expedition—February 26, 1937, to April 8, 1937.
Bruce Crawford, John S. Garth, J. Alex Hill, Edward M. Pallette, P. J. Rempel, Charles B. Wade. (Chart 6, vol. 1, no. 3.)

Seventh Expedition—January 3, 1938, to March 13, 1938.
Granville Ashcraft, Hubert Lyman Clark, John S. Garth, J. Alex Hill, Karl Koch, George S. Myers, Edwin O. Palmer, Cyrus B. Perkins, Jr., Anker Petersen, Fred Ziesenhenne. (Chart 7, vol. 1, no.3.)

Eighth Expedition—March 12, 1939, to May 14, 1939.
Granville Ashcraft, Francis Elmore, John S. Garth, J. Alex Hill, C. L. Hogan, Karl Koch, Cyrus B. Perkins, Jr., Anker Petersen,

Waldo L. Schmitt, Wm. Randolph Taylor, Chas. B. Wade, Harry W. Wegeforth (return from Trinidad only), Fred Ziesenhenne. (Chart 8, vol. 1, no. 3.)

Ninth Expedition—January 17, 1940, to February 20, 1940.
Granville P. Ashcraft, Gustav F. Augustson, Yale Dawson, John S. Garth, J. Alex Hill, Anker Petersen, John Tyler, Chas. B. Wade, Fred Ziesenhenne. (Chart 9, vol. 1, no. 3.)

Tenth Expedition—February 22, 1941, to March 2, 1941.
Granville Ashcraft, Thomas Clements, C. McLean Fraser, John S. Garth, William Richardson, John Tyler, Henry Ward, Fred Ziesenhenne. (Chart 10, vol. 1, no. 3.)

GRANVILLE P. ASHCRAFT—Allan Hancock Foundation
Field Collector, birds, mammals

GUSTAV F. AUGUSTSON—Allan Hancock Foundation
Field Collector, ecto- and endo-parasites

HUBERT LYMAN CLARK—Museum of Comparative Zoology at Harvard College
Echinoderms

THOMAS CLEMENTS—The University of Southern California
Geology, sedimentation

R. W. CRAFT—Pasadena
Ship's Doctor

BRUCE CRAWFORD—The University of Southern California
Field Collector, cestodes

E. YALE DAWSON—University of California, Berkeley, California
Field Collector, algae

FRANCIS ELMORE—The University of Southern California
Anthropology

C. MCLEAN FRASER—University of British Columbia, Allan Hancock Foundation
Hydroids

JOHN S. GARTH—Allan Hancock Foundation
Arthropods

LEO G. HERTLEIN—California Academy of Sciences
Paleontologist, mollusks

J. ALEX HILL—Allan Hancock Foundation
Field Collector, echinoderms

C. L. HOGAN—The University of Southern California
Geology, photographer

Karl Koch—San Diego Zoological Gardens
Collector, live birds
Harold W. Manter—University of Nebraska
Zoology, fish parasites
George S. Myers—Natural History Museum, Stanford University
Ichthyology
Edward M. Pallette—Los Angeles
Ship's Doctor
Edwin O. Palmer—Hollywood
Ship's Doctor
Cyrus B. Perkins—San Diego Zoological Gardens
Herpetologist
Cyrus B. Perkins, Jr.—San Diego Zoological Gardens
Field Collector, reptiles
Anker Petersen—Allan Hancock Foundation
Staff Artist
P. J. Rempel—The University of Southern California
Botany, land plants
William Richardson—Portersville, California
Field Collector, mammals
Waldo L. Schmitt—United States National Museum
Crustacea
Alvin Seale—Steinhardt Aquarium, Golden Gate Park, San Francisco
Fishes
Wm. Randolph Taylor—University of Michigan
Botany, algalogist
Chas. Towers—The University of Southern California
Field Collector
John Tyler—Allan Hancock Foundation
Biologist, photographer
Charles B. Wade—Allan Hancock Foundation
Field Collector, fishes
Henry C. Ward—Santa Monica
Ship's Doctor
Harry W. Wegeforth—San Diego Zoological Gardens, *President*
Ship's Doctor
M. Woodbridge Williams—The University of Southern California, Zoology
Field Collector, mollusks
Fred Ziesenhenne—Allan Hancock Foundation
Field Collector, echinoderms

Acknowledgments

Exploration which is international in scope cannot be accomplished without the closest cooperation of the various agencies of the countries visited. This is particularly true in the field of marine biology and ornithology, where valuable commercial species are protected by national and sometimes by international law. In all cases the work of the *Velero III* was welcomed by the Latin-American governments, who saw in it an opportunity to gain important information upon their flora and fauna (and to aid international scientific research). The government of Mexico, through its Department of Fish and Game, not only generously issued permits for exploration at Guadalupe Island and in the Gulf of California but made available the services of a staff member, well acquainted with local conditions, to accompany these cruises. The Ecuadorian government, through its Minister of Foreign Relations, not only issued the desired permits allowing the *Velero III* to visit the Galapagos Islands but generously waived the customary fees levied against both private and commercial vessels visiting Ecuadorian waters. The Peruvian *Compañia Administradora del Guano,* which controls valuable guano concessions, twice issued permits for the *Velero III* to conduct exploration in the vicinity of the Bird Islands of Peru. To these governments and their agencies in particular, as well as to those of other countries at which Allan Hancock Expeditions stopped for less extensive operations, acknowledgment is gratefully tendered.

Before the permits mentioned above could be issued, certain diplomatic representations had to be made. On cruises in which the U.S. National Museum participated, these were made through the U.S. Department of State; on other cruises, through the office of the Director-General of the Pan American Union. The personal interest taken by United States Minister Dawson in Ecuador and by Ambassador Lawrence Steinhardt in Peru, and the services rendered by the United States consulates at Guayaquil and Callao greatly facilitated the work of the expeditions in South America. The same is true of representatives of the State Department at Central American ports of call of the *Velero III.*

The Department of Commerce issues, through the U.S. Coast and Geodetic Survey, the navigational charts used in plotting *Velero III* station locations, and the *U. S. Coast Pilot,* excerpts from which are freely quoted in the geographical section of this account. The U.S. Bureau of Fisheries (now the Fish and Wildlife Service of the Department of the

Interior) was responsible for the loan of valuable oceanographic equipment used in surveying the Humboldt Current in 1934.

Again it is desired to call attention to the valuable assistance of the San Diego Zoological Society under the late Dr. Harry W. Wegeforth and the valuable assistance of the California Academy of Sciences at San Francisco, for doing so much to initiate the scientific work of the *Velero III* in the Eastern Pacific.

Under ordinary circumstances personal acknowledgments would loom large in a publication such as this; but, as all the obligations that there may be depend upon the good will of those directly associated with the Allan Hancock Foundation, it may be well to call this an All-Foundation product rather than to credit individually the workers who have made it possible.

ALLAN HANCOCK PACIFIC EXPEDITIONS

VOLUME 1 NUMBER 2

GENERAL ACCOUNT OF THE SCIENTIFIC WORK OF THE *VELERO III* IN THE EASTERN PACIFIC, 1931-41

PART II

Geographical and Biological Associations

(PLATES 17-128)

BY

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GENERAL ACCOUNT OF THE SCIENTIFIC WORK OF THE *VELERO III* IN THE EASTERN PACIFIC

Geographical and Biological Associations

During the ten years in which the *Velero III* has been in the service of marine exploration in the Eastern Pacific, the ship has traversed a great stretch of coast line, much of it several times. This running description of the coast line, as it is associated with the collecting stations of the *Velero III*, is presented in the hope and expectation that it may be useful for reference to all those who are interested in the voyages of the *Velero III* and in the work of the Allan Hancock Foundation, but particularly to anyone who has been, is, or will be engaged in the detailed examination of any portion of the vast amount of biological material collected on the voyages, and preserved and stored in the Allan Hancock Foundation Building on the campus of The University of Southern California, Los Angeles. The account is intended as a setting for the record of collecting stations, as listed in a later part of this volume.

The principal sources of the information here supplied are the hydrographic survey charts, the three numbers of *Coast Pilot* that cover this part of the coast, photographs taken by photographers and other members of the Hancock Pacific Expeditions, in the possession of the Allan Hancock Foundation, direct observations of various members of these expeditions, and personal observations.

No apology is necessary for the greater detail in reference to the Gulf of California and the Galapagos Islands, since the collecting has been much more concentrated in these regions.

For many of the geographical names there is a lack of agreement in spelling. In cases of disagreement the *Coast Pilot* has been used as the authority, not that the *Coast Pilots* show any phenomenal degree of consistency, but because in them one can always find the name used, and the likelihood is that, as an authority, they are as reliable as, if not more reliable than, any other single authority.

The photographs, reproduced for illustration, have been selected, on the whole, from the extensive photograph library of the Foundation to give some pictorial idea of the nature of the coast described. Additional photographs supplied by the several scientists are so indicated in connection with the brief explanation of each illustration used in this account. One set of charts serves to indicate the routes taken in the longer expeditions, and the other set shows the trend of the whole coast line on a somewhat larger scale.

Distances are always given in geographical miles.

The Voyages of Velero III

Since the launching of the *Velero III* in the summer of 1931, use has been made of her to explore the shore and coastal waters of the Pacific coast of the Americas, from the Golden Gate, San Francisco, California, 37° 49′ North, 122° 29′ West, to Port San Juan, Peru, 15° 20′ South, 75° 10′ West, a distance of over 4,500 miles; and, if the coast of the Gulf of California is included, as it must be, 1,500 miles should be added. Most of the continental islands have been visited, as well as the oceanic islands, the Revilla Gigedo group (Socorro and Clarion), Clipperton, Cocos, and the several islands of the Galapagos Archipelago.

Thrown in, as an extra that cannot readily be included in the Pacific Expeditions, was a cruise in 1939 through the Panama Canal, east along the coasts of Panama, Colombia, Venezuela, and the Guianas, to the Island of Trinidad and Tobago Island.

Although, particularly in the later expeditions, the main objective has been oceanographic and, especially, biological, abundant opportunity has been provided to collect material and data concerning terrestrial organisms and to observe the habits, customs, arts, and handicrafts of the natives that inhabit the countries bordering on these shores. This account, however, will be almost entirely restricted to the oceanographic work.

On the first expedition, December 3, 1931, to February 27, 1932, the first stop was made at Mazatlan, Mexico, from which the mainland coast line was traversed to Balboa, Canal Zone, hence to the Galapagos Islands and back to Balboa. The return trip was made by way of Cocos Island, up the west coast to the Gulf of California, along the west shore of the Gulf as far as Espiritu Santo Island, then back to port, after calling at Cedros Island on the way. (Expedition Chart 1)

The main object of this expedition was to obtain live animals—vertebrates—for the San Diego Zoological Gardens. There was no special equipment aboard for making any collections of marine invertebrates. Some such collecting was done in addition to collecting of terrestrial species. Insects on land and such shore forms as Crustacea and Mollusks served as a beginning of the collections that have since become so extensive, although this collecting was largely incidental.

The second expedition, December 29, 1932, to March 23, 1933, touched first at Tenacatita, Mexico, passed down the coast to Balboa by way of Malpelo Island to La Libertad, Ecuador, across to the Galapagos Islands by way of Cocos Island back to Balboa, then northwestward along the coast to the home port without entering the Gulf of California. (Expedition Chart 2)

The collecting of marine invertebrates on the first expedition was successful enough to indicate that the Eastern Tropical Pacific offered a fertile field for marine biological exploration, a field up to this time almost untouched. From such an unpretentious beginning, without placing any restraint on work on vertebrates, terrestrial invertebrates, or ethnology, marine biological exploration has come more and more to the fore until, on recent expeditions, this type of investigation, with other cognate oceanographic adherents, is of paramount importance.

Paralleling this development and, to some extent, accounting for it, there has been an increase in the amount and in the efficiency of the equipment carried on the *Velero III*. Suitable auxiliary boat equipment was provided as the ship was built, and this made it an easy matter to fit in any extra equipment necessary.

For the 1933 Expedition much equipment was added—a hand dredge, diving helmet, seines, dipnets, lobster traps, etc., suitable for shallow water as well as intertidal collecting. This brought in its train such an increase in marine invertebrate collecting, with such satisfactory results, that there could no longer be any doubt that the *Velero III* had found its proper niche in scientific endeavor.

The 1934 Expedition, December 30, 1933, to March 14, 1934, took quite a different route, although it covered little new area. The first stop was made at Socorro Island (Revilla Gigedo group), and the second at Clarion in the same group. From Clarion the course was set to Clipperton Atoll, and on to the Galapagos Islands. This was the only time that the archipelago was approached by way of Culpepper and Wenman islands, the most northwesterly islands of the group. Three weeks were spent in the Galapagos before proceeding to Guayaquil, Ecuador. The return voyage was made to Balboa, C.Z., and along the coast to the home port without entering the Gulf of California. (Expedition Chart 3)

The greatest improvement in equipment for this cruise was the fitting up of one of the whaleboats with a suitably geared power winch for dredging, a sorting table on the stern, movable shear legs for raising and emptying the dredge, and 250 fathoms of steel cable for hauling the dredge. This equipment made it possible to dredge satisfactorily in water to a depth of 100 fathoms or even more, although that depth was seldom exceeded.

Equipment to take water samples and bottom samples introduced physics and chemistry into the general plan of operations.

The success of this expedition engendered lasting confidence in the work of the expeditions. A sound basis for future work had been fairly and firmly established.

In June of this same year, 1934, a trip was made to the Revilla Gigedo Islands (Socorro and Clarion) to do some summer collecting.

The winter expedition of 1934-35, November 23, 1934, to April 12, 1935, was a long one. Sailing direct from Cedros Island to the Galapagos Islands, the members of the expedition spent over two weeks among the islands before leaving for Puná and Guayaquil, Ecuador, and on southward to Independencia Bay, Peru. On the return trip to port there was little wandering afield from the main coast line. (Expedition Chart 4)

The distinctive feature of this expedition was the visit to the Bird Islands and Bird Rocks along the Peruvian coast.

The route of the 1936 Expedition, February 14, 1936, to March 26, 1936, was largely confined to the Gulf of California. Certain stops were made along the west coast of Lower California; then the west coast of the Gulf of California was followed to Angel de la Guardia Island, across to Tiburon Island on the east side of the Gulf, down to San Pedro Nolasco Island, back again to the west coast of the Gulf to Cape San Lucas and back again to port. (Expedition Chart 5)

This was the first of three expeditions to do intensive as well as extensive collecting in the Gulf of California.

The 1937 Expedition, February 26, 1937, to April 8, 1937, covered somewhat the same general area as did that of 1936. The main attack was made in the Gulf of California. This time both sides of the Gulf were explored as far in as Consag Rock, not very far from the mouth of the Colorado River. On this occasion the east coast of the Gulf was followed as far south as Point Piaxtla before return was made to the west coast of the Gulf on the return journey. (Expedition Chart 6)

In July of this same year, 1937 (July 8 to 21), a trip was made to Cedros Island, Abreojos Point and Pond Lagoon, on the west coast of Lower California, the San Benito Islands, and Guadalupe Island, mainly, but not entirely, to obtain sea lions and elephant seals for the San Diego Zoological Gardens.

The 1938 Expedition, January 3, 1938, to March 13, 1938, was another long cruise, south along the coast to Guatemala, and then by way of Cocos Island to the Galapagos Islands, across to Peru as far south as San Juan Bay, Peru, to visit again the Bird Islands and Rocks. The return trip followed the mainland coast. (Expedition Chart 7)

Further equipment for dredging was used on this expedition for the first time. Facilities for using a much larger dredge directly from the deck of *Velero III* were provided, with 1,200 fathoms of cable, so that satisfactory dredging could be done at a much greater depth than formerly if the bottom was suitable. The smaller dredge was not discarded, since it could be worked in shallower water and over a much rougher bottom than would be safe for the larger dredge.

In the summer of this year, 1938, the *Velero III* headed north for a change, for a visit to San Francisco. This provided the opportunity to do some collecting, mainly by dredging, in an area not previously entered.

In 1939, March 12 to May 14, Clarion and Socorro islands provided the first bases of operation. From these islands the course was set to Chacahua Bay, Mexico, and southeast along the mainland coast to Balboa, C.Z. (Expedition Chart 8)

Here came the only digression from the Pacific area in the ten years of operation. The Panama Canal was traversed to explore the Caribbean coastal areas of Panama, Colombia, Venezuela, and the Guianas, as far east as Trinidad and Tobago islands. On the return to Balboa, the *Velero III* was headed homeward along the mainland coast, collecting by the way as far north as Isabel Island, Mexico.

In 1940, January 17 to February 20, the Gulf of California was the center of attraction for the third time. On the way south stops were made at Turtle Bay, Santa Maria Bay, and Magdalena Bay, and on the way back at San Benito Islands. The Gulf itself was traversed pretty well from end to end, and many points on both sides of the Gulf, as well as the shores of many of the islands in the Gulf, provided collecting stations. (Expedition Chart 9)

In 1941 no long voyage south materialized. The longest trip (February 22 to March 2), although lasting but nine days, was quite successful. The route was to Wilson Cove, San Clemente Island, Johnsons Landing and White Cove, Santa Catalina Island, south and west of Point Loma, Todos Santos Bay, Ranger Bank, San Benito Islands, South Bay, Cedros Island, around Natividad Island, north through Dewey Channel, to the northeast point of Cedros Island and home. Its principal importance lay in the fact that the gaps in the Cedros Island region were filled up to some extent in an area that is much in the limelight in discussing distribution along the west coast of Lower California in relation to other areas farther north and south. (Expedition Chart 10)

During the intervals between the longer cruises, especially in the last three years, shorter collecting trips, lasting from one day to four or five days, have been made in the area between Point Conception and Point Loma. The shore has been explored, biologically, at most of the suitable locations on the mainland as well as on the islands of the Santa Barbara and the Santa Catalina groups of the Channel Islands. Dredging has been done at various stations off all these shores, in shallow water from the dredge boat and, farther out, in deeper water, from the *Velero III*. The beam trawl and the tangles have been used to some extent. More recently the tangles have been used with the dredge regularly when the larger dredge is used. Water samples and bottom samples have been taken frequently and, more recently, bottom cores.

While, in a later part of this volume, a list of the collecting stations, with contributing data, will be given in chronological order, a brief description of each more general location, given in geographical order, will serve to give definition to these locations in larger sections of the coastal area. (See vol 1, no. 3, for station lists.)

An Account of Collecting Stations

California South of San Francisco

Plates 17, 26-28; Charts 19, 20, 25, 26

The most northerly location, represented by one dredging station, listed in the Pacific, is situated in the Gulf of the Farallones, 6 miles from the Middle Farallon and much the same distance from the North Farallon.

The Gulf of the Farallones serves as the approach to San Francisco Bay. It is bounded on the north by Point Reyes, on the south by Point San Pedro, and on the west by the Farallones. It is comparatively shallow, seldom exceeding 40 fathoms in depth, and most of it less than 30 fathoms. In general, the bottom is sandy.

The Farallones consist of three rocky islets, or groups of islets—the Southeast, the Middle, and the North Farallon islands—extending 7 miles in a northwest-southeast direction, approximately 25 miles from the Golden Gate.

Six miles south of Point San Pedro is Pillar Point, which serves to protect Halfmoon Bay from the northwest. This bay is shallow and has no protection from the southwest. There is one dredging station 1¼ miles south of Pillar Point, in 16 fathoms, coarse gravel.

Forty miles southeast of Halfmoon Bay is the much larger Monterey Bay, with a 20-mile face between Point Santa Cruz to the north and Point Pinos to the south. The shore consists largely of sand dunes, and the water is shallow for some distance out from the head of the bay with exception of a portion centrally placed where a deep canyon, Monterey Canyon, extends outward across the bay into the open ocean, with a depth, at the entrance of the bay, of 550 fathoms.

There is one station in quite shallow water at the head of the bay near the mouth of the Salinas River, in sand, and 3 stations in and outside the bay near Point Pinos, in 26-54 fathoms, shell and rock.

From Point Pinos the coast extends southwesterly 4 miles to Cypress Point and then turns abruptly eastward a couple of miles to Pescadero Point, which forms the northwestern boundary of Carmel Bay. Point Lobos appears at the southern extremity. Some dredging has been done in and around Carmel Bay in depths up to 40 fathoms.

From Carmel Bay there is a stretch of rugged coast southward 90 miles before the next station appears at Point San Luis, the point that bounds San Luis Obispo Bay to the westward. Around this rocky point, off Port San Luis, lobster traps have been set and crabs *(Cancer)* obtained. A dredging station is located in San Luis Obispo Bay in 8-14 fathoms.

Thirty-six miles south of Point San Luis lies Point Arguello, with a dredging station a mile offshore in 15-30 fathoms.

At Point Conception, 12 miles farther on, the shore takes a sharp turn to run almost exactly east. Santa Barbara is located 40 miles from this point; and off the city, in 35 fathoms, there is a dredging station.

For 30 miles southeast of Santa Barbara there is a concavity in the coast line reaching to Point Hueneme, and then a nearly direct coast line, 23 miles, to Point Dume. Extending southward from Point Hueneme is the Hueneme Canyon. Two miles west of the mouth of this canyon is a dredging station; another is located 5 miles to the northwest of this; and still another, east of the canyon and quite close to it.

Seven miles along the coast from Point Hueneme is another canyon, Mugu Canyon, not so narrow or so definite as Hueneme Canyon. There are one dredging station near shore to the east of the canyon and two more about 4 miles offshore.

Northern Channel Islands

Plates 18-21; Charts 21-24

Separated from the eastern trend of the coast line from Point Conception by Santa Barbara Channel, and running east and west along the 34th parallel, is a series of four islands, Anacapa, Santa Cruz, Santa Rosa, and San Miguel, that makes up the Santa Barbara Islands, or the Northern Channel group.

The surface of each of these islands is irregular, and the shores are rocky, often precipitous. For much of the year there are strong winds and varying currents, from which the small open bays or coves give little shelter. There is scant precipitation, and permanent streams are scarce; hence, the vegetation, although varied, appears rather insignificant. San Miguel comes the nearest to absolute barrenness.

Anacapa Island, the most easterly, really consists of three islands—East, Middle, and West. It is 4 miles long, east to west, but in some places is quite narrow. The West Island is the highest, 930 feet.

The inshore water is rocky with kelp in places, the increase in depth is quite gradual, and the bottom soon becomes rocky or sandy, with shell.

The only shore stations are located at the east end of the West Island, or near the passage between the Middle and West islands. There are numerous dredging stations all around the island, out to distances of $2\frac{1}{2}$ to 3 miles, in depths of 50 fathoms or less. Those north of the West Island and west of this island in Anacapa Passage are among the richest in the southern California area.

Santa Cruz Island, separated from Anacapa Island by the 4-mile Anacapa Passage, is the largest island, 21 miles long and an average of 5 miles wide. It has several harbors, coves, and anchorages, but scarcely one of them is well protected in all weathers. On the north side there are Scorpion Anchorage, near the east end, and Chinese Harbor, Prisoners Harbor, and Pelican Bay, near the center—all in one large bight. To the east there are Smugglers Cove and to the south Willows Anchorage. The only island offshore, and it is small, is Gull Island, near the west end of the south side.

There are shore stations at Scorpion Anchorage and at Willows, where there are reefs and some turnable rocks, and at Prisoners Cove and Pelican Bay. There are dredging stations all around the island, but they are rather scarce along the east half of the south side and the west half of the north side. The latter area does not promise much, but the former gives indication of some good material. The dredging depths have ranged from 6 to 140 fathoms. The change in bottom with depth is much the same as with Anacapa.

Santa Rosa Island, 5 miles across Santa Cruz Channel from Santa Cruz Island, 15 miles long and 10 miles in greatest breadth, has almost as great an area as Santa Cruz Island. Water is more plentiful, and hence the vegetation is more conspicuous. The shore line is little indented, Bechers Bay, to the northeast, being the only inlet of any size. There are no islands off the coast, but offshore rocks are so numerous that few spots offer a good landing even in fair weather.

There are a fair number of dredging stations off Bechers Bay, on south through Santa Cruz Channel and to the southeast of the island, but the remainder has not been touched. This latter part is foul with rocks, reefs, and kelp in shallow water, but is better farther out. To explore it thoroughly, better sea and weather conditions than are commonly met with are necessary. The shelf south of the island, extending 18 miles from shore, should receive, and probably will receive, much more attention, as the dredging there, so far, has been very fruitful.

San Miguel Island, the most westerly of the group, is separated from Santa Rosa Island by the 3-mile San Miguel Passage. It is $7\frac{1}{2}$ miles long, with an average width of 2 miles. The island is pretty well covered with grasses, but there are no trees. There are more outlying rocks and reefs off the coast here than there are in the vicinity of the other islands, but there are some reasonably well-protected bays and harbors, although none of them is safe in all weathers. Cuyler Harbor on the north coast is the largest.

Shore collecting has been done only at the west end of the island, just north of Point Bennett. Dredging has been done in San Miguel Passage and at several points along the south coast, mostly in shallow water; but some deeper hauls have been made south of the west end of the island. On the north side the only dredging has been in and north of Cuyler Harbor.

Southern Channel Islands

Plates 22-25; Charts 27-31

The whole Santa Barbara Islands region, at least in waters 50 fathoms or less, offers greater inducements to carry on intensive work than does any other area of similar size that has been explored between Point Conception and the Mexican boundary. There are many places in which the fauna is rich and varied. In the deeper water farther out the bottom is nearly always fine sand or mud with very little to show as compared with the shallower water.

The eastern terminus of Santa Barbara Channel is Point Dume, 28 miles directly east of Anacapa Island. It also serves as the western or northwestern limit of Santa Monica Bay, which stretches 25 miles across to Cape Vicente. The shore of the bay forms a regular curve, and there is nowhere in it suitable protection in stormy weather. In general, the depth increases gradually from shore, but near Redondo there is a submarine valley with deep water almost to the shore, Redondo Canyon. At both extremities of the bay the shore is rocky and somewhat rugged, although in places the banks are clay; but the intervening portion, in the main, is a sandy beach, although it may be backed by rocky or clay cliffs.

Shore collecting has been done on an old pier at Playa del Rey and on the rocks at Bluff Cove, some distance south of Redondo Beach. Most of the dredging and beam trawl stations have been grouped in or near the Redondo submarine canyon, but there are two a short distance off Manhattan Beach.

At Point Vicente the coast line turns abruptly to run a little south of east for 7 miles to Point Fermin, the western limit of San Pedro Bay. The shore here is abrupt and rocky. Around Point Fermin and at Portuguese Bend, 2 miles east of Point Vicente, conditions are favorable for collecting at low spring tides, and some of it has been done at both places. There are dredging stations a short distance out from both of these points.

Point Fermin forms the western boundary of San Pedro Bay, which, with San Pedro Harbor, has become Los Angeles Harbor, with extensive sea walls or breakwaters to provide protection in all weathers. The outer breakwater, especially that part of it toward Point Fermin, has developed a rich fauna to be reached by low-tide collecting. In the harbor itself the hull of *Velero III* in dry dock at Craig's served as a collecting station. Anaheim Slough, near Seal Beach, was at one time a fine collecting area, but the changes that have been made in developing the area have destroyed much of the fauna. Dredging stations extend out from Seal Beach and Sunset Beach as far as the entrance of Los Angeles Harbor.

From Los Angeles Harbor the shore extends 70 miles in a gentle curve to Point La Jolla. It is low and sandy throughout, along the shore and for some distance out from shore, with few rocky projections and with no indentations that can be called bays, with the exception of the small, shallow Newport Harbor. The sandy bottom shore area is rather definitely marked off from the area farther from shore, and the increase in depth from this line is rapid.

Certain of the rocky projections at Corona del Mar, Laguna, and La Jolla have served for shore collecting. A series of dredging stations extend for 10 or 12 miles from Huntington Beach, Newport, and Laguna Beach. A bank that comes to about 60 fathoms from the surface midway between Dana Point and the eastern end of Santa Catalina Island has received considerable attention with both dredge and tangles.

From Point La Jolla the shore extends southward, 11 miles, to Point Loma, the western boundary of San Diego Bay. No collecting has been done in this stretch except for some shore work in Mission Bay, about midway between the two points. It is much in the nature of a large lagoon, and the fauna seems to be going the same way as it is in Anaheim Slough.

Lying some distance off the shore that extends from Point Vicente to Point Loma are the four islands that make up the Santa Catalina group, or the Southern Channel Islands. They do not form a linear series as the Santa Barbara Islands do, and no two of them are near each other. The main axis of each extends in a northwest-southeast direction. In general appearance and in vegetation there is much general resemblance to the Santa Barbara Islands.

Santa Catalina is the largest of these islands, and it lies nearest the mainland, 18 miles across the San Pedro Channel from Point Fermin. It is 18½ miles long with a greatest width of 7 miles. Six miles from the northwest end it is almost divided into two parts by Catalina Harbor on the southwest coast and Isthmus Cove on the northeast; the low isthmus is only half a mile across. There are two inhabited areas both on the east coast, the one at Isthmus Cove and the other at Avalon (Dakin Cove), near the southeast end of the island, with smaller settlements at other points. The shore is rugged and even precipitous in places, with few beaches, and these small.

It affords so few satisfactory locations for shore collecting that very little has been done. The only shore collecting station is in Fourth of July Cove, on the north side of Isthmus Cove. The seaward slope is steep, so that there is little shallow water out from the coast. To the west and southwest there are strong currents and little shelter from the strong winds. It is but a short distance out to muddy bottom, and the stations in this bottom give little but polychaetes, brittle stars, and sea cucumbers.

All of the remainder of the way around the coast of the island dredging has been extensive, from close in shore to as much as 6 miles out. One bank, 6 miles east of Long Point with a loose rock bottom in 225-230 fathoms, is particularly rich in echinoderms. The favored locations have been off the northwest end of the island, off Emerald Cove, off Isthmus Cove, off Long Point and White Cove, off Avalon, and off the southeast end of the island.

In the deeper parts of San Pedro Channel, as well as in the other wide channels, except on certain small banks, the bottom is of green mud, but in shallower water this often gives way to sand, sometimes with shell or coralline, and then to rock, although there are rock patches well scattered over the whole area. Gravel patches or pebble beds seem to be conspicuous by their absence.

Lying 21 miles to the westward of the northwest end of Santa Catalina Island is Santa Barbara Island, the smallest of the four. It is only 1½ miles by 1 mile. There is a wider shallow-water area around this island, which area is rocky and heavily provided with kelp. Off the southwest end of the island the area is particularly foul with rocks and reefs. A rocky island—Sutil or Gull Island—lies 200 yards offshore, the channel foul and shallow. The islet is 300 feet high and is quite conspicuous. There is no very safe anchorage.

A small amount of shore collecting has been done around the north end of the island. Dredging stations appear all around the island and out to banks 15 miles to the northward and 6 miles to the southward (Osborn Bank). Beam trawling has been done all along the east side.

Twenty-four miles southwest of Santa Barbara Island is San Nicolas Island, 8 miles long, with an average width of 3 miles. There is more sandy beach on this island than on any of the others; but even off the beaches a short distance rocky patches appear, close or scattered, to give holdfast to a very abundant supply of kelp. At the west end this extends out from shore for as much as three miles.

A small amount of shore collecting has been done at Dutch Harbor on the south coast, the only place around the island that offers even a modicum of shelter. Scattered dredging stations appear north and northwest of the eastern end of the island and in a more concentrated area on the south coast, off Dutch Harbor.

San Clemente Island is the southernmost of the group, directly south of Santa Catalina Island, 19 miles away, and 60 miles from the mainland coast at La Jolla. It is almost as long as Santa Catalina Island, but it has an average width of only 2½ miles. The northwest half of the island has much more regular surface than is ordinarily found in these islands, but the remainder of the island is more corrugated. The northeast side is rocky and abrupt, but the southwest side is much less so, the sea slope here being correspondingly more gradual. There is much less kelp around the shores than around San Nicolas or Santa Barbara. There are three harbors near the north end—West Cove, Northwest Harbor, and Wilson Cove—and Pyramid Cove at the south end.

Shore collecting has been done at Northwest Harbor, Pyramid Cove, and Horse Cove (adjacent to Pyramid Cove). Dredging has been done west, north, and east of the north end of the island, in and near Wilson Cove, and in and off Pyramid Cove.

Lying southwest of San Clemente Island, the nearest one 30 miles away, are three large banks and other smaller ones, the surface of which comes much nearer to sea level than that of the surrounding areas. They all have their long axes in a southeast-northwest direction and are much longer than they are broad. They may be considered as South Channel Islands that do not quite reach the surface.

The largest of these banks is Cortes Bank, which, measured within the 100-fathom line, is 25 miles long and 8 miles broad. Within the 50-fathom line it is 19 miles long, with a greatest width of 5 miles, and within the 20-fathom line it is 3 miles long and 1½ miles wide. The pinnacle, Bishop Rock, is but 15 feet below the surface. Chart 32.

This bank lies 36 miles off San Clemente Island and is the most southerly bank of the group.

Tanner Bank, lying 5 miles northeast of the northern part of Cortes Bank, is not so large, 12½ miles long, 5½ miles wide. The pinnacle has 12 fathoms of water over it. Charts 32, 33.

Directly in line with Tanner Bank, 9 miles to the northwest of it, is the third large bank, yet unnamed, 9 miles long and 3 miles wide. It is 17 miles south of San Nicolas Island. No part of it comes nearer to the surface than 50 fathoms.

Dredging has been done on each of these banks with fair success. Much of the bottom is rocky, but there is also a large amount of sand and finely broken shell. In some spots there is coralline.

Point Loma is a narrow point of land extending directly southward to shut off San Diego Bay from the open ocean. The mainland shore extends in a regular, wide curve to the International Boundary, 10 miles from Point Loma. San Diego Bay itself, 7 miles long, is shut off further by a narrow spit that extends northwestward from the main shore, some distance south of the city of San Diego. This leaves a shallow bay, mostly with sandy bottom, outside the spit, extending southward from Point Loma to beyond the International Boundary. Chart 34.

The beam trawl and the small dredge have been used here in water less than 10 fathoms, while dredging from the *Velero III* has been done farther out, and in deeper water, about 80 fathoms, on a bank that lies 8 or 9 miles off Point Loma.

Lower California—West Coast

Plates 29-36; Charts 35-39, 41-45

When the coast line crosses the boundary, it is trending directly southward, and it continues much in this direction for 17 miles to Point Descanso. At first much of the shore is sandy, but later bluffs up to 80 feet in height appear, with characteristic flat-topped hills in the background, Table Mountain being very distinctive. The shallow water bench extends outward from shore from 8 to 12 miles, but from this to deep water the change is quite abrupt.

On this shallow water bench, 7 miles from shore and 5 miles south of the boundary, are the Coronado Islands, with a southeasterly axis. North Coronado is about one mile long, Middle Coronado consists of two small islets, and South Coronado is 1¾ miles long. They are all precipitous and rugged, the north island 467 feet high and the south island 672 feet. For most of the year they appear very barren, but in the early spring (February and March) flowers may be quite abundant.

There is a dredging station in 14 fathoms between South Coronado and the main shore.

From Descanso Point to San Miguel Point, 26 miles, the shore takes two steps, first east and then south. There are several sandy beaches, but they are backed by abruptly rising bluffs or hills, and often the shore itself forms a bluff. There is little protection in any part of this coast. The depths increase rapidly offshore so that the shelf is narrow.

San Miguel Point forms the northern boundary of Todos Santos Bay, which provides the best protection along a great stretch of the northern part of the west coast of Lower California. The town of Ensenada is situated near the head of the bay. The bay, somewhat rectangular, is 9 miles wide at the entrance between San Miguel Point and Banda Point. Lying off the latter point 3 miles are the Todos Santos Islands, which offer some protection to the waters of the bay. A wind from the northwest is interrupted very little. The bay is all relatively shallow except for a small area north of Banda Point. An extensive lagoon lies behind a low sand beach on the south shore. Much of the bottom is sand or mud, but there are several rocky patches. Two dredging stations are located about 3 miles off San Miguel Point at the entrance to the bay.

From Point Banda to Cape San Quentin, a distance of 90 miles, the coast is quite regular, made up of three shallow bights, the northern one small, from Point Banda to Santo Tomas Point, the other two much more extensive—the first one from Santo Tomas Point to Cape Colnett and the second from this cape to Cape San Quentin. The coast is a succession of sandy beaches, rugged patches with outlying kelp, and more or less abrupt bluffs, with the background, hills, nearer the shore in the northern portion than in the southern. The most conspicuous feature is Cape Colnett, a semicircular headland that rises abruptly from the water in perpendicular cliffs to a plateau 300 or 400 feet high.

The shallow water shelf is much broader here, reaching a maximum width of 17 miles.

South of Cape San Quentin there is another bight extending to Point Baja, 26 miles, resembling those last mentioned except that Cape San Quentin extends southward to a long point to form the boundary of San

Quentin Bay, in which some dredging has been done in 25 fathoms or less.

From Point Baja to Point San Antonio, 12 miles, the San Quentin bight is repeated but on a smaller scale, with a bay, Rosario Bay, similarly placed to San Quentin Bay. There is an extensive sandy beach; and outside it, the bay, and the whole bight, for that matter, is well filled with kelp. A couple of miles off Point Baja there is a gap in the kelp, and here there is fair anchorage. Three dredging stations are located at the entrance to this gap.

From Point San Antonio to Point San Rosarito, a distance of approximately 110 miles, the coast line extends southeasterly. It consists of a series of shallow bights, varying much in breadth. In most cases the point between the bights extends in a southerly direction, to give slight protection to the northern extension of the bight, which in some cases is even called a bay. The last of these, Santa Rosalia, 7 miles across the entrance, deserves the name better than the others. The shore, in general, is of much the same type as that farther north. The depth of the water increases gradually, so that the 100-fathom line may be 30 miles or more offshore.

From Point San Rosarito, the coast line makes a long, gradual sweep southward, then southwestward, and finally westward to Cape San Eugenio. This large area, extending from Maria Point, 30 miles northwest of Point San Rosarito, to Cape San Eugenio and bounded on the west by Cedros Island, is Sebastian Viscaino Bay. It is 60 miles from Maria Point to Cape San Eugenio and 48 miles from Maria Point to the north end of Cedros Island. The whole bay is shallow, with no soundings greater than 70 fathoms recorded.

From Point San Rosarito almost to Cape San Eugenio the coastal area is low and much of the shore is sandy beach. Close to the shore and opening into the bay are three extensive lagoons, Manuela, Black Warrior, and Scammon. North of the entrance to Manuela Lagoon is a prominent headland, Lagoon Head (Morro de Santo Domingo), serving as a protection to Lagoon Head Anchorage.

Toward Cape San Eugenio the coast becomes more rugged again, particularly so in the vicinity of False Point, 12 miles northwest of Cape San Eugenio.

Apart from the collecting near Cedros Island, mentioned later, the only stations are in and off Lagoon Head Anchorage and in Manuela Lagoon.

Islands Off the West Coast of Lower California

Plates 29-32; Charts 39, 40

Off the west coast of Lower California, from Todos Santos Bay to Cape San Eugenio, there are several islands of special interest.

Guadalupe Island (North Point 29° 11′ North, 118° 17′ West), lying about 140 miles off the coast and 150 miles west and slightly north of the San Benito Islands, is 20 miles long, north and south, with a maximum width of 7 miles. Off the south end are two islets, the Inner Islet and the Outer Islet, the latter being 677 feet high. It is of volcanic origin and is mountainous (highest peak near North Point, 4,500 feet). The shores are so bold and rocky that landing is possible only in very limited areas. The south of the island is quite barren, but in the northern part there are fertile valleys, and there is some vegetation on the mountains. This vegetation has suffered badly from the numerous goats on the island. The depth of the water offshore increases rapidly, so that there is little or no shelf.

Guadalupe Island is of particular interest as the home of elephant seals and sea lions, and fur seals have also been reported. The island has been visited mainly to obtain live elephant seals for the San Diego Zoological Gardens, but some shore and inland collecting has been done.

The largest island off this part of the coast is Cedros (Cerros) Island, lying 12 miles to the northwest of Cape San Eugenio and forming the western boundary of Sebastian Viscaino Bay. It is 20½ miles long, from north to south, and from 2 to 9 miles wide, the widest portion being near the south end. The surface is very rugged, with high, abrupt peaks (the highest, Cedros Mountain, 3,950 feet), with deep, irregular valleys between. The southern end of the island is perhaps the most barren area along this whole barren coast. Toward the north end there are vegetation and even trees—cedars, pines, and some dwarf oaks.

The island arises from the continental shelf, so that there is shallow water for a considerable distance on all sides. Dredging and shore and inland collecting have been done on the east side near the north end and in or near a small village not far from the south end. In South Bay, to the south of the island, shore collecting has been done and dredging near the reef and kelp bed that extends outward from Cape San Agustin, the southwest point of the island.

Lying to the westward of the northern portion of Cedros Island, 14½ miles, are the three San Benito Islands, East, Middle, and West. They are all rocky and barren, and there are outlying rocks and masses of kelp in almost every direction. The West Island is the largest and highest (661 feet), the East Island is the second, and the Middle Island is a small, low, flat island. The passage between the East and Middle islands is safe for navigation, but the other passage is not.

A spur of the continental shelf extends northward from the area west of Cape San Agustin, Cedros Island, to surround the San Benito, but there is a tongue of deeper water coming in from the north that separates these islands from the northern portion of Cedros Island.

At present the San Benito Islands serve as the home of many sea lions and elephant seals. At one time, the elephant seals were slaughtered so extensively that, as far as the San Benito were concerned, they seemed to be exterminated, but a few remained on Guadalupe Island; and, when they were totally protected for some time, the numbers materially increased, and now they are back on San Benito Islands again in goodly numbers.

Some collecting has been done on all the islands, and considerable dredging to the south of them.

Lying 6 miles to the northward of East San Benito Island, Ranger Bank extends on northward for 11 miles, with a breadth of 1¼ to 3½ miles. It is at quite a uniform depth of 67 to 75 fathoms, except at the margins where the depth is slightly greater, and is surrounded by water of much greater depth. The bottom consists of rock in place, loose rock, pebbles, and shell, with an abundance of a tall, much-branching coral. Dredging here has given very satisfactory results.

Natividad Island lies 3¾ miles west of Cape San Eugenio, separated from it by Dewey Channel. It lies in a northwest-southeast direction, 3¾ miles long, ½ to 1½ miles wide. It is barren and hilly and is surrounded by reefs, rocks, and kelp patches that extend into Dewey Channel, but there is a safe passage through, near the mainland shore.

Dredging has been done in Dewey Channel and in various directions from Natividad Island, in depths of 20-65 fathoms.

The whole area west and south of Cedros Island, from Ranger Bank, past the San Benito Islands, to and around Natividad Island, on the continental shelf, has been explored to some extent, with very satisfactory results. Much of the bottom is shell, coral, nullipores, and sponges, on a rocky or sandy base, and the fauna is rich in practically all groups of marine invertebrates. It is of special interest because this area appears to be the northern portion of a zone that extends southward to Santa Maria Bay, or Magdalena Bay, where there is much distributional overlapping between the Panamic and Californian faunas.

For 10 miles southward from Cape San Eugenio, the coast is somewhat abrupt, but little indented, backed by rapidly rising hills. For the next 5 or 6 miles to Kelp Point it forms a shallow bight with a low-lying shore, but Kelp Point itself is more conspicuous. It forms the boundary for Port San Bartholomé, with a southern extension to form Turtle Bay, which provides the best harbor between the International Boundary and Magdalena Bay. It is 1 mile wide at the entrance and has a depth of 2½ miles. Most of the shore is formed by gravel, shingle, or sand beaches. Cape Tortolo forms the southwestern limit of the bay. From this cape, for over 2 miles to Thurloe Head there is a continuous, conspicuous cliff, 25 to 100 feet high. A reef extends from Thurloe Head in a southerly direction for 400 yards, around and adjacent to which is the most southerly mass of kelp, similar in nature and size to the kelp beds farther north. South of this point, these large kelps gradually disappear, until no more of them are in evidence.

East of Thurloe Head is Thurloe Bay, with a sand or shingle beach backed by sand hills.

Shore collecting and dredging have been done in the vicinity of Port San Bartholomé, Thurloe Head, and Thurloe Bay. Dredging near the kelp on the reef off Thurloe Head gave excellent results.

From Thurloe Head to Abreojos Point, a distance of nearly 100 miles, the coastal area is quite inconspicuous. The coast line itself forms a number of wide, shallow bights. In the northern portion bluffs appear along the coast, but these soon disappear, and the shore is mostly low lying, sandy, with several extensive lagoons just behind it. The 100-fathom line may be as much as 20 miles offshore. The only stop that has been made in all this distance was off Asunción Island, near the center of the coast.

From Abreojos Point the coast makes a wide sweep, first southeastward and then almost directly southward to Cape San Lazaro, 135 miles away, in a straight line, with only two significant indentations, Ballenas Bay, behind Point Abreojos, and San Juanico Bay, over a third of the way southward. From the sea this coastal area is not interesting. Most of it is low, with sandy shores and extensive lagoons, with sand dunes or low benches, sometimes cut with arroyos, forming the immediate background. Hills or mountains can commonly be seen, but they are far in the distance. The seaward slope is just as gradual; the 100-fathom line may be 40 miles offshore. The bottom is sand, mud, and broken shell.

The only collecting stations along this part of the coast are in San Juanico Bay, but in one stormy passage southward several specimens were picked up on deck, about 50 miles offshore, slightly south of San Juanico Bay.

From Cape San Lazaro the coast trends southeastward for 3½ miles to Hughes Point, the northwest boundary of Santa Maria Bay, with an entrance width of 7½ miles, to Cape Corso, its southwest boundary. From this entrance, the bay extends 4½ miles to the northeastward. A narrow strip of sand beach serves as its east coast and separates the bay from Magdalena Bay.

Cape Corso is the northern extremity of a narrow peninsula that extends to the southeast 9 miles to Entrada Point, to separate all but the southern portion of Magdalena Bay from the open ocean. Its open coast consists of a series of rocky points separated by sandy beaches. The southern portion of this bay and its southern extension through Marcy Channel, Almejas Bay, are separated from the open sea by the large island, Santa Margarita, 21 miles long and as much as 4½ miles wide. It is bold and rocky at each end but low and sandy in the central portion. The northwestern tip is Redondo Point, and the southeastern is Point Tosco.

Although the entrance to Magdalena Bay, from Entrada Point to Redondo Point, is only 3 miles wide, the bay is large, 17 miles by 12 miles. Most of the coast is low and sandy, with numerous lagoons, shoals, and sandbars. This is true of Almejas Bay as well.

Considerable dredging and shore collecting have been done in and off Santa Maria Bay, particularly in the vicinity of Hughes Point. There are one dredging station 8 miles off the entrance to Magdalena Bay in 81 fathoms and two off Point Tosco in 15 and in 45 fathoms.

From Point Tosco to Cabo Falso, the southern extremity of Lower California, approximately 130 miles, the coast line is regular with no significant indentations. Most of the minute dents appear where the arroyos meet the sea. For the first hundred miles the coast and the immediate background are low, rather frequently cut with arroyos. At Lobos Point, near-by low hills begin to appear and the sand beaches are broken by rocky or sandy bluffs; this condition is continued to Cabo Falso. In this area also there are distinctive arroyos. The shelf out to the 100-fathom line continues wide until within 50 miles from the extremity of the peninsula and then abruptly contracts to 1 to 3 miles.

There has been little collecting in all of this vast area, but directly west of Cabo Falso, 14 miles, rising from the deeper water to a minimum depth of 50 fathoms and consisting of 3 patches, is the area known as San Jaime Bank, which has been explored to some extent.

From this account it is evident that the Pacific Coast of Lower California, with the exception of the Cedros Island region, has been explored very inadequately as yet, although it is an area of promise above the average. It is quite a different story with the east coast of the peninsula and the whole of the Gulf of California.

Before giving consideration to this large and important area, some reference may be made to some of the outlying islands.

The Revilla Gigedo Islands

Plates 74, 75; Charts 46, 47

South of Cabo Falso 260 miles and slightly west of it is Socorro Island, the largest island of the Revilla Gigedo group. This island consists of a large volcanic cone, Mount Evermann, 3,707 feet high, with several smaller cones, some of them quite small, on its flanks. It is 10 miles in length and over 8 in breadth. The slopes to the north and west are quite steep, to the south and east much less so. The whole island is volcanic, and the general appearance, due to exposed lava and a general lack of green vegetation, is anything but inviting. There is said to be fresh water on the island throughout the year, but there is not much general evidence of it. At times the island has been inhabited. Chart 46.

Some of the ash or cinder cones stand out prominently; the one to the westward of Braithwaite Bay is a characteristic feature of the island. In many cases the lava flows are entirely exposed. Near the shore this is generally true, but in the gullies or draws, or even on the regular slopes, the cactus and low shrubbery may be plentiful, often so thickly matted that passage through is not readily possible.

The island is nearly rectangular, the northern portion terminating in Cape Middleton, the eastern in Cape Pearce, the southern in Cape Rule, and the western in two points, two miles apart, Rugged Point and Cape Henslow. A short distance off this latter cape is a conspicuous, rocky islet, Oneal Rock. The shore, in general, is abrupt and rugged, with plenty of outlying rocks, but with deep water close offshore; hence, there are few spots that offer a good landing. Much of the southwest coast consists of a narrow bight, Cornwallis Bay; and on the south shore, some distance east of Cape Rule, is the only real bay on the whole coast, Braithwaite Bay, with the cinder cone, mentioned above, forming much of its western boundary. At the head of the bay is a beach, well supplied with isolated rocks, so that it may be described as bouldery rather than shingly.

There is plenty of evidence that Socorro is a tropical island. Frigate birds, goonies, and boobies fly about, mantas and sharks are abundant in the waters, the brilliant red Sally Lightfoot crab scuttles about among the boulders on the beach, and coral masses appear at or near the surface.

With the exception of some shore collecting at Grayson Cove, in the northwestern part of Cornwallis Bay, all the stations are in the vicinity of Braithwaite Bay and Cape Rule. The bouldery shore provides much good material, and the coral masses protect an interesting association of species. Dredging in depths to 75 fathoms, mostly in nullipore bottom, has been profitable but not startlingly so.

Clarion, the only other sizable island in the group (San Benedicto Island, very small, and Roca Partida, a rocky islet, have not been visited), lies 214 miles to the westward of Socorro Island, but separated from it by water of a depth of over 2,000 fathoms. It, also, is volcanic, and in many of its physical features it resembles Socorro. Instead of a single large cone, there are three, 1,100, 933, and 959 feet high. The island is 5¼ miles long, east and west, and 2 miles wide, rectangular or trapezoidal in shape. It is abrupt to the north, west, and east, but slopes much more gradually to the south from a high ridge running east and west. The slope flattens more toward the sea, with the area approaching the two southern beaches (the only beaches on the island) not so far from being level. There is a large dry lagoon near Sulphur Bay. Chart 47.

Instead of having distinct points at the four corners, as Socorro has, there is one rocky point to the southwest; but at or near the other corners there are conspicuous outlying rocks or rocky islets—Monument Rock to the northwest, Shag Rock, somewhat moved southward, to the northeast, and Pyramid Rock to the southeast. The only bay, and it is not very prominent, is Sulphur Bay, on the south shore, 1½ miles east of Rocky Point.

The surface has much the same general appearance as Socorro, but there is more vegetation, even if the most of it is cactus. The fauna is similar in type to that of Socorro. The island is an important breeding place for birds.

Much shore collecting and inland collecting have been done at Sulphur Bay and around the lagoon back of it, much dredging in and off this bay, with conditions much similar to those at Braithwaite Bay; and there are four stations located north of the west end of the island.

Clipperton Island

Plate 75

Away to the southeast of the Revilla Gigedo group, 515 miles from Socorro Island, lies the isolated Clipperton Island (10° 17′ North, 109°

13′ West). It is 600 miles from the nearest mainland, near Cape Corrientes, Mexico, and 1,400 miles almost due west of Port Culebra, Costa Rica. Apparently, Clipperton is the only sizable atoll in the Eastern Pacific. The lagoon is a couple of miles in breadth, with a depth varying from a few inches to 55 fathoms. The low coral ring that forms the island varies in width from a few yards to a quarter of a mile, and in height, from 5 to 14 feet.

On the west side of the island there is a clump of cocoanut palms, and on the east side are some scattered palms and a conspicuous rock, Clipperton Rock, 62 feet high, which, from certain directions, looks like a sail. The island is fringed by a coral reef and coral rocks, over which there is always a surf breaking. Outside the reef the water deepens rapidly.

On the occasion of the only visit to this island, the surf was too heavy to attempt landing. Dredging was attempted to the east of the atoll, but the slope was so steep and the bottom so rocky that the attempt met with little success.

PLATE 17

Fig. 31 The Golden Gate Bridge as seen from the flying bridge of the *Velero III,* which visited San Francisco Bay in August of 1938. The bay region is the northernmost coastal area explored by Allan Hancock Pacific Expeditions.

Fig. 32 Rolling hills covered with live oak trees rise behind Port Luis Obispo near Avila, where *Velero III* often anchored while side trips were being made to Captain Hancock's Santa Maria properties.

PLATE 18

Fig. 33 View of Cuyler Harbor, San Miguel Island, looking northeast. A steady wind which blows from the west has lifted sand from the windward side of the promontory and deposited it on the lee side as shown in the picture. (Photograph, L. A. Museum—Channel Islands Biol. Survey.)

Fig. 34 View of Cuyler Harbor looking northeast from the main island of San Miguel toward Prince's Island. The *Velero III* rides at anchor at the right of the smaller islet. Chart 24, p. 379.

Fig. 35 A rookery of California sea lions off Point Bennett, at the extreme western tip of San Miguel Island. Dangerous submerged reefs extend for several miles to the west and north.

PLATE 19

Fig. 36 View of Santa Rosa Island looking northwest along the shore from the summit of Skunk Point. (Photographs, figs. 36-40, by Arthur Woodward.)

Fig. 37 Sand dunes at the east end of Santa Rosa Island. Chart 23, p. 379.

Fig. 38 Mouth of Elderberry Canyon near the wharf at Becher's Bay, Santa Rosa Island.

Fig. 39 Skunk Point, Santa Rosa Island, site of an old Indian village.

Fig. 40 View of Santa Rosa Island looking northwest across Becher's Bay. An old Indian village site is located on the point in the middle foreground.

Fig. 41 View along the beach at Santa Rosa Island showing the way in which the sand has been piled in dunes by the incessant wind. (Photograph, L. A. Museum—Channel Islands Biol. Survey.)

PLATE 20

Fig. 42 Pelican Harbor, on the northern or protected shore of Santa Cruz Island, which is sparsely covered with oak and Bishop pine. A few inhabited dwellings may be seen on the promontory in the center of the picture.

Fig. 43 Willow's Anchorage, on the south shore of Santa Cruz Island. The Tertiary sediments of Anacapa and Santa Cruz islands represent a western extension of the Santa Monica Mountains. Chart 22, p. 378.

Fig. 44 Prisoner's Harbor, Santa Cruz Island, showing the protected landing place in which small vessels may anchor to serve the farmhouse a short distance inshore. The perpendicular cliffed shore line is similar to that of Anacapa Island, which lies but a few miles across Anacapa Passage.

PLATE 21

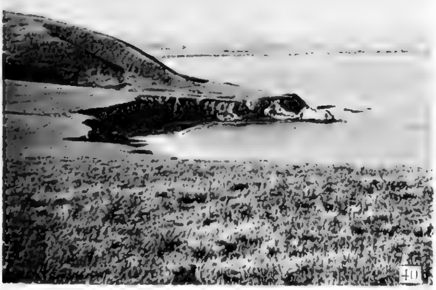
Fig. 45 East Anacapa Island, with west island visible in the middle distance and Santa Cruz Island beyond. Wave action has resulted in a remarkable series of sea stacks, seen at the base of the lighthouse. Chart 21, p. 378.

Fig. 46 The results of wave action are clearly seen on Gull Island, a series of low rocks lying off the southwest corner of Santa Cruz Island and marked by a flashing light. Much dredging was done in the vicinity of Gull Island and in the adjacent Santa Rosa Channel.

Fig. 31 *Velero III* beneath Golden Gate Bridge

Fig. 32 Port San Luis Obispo near Avila

Figs. 33, 34 Cuyler Harbor; 35 Point Bennett, San Miguel Island



Figs. 36-41 Santa Rosa Island

Figs. 42-44 Santa Cruz Island

Fig. 45 East Anacapa Island

Fig. 46 Gull Island off SW corner of Santa Cruz Island

Fig. 47 Santa Barbara Island, northwest side

Fig. 48 Santa Barbara Island

Fig. 49 Santa Barbara Island Landing

Fig. 50 San Nicolas Island, Dutch Harbor

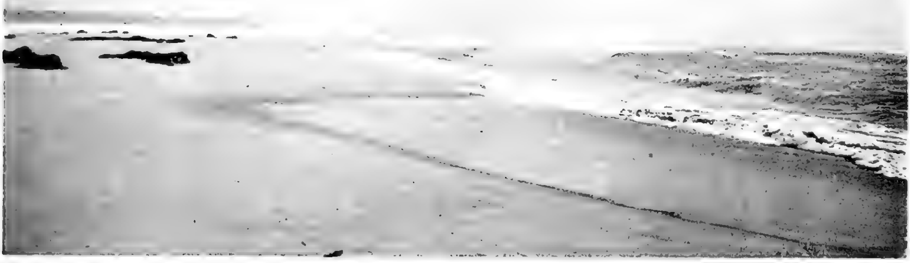


Fig. 51 San Nicolas Island, east sand spit

Fig. 52 San Nicolas Island looking southward

Fig. 53 China Point SE end of San Clemente Island

Fig. 54 Pyramid Cove, San Clemente Island

Fig. 55 San Clemente, south side looking NW from China Point

Fig. 56 Santa Catalina Island, SE end

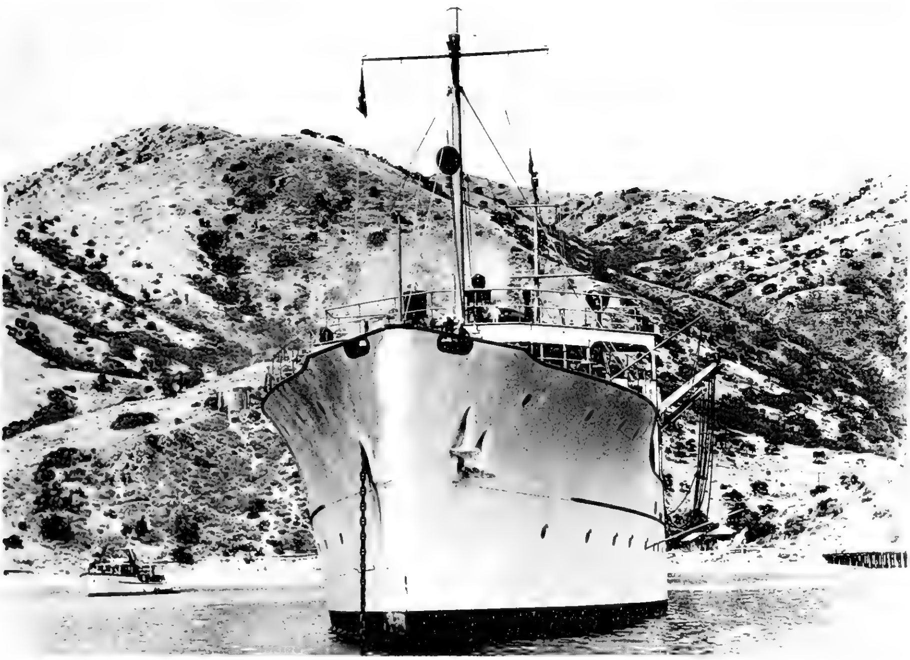


Fig. 57 Santa Catalina Island, *Velero III* in White Cove

Fig. 58 Point San Vicente light, Palos Verdes hills

Fig. 59 Point Fermin, San Pedro

Fig. 60 Corona del Mar, California, looking southward

Fig. 61 Corona del Mar, California

Fig. 62 Laguna, California, looking northward

Fig. 63 Laguna, California, looking northward

Fig. 64 Guadalupe Island, north end

Fig. 65 Guadalupe Island, south end

Fig. 66 Guadalupe Island, Elephant Seal Beach

Fig. 67 East San Benito Island

Fig. 68 West San Benito Island

Fig. 69 Village east side of Cedros Island

Fig. 70 Algae, Cedros Island, South Bay

Fig. 71 Cedros Island, South Bay

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

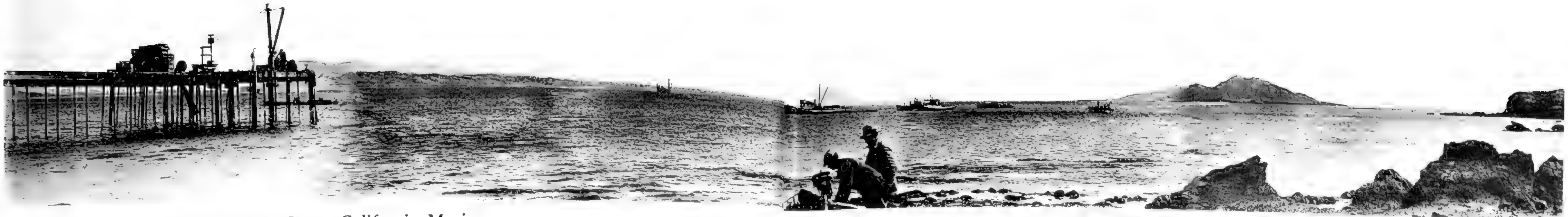


Fig. 75 Panorama of Turtle Bay, Lower California, Mexico

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, 2½ 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 2¾ 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, 4½ 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 3½ 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 Pichilinque 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 Pichilinque 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 1¼ 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, 3½ 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 Firma 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, 17½ miles long and 6 miles in greatest width, with its southern point, Punta Baja, 3½ 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 1½ miles is an irregular island, Coronados Island, 1¾ miles by 1½ 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, 1¼ 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, 1¼ by ½ 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, 4½ 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, 8¾ 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, 1¾ 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, 2½ miles from shore, is San Marcos Island, 5½ miles long and 1¼ to 2½ 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, 6½ 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, ¾ mile by ½ mile, is whitened with guano. Around it and also around Isla Partida are several outlying rocks, some of them of considerable size. Isla Partida, 1¼ miles by ½ mile, is 4½ 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 Ballenas 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 ¼ 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, 14¼ miles farther on. Bluff Point is the tip of a bold, rocky headland, the northeastern 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 Ballenas 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 18½ 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 1½ 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 Pichilinque 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

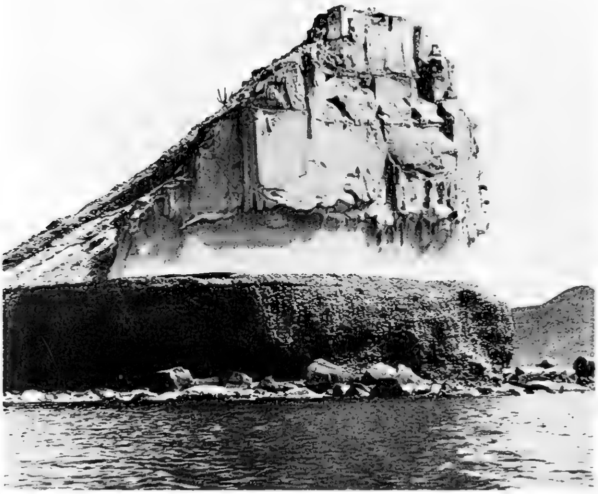


Fig. 83 Espiritu Santo Island, headland south of San Gabriel Bay

Fig. 84 Espiritu Santo Island looking toward La Paz Bay

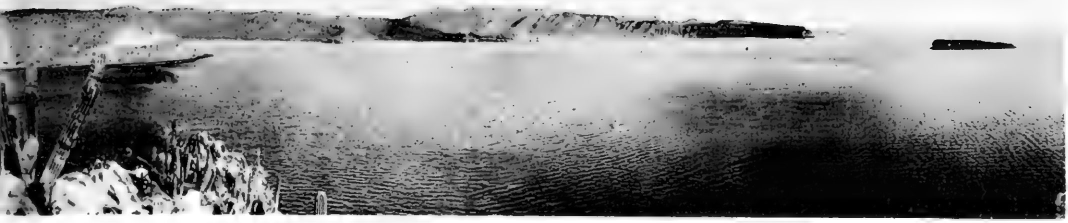


Fig. 85 (*above*) Espiritu Santo Island, coral heads, low tide
Fig. 86 Espiritu Santo Island, headland, San Gabriel Bay

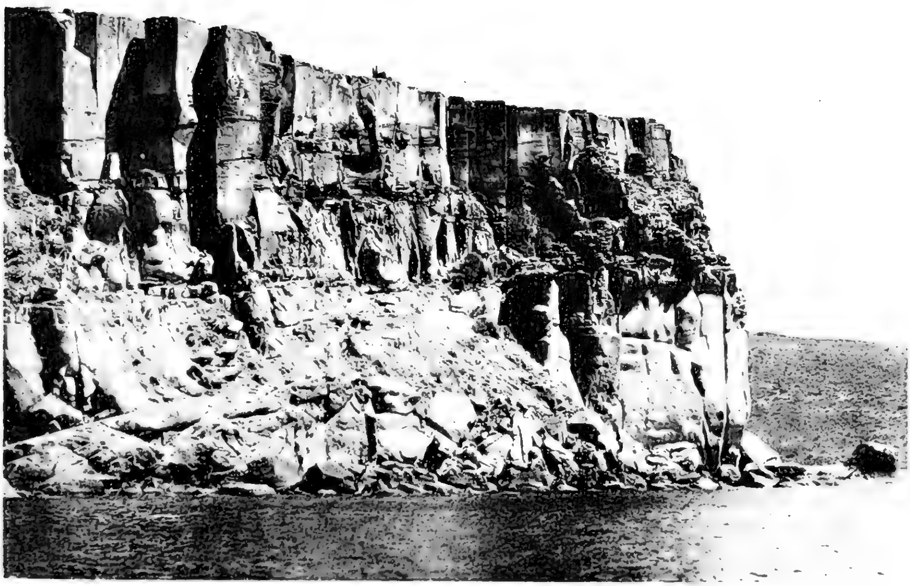


Fig. 82 Panorama, Espiritu Santo Island from the west

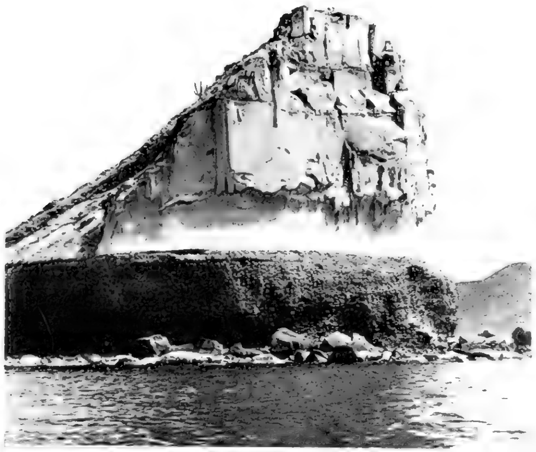


Fig. 83 Espiritu Santo Island, headland south of San Gabriel Bay

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

Fig. 84 Espiritu Santo Island looking toward La Paz 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

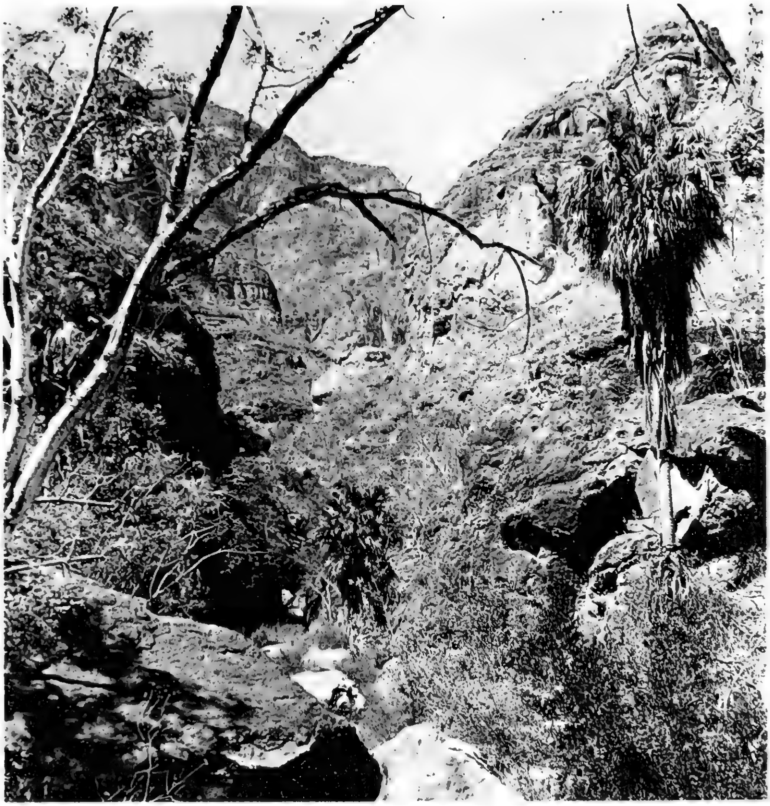


Fig. 97 Looking toward Sierra de la Giganta, Escondido Bay, Gulf of California

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

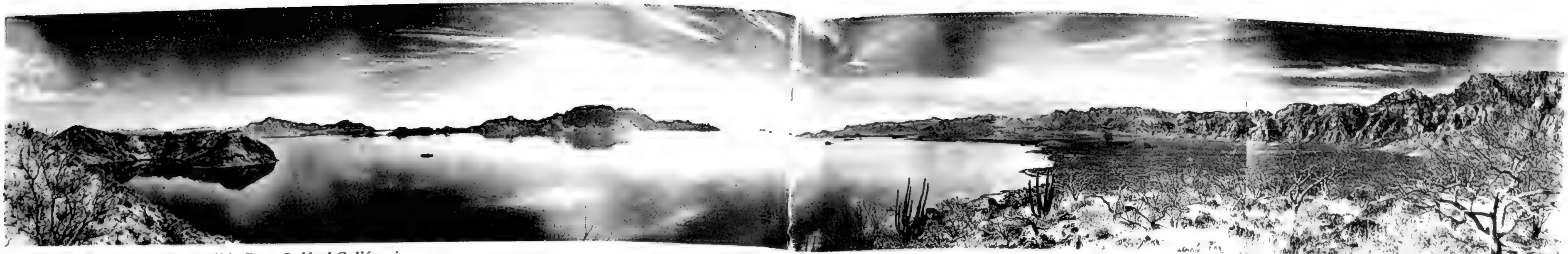


Fig. 99 Panorama, Escondido Bay, Gulf of California

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

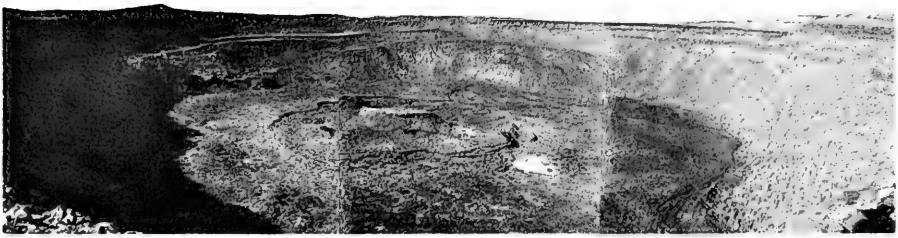


Fig. 104 Crater, Tortuga Island, Gulf of California

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

Fig. 110 Angel de la Guardia Island, from Granite Island

Fig. 111 Puerto Refugio, Angel de la Guardia Island

Fig. 112 Puerto Refugio, Angel de la Guardia Island, looking west

Fig. 113 Reef at Puerto Refugio, Angel de la Guardia Island

Fig. 114 Entrance Angeles Bay, Gulf of California

Fig. 115 Round Top Mountain behind Angeles Bay

Fig. 116 Pond Island, Gulf of California

Fig. 117 Panorama, Angel de la Guardia Island, north end

Fig. 118 Panorama, San Felipe Bay, Gulf of California

Fig. 117 Panorama, Angel de la Guardia Island, north end

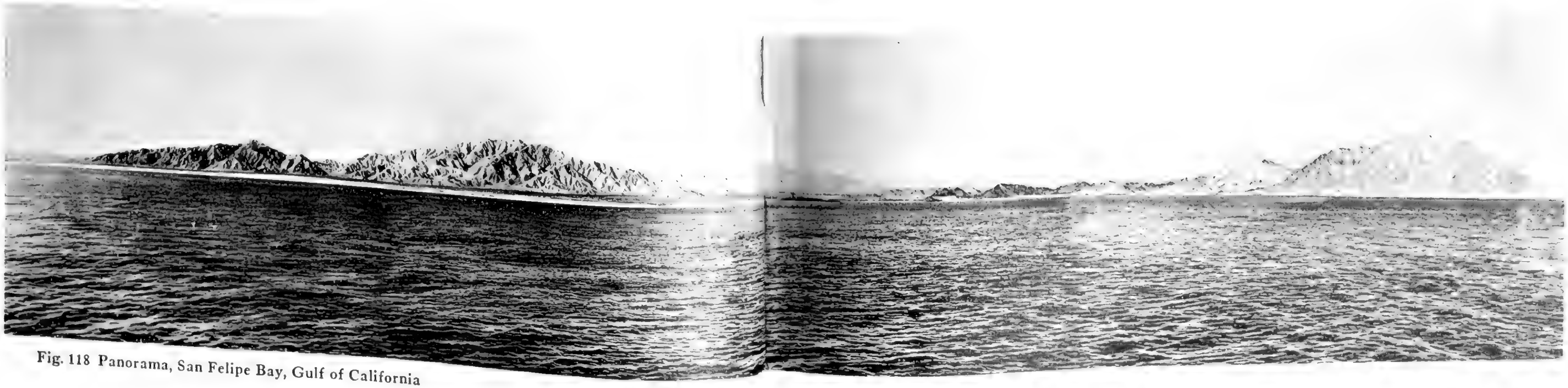


Fig. 118 Panorama, San Felipe Bay, Gulf of California

Fig. 119 Angel de la Guardia Island, mountain of pumice

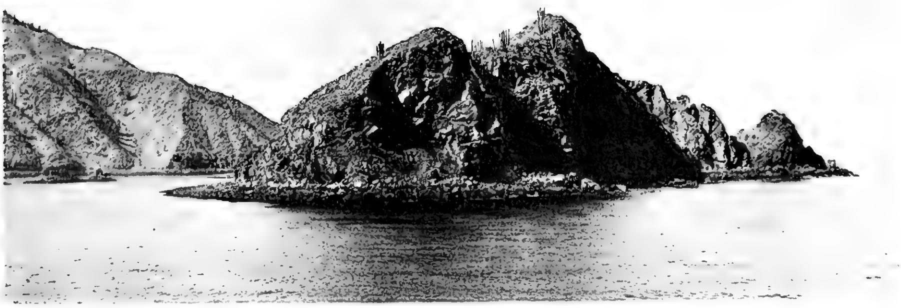


Fig. 120 Islet of Puerto Refugio Bay, Angel de la Guardia Island

Fig. 121 Gonzaga Bay, Gulf of California

Fig. 122 San Luis Island, north of Gonzaga Bay

Fig. 123 Panorama of nesting colony Heerman Gulls, George's Island

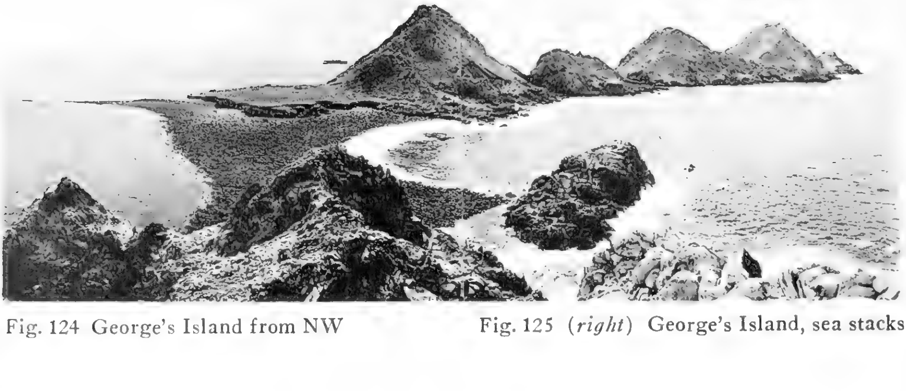


Fig. 124 George's Island from NW

Fig. 125 (*right*) George's Island, sea stacks

Fig. 123 Panorama of nesting colony Heerman Gulls, George's Island

Fig. 124 George's Island from NW

Fig. 125 (*right*) George's Island, sea stacks

Fig. 126 Heerman gulls, George's Island

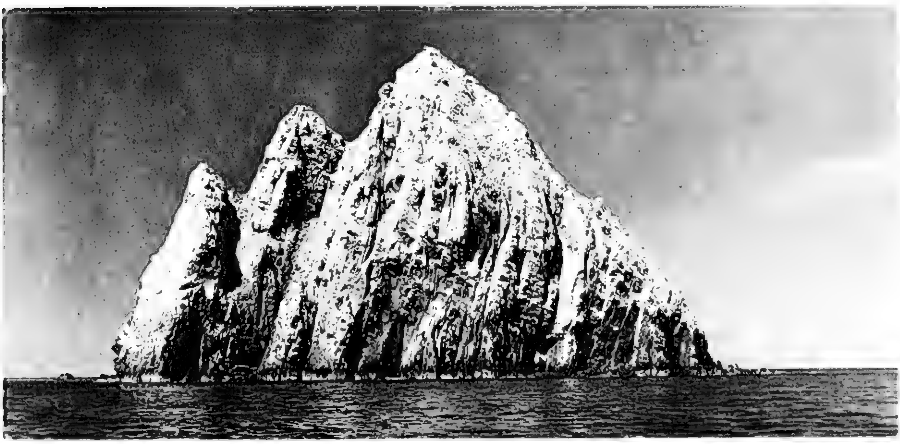


Fig. 127 Consag Rock, Gulf of California

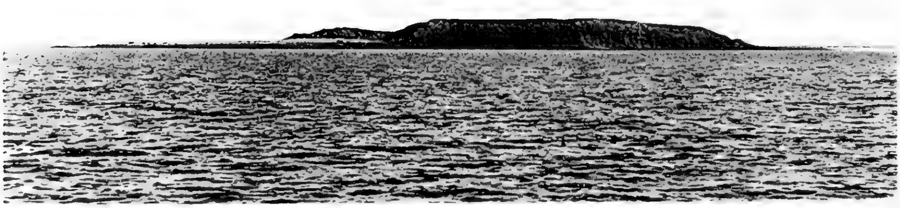


Fig. 128 Rocky Point, Sonora, Mexico

PLATE 49

Fig. 105 Isla Raza, Gulf of California, looking north toward Isla Partida and Angel de la Guardia Island, which are shown in the left background. The pools in the foreground have been artificially built for the culture of oysters.

Fig. 106 Isla Partida, showing the western half of the island as viewed from the eastern half. The inlet at the right and a corresponding indentation to the left of the picture divide the island opposite the low isthmus shown in the foreground, so that from a little distance it resembles two islands. Chart 59, p. 400.

PLATE 50

Fig. 107 Unusual geologic formation at Isla Partida, Gulf of California. The columnar basalt shows cooling from a series of centers. The water in the foreground is deep, the illusion of shallowness being given by reflections of the rock mass.

Fig. 108 A number of planed terraces are seen in this photograph, taken at San Francisquito Bay, Gulf of California. The arm of the bay shown in the foreground is subject to extreme rise and fall of tidal level, since it is located opposite the narrow Sal Si Puedes Channel. Chart 58, p. 399.

Fig. 109 San Francisquito Bay, Gulf of California, is located just below San Francisquito Point, which in turn is located opposite San Lorenzo Island, across the famed Sal Si Puedes Channel, the swift current of which was much feared in the days of small sailing vessels.

PLATE 51

Fig. 110 View of Angel de la Guardia Island from Granite Island, located in Puerto Refugio. A flock of pelicans may be seen along the edges of the rocky spit which extends into the bay. Chart 59, p. 400.

Fig. 111 Puerto Refugio, Angel de la Guardia Island, has many arms extending among the low-lying foothills of the mountain chain arising in the background. The beach in the foreground shows clearly the 12-foot rise and fall of tide which continually alters the relative proportions of land and sea.

PLATE 52

Fig. 112 Puerto Refugio, Angel de la Guardia Island, seen from a hilltop located on the east side of the bay. The series of rocky spits extending into the bay are all part of the same bed of hard rock which underlies the softer deposits. The mainland of Lower California can be distinguished in the far distance.

Fig. 113 Reef at Puerto Refugio, Angel de la Guardia Island, a favorite collecting ground for the marine zoologists. It is the result of a tilted bed of hard rock which has withstood the weathering that has reduced the softer formation.

PLATE 53

Fig. 114 The entrance to Angeles Bay, Lower California, is guarded by several small islets, two of which are shown in the center of the picture. Much profitable dredging was accomplished by the small dredge boat in this vicinity. (See pls. 13, 14.)

Fig. 115 Round Top Mountain, elevation 3,423 feet, rises behind Angeles Bay, Lower California. An alluvial fan, cut by wave action, is shown in the foreground.

Fig. 116 Pond Island, Gulf of California, seen from the deck of *Velero III*. The island lies to the south of Angel de la Guardia Island and encloses a large lagoon in which rock oysters are found. Chart 59, p. 400.

PLATES 54, 55

Fig. 117 (A panorama.) A view of the north end of Angel de la Guardia Island, Gulf of California, showing Granite Island on the left, Mejia Island on the right, and the entire bay of Puerto Refugio between them.

Fig. 118 (A panorama.) San Felipe Bay, seen from the east. In the extreme distance rises the mountain range which forms the backbone of the Lower California peninsula and culminates in Mt. San Pedro Martir, elevation 10,000 feet, opposite San Felipe Bay. Chart 63, p. 402.

PLATE 56

Fig. 119 A mountain of pumice, located on the east side of Angel de la Guardia Island, Gulf of California. Pieces of this rock will float when placed in water.

Fig. 120 A nameless islet in Puerto Refugio Bay, Angel de la Guardia Island, Gulf of California.

PLATE 57

Fig. 121 A perfect spit separates the lagoon in the background from Gonzaga Bay (shown in the left foreground). In the right foreground is the narrow channel which lies between the tip of the sand spit and the rocky promontory from which the photograph was taken. The lagoon is a favorite stopping place for migratory birds.

Fig. 122 The island of San Luis, located north of Gonzaga Bay in the Gulf of California, is composed entirely of a soft gray sandstone which shows beautiful bedding.

PLATES 58, 59

Fig. 123 Nesting colony of Heerman gulls at George's Island, Gulf of California. The site chosen by the birds is an ancient alluvial fan. No eggs had yet been laid at the time the picture was taken.

Fig. 124 George's Island, seen from the northwest. *Velero III* may be seen in the distance directly above the remnants of an old alluvial fan. The reef in the foreground is awash at high tide.

Fig. 125 Marine biologists collecting on a reef which extends between two of the series of sea stacks which comprise George's Island, Gulf of California.

PLATE 60

Fig. 126 Heerman gulls nesting on the remnants of an ancient alluvial fan at George's Island, Gulf of California.

Fig. 127 Consag Rock, a conspicuous landmark for vessels setting a course to the mouth of the Colorado River. It is of basalt, the columns showing almost vertical jointing, and rises from the otherwise muddy floor of the upper Gulf to a height of 285 feet. Chart 63, p. 402.

Fig. 128 Rocky Point, Sonora, was the northernmost locality visited by *Velero III* on the east side of the Gulf of California. It is the terminus of an almost impassable road leading across the desert from southern Arizona. Chart 64, p. 402.

Gulf of California—East Coast

Plates 60-64; Charts 63-69

On the east coast of the Gulf of California, the *Velero III* has not proceeded farther north than Rocky Point. From this point to the mouth of the Colorado River the coast has been described by the *Coast Pilot* thus:

Beyond Shoal Point, the eastern entrance point of the Colorado River, the coast, trending east-southeastward for a distance of 10 miles, is generally low, with here and there a sandhill of moderate height. Shoal water extends off shore to distances increasing from ½ mile, near Shoal Point, to 2 miles, at a position 10 miles farther east-southeastward.

Adair Bay is a wide indentation that is entirely open to the southward, and is so filled with dangerous shifting shoals as to be impracticable for even the smallest coasters. Its western limit lies 10 miles east-southeastward of Shoal Point, and Rocky Bluff, the eastern limit, lies 35½ miles in the same direction from that point. The coast recedes 10 miles from a line drawn between these two points. The shore of the bay is low and sandy, with occasional rocky patches. Opening into the northern part is a lagoon, at the entrance to which there are several drying sandspits that project out 2 or 3 miles into the bay. Low plains with surface deposits of soda extend far into the interior. Spring tides rise about 22 feet.

From the bold Rocky Bluff the coast turns eastward for 5 miles to Rocky Point, the stretch between being Rocky Point Bay, with a sandy shore. There are dredging stations off Rocky Bluff and in Rocky Point Bay, 4-12 fathoms, sand and mud, at one of which basketstars were obtained.

From Rocky Point the coast turns almost directly eastward for 22 miles and then southward to form the wide open Georges Bay, about 26 miles from point to point, with low, sandy shore. Lying 7 miles offshore from the southern extremity of the bay is a high, barren rock, white with guano, Georges Island, with small outlying rocks. On portions of the shore there are large individual rocks, so that the shore might be described as a very coarse shingle. Here some collecting has been done, and there are dredging stations near the island.

From the southern extremity of Georges Bay the coastal trend is almost directly southward for more than 20 miles, when it gradually swings eastward past the mouth of the San Ignacio River, 32 miles from the southern extremity of Georges Bay, and then southward again to Cape Tepoca, 18 miles from the mouth of the river. The northern part of this coast is low and sandy, but the southern part is not so low. Cape Tepoca is high near the tip, but lower farther back. A low, rocky point extends ½ mile southeastward to be continued as reef for some distance farther. The point and reef form the western limit of Tepoca Bay, 2½ miles across, the western portion of the shore being low and sandy, but the eastern with sand bluffs. Shore collecting has been done on the point and on the reef, and dredging in the bay.

From Cape Tepoca the coast turns eastward and then southward again to Cape Lobos, 23 miles distant. The sand cliffs extend for some distance, to be followed by a low, sandy shore. Cape Lobos is similar to Cape Tepoca, sheltering Libertad Anchorage in the same way that Cape Tepoca shelters Tepoca Bay. There are one shore station at Cape Lobos and two dredging stations offshore to the northwest.

From Libertad Anchorage, the coast continues in a southeasterly direction for 36½ miles to Cape Tepopa, with much the same type of coast, but with less of a sweep than in the two previous bays. Like the other two points, Cape Tepopa is a bold, rocky headland. Six and a half miles farther on in the same general direction is Sargents Point, also high and rocky, but it is connected with the mainland by a low, narrow neck of land that may be submerged at high tide. West of this point, 5½ miles, lies Patos Island, which, except for a conical hill in the northwest portion, is low. It, also, is white with guano. Collections of plants and insects have been made on this island.

From Sargents Point there is another sweep southeastward 20 miles to San Miguel Point, with a much similar coast line. From 2½ to 3½ miles off this part of the coast lies the northern half of the largest island in the Gulf of California, Tiburon Island, with the northern extremity 4 miles south of Sargents Point. It is high and rugged but not so barren as other islands in the Gulf, with a length north and south of 29 miles and an average width of 15 miles. It is nearly rectangular, but the east side is somewhat longer than the west. The north and much of the east coast are low and sandy, but the remainder is bolder and more rocky. Only the shore at the southeast corner is much broken.

The southeast point of the island, not named on the chart, is a high headland at the extremity of a peninsula that forms a bay, well protected from the southeast winds. To the westward of this point, 3 miles, separated from it by a narrow bay with a sand beach, is Monument Point, the most southerly point of the island. Off this bay are Turners Island, 1¼ miles by ½ mile, Seal Rocks, and several other rocks and reefs. Another small bay separates Monument Point from Red Bluff Point, 2½ miles westward. West of Red Bluff Point, the coast again becomes regular.

Only the vicinity of the southeastern extremity of the island has been explored, on both sides of the extreme southeastern point and around Turners Island, shore collecting on sand, rock, shingle, and reef, dipping, seining, and much dredging—almost wholly in shallow water.

Lying 7¾ miles south of Willards Point, the western extremity of Tiburon Island, is a barren, rocky island, 4 miles by 3 miles, Esteban Island, with plenty of coastal variety, rocks, reefs, gravel, shingle, and a sandspit (to the southwest). There have been shore collecting along the south shore and dredging to the east and southeast of the island.

From San Miguel Point southeastward to Point San Antonio, a distance of 90 miles, there are no significant coastal features. The coast is still low and sandy, and the water is shallow for a long distance from shore, but rocky bluffs, not very high ones, appear more often than farther north. The bluffs are continuous enough for 5 to 10 miles northwest of Point San Antonio to form a rugged coast for this short distance.

Directly west of Point San Antonio, 15 miles, and 8 miles from the nearest Sonora mainland is the barren, rocky, volcanic islet, San Pedro Nolasco Island, 2¼ miles long, ¾ mile wide. The coast is largely inaccessible. Off the southern end there are detached rocks, but elsewhere the water is deep close to shore. Some land plants have been collected on the island, and dredging has been done to the east and the northeast, in 45 to 110 fathoms.

The shore for some distance east of Point San Antonio becomes much higher and more rugged. The mountain peaks are nearer the coast, and the coast line is much more broken with numerous small indentations, projecting points, and small islands. East of Point San Antonio 2½ miles is Punta Doble, forming the western extremity of a large open bay, Ensenada San Francisco, the shore of which sweeps eastward and then southward to Cabo Arco, the southeastern extremity, 7 miles from Point Doble. There are several secondary inlets, of which Puerto San Carlos, nearer the northwestern end of the bay, affords the best shelter. Most of the collecting in Ensenada San Francisco has been done in or near Puerto San Carlos, shore collecting on rock and shingle, dipping, seining, beam trawling, and dredging.

From Cabo Arco the coast extends slightly south of east, in a series of three bights, to Cabo Haro, 4 miles away. Cabo Haro is the southern point of a peninsula that shuts off the inner harbor of Guaymas from the open Gulf and forms the western boundary of the outer harbor and the southern boundary of the middle harbor. The west face of this peninsula extends irregularly 4 miles from Cabo Haro to Punta Baja. The most protected inlet is Bahia Catalina, 1½ miles from Cabo Haro, where shore collecting on shingle and dredging in and outside the bay have been carried on.

The outer harbor is shut off from the Gulf by the Isla de Pajaros and from La Laguna, an extensive body of water lying to the northward, by the long, narrow spit from the east shore, Playa de los Dolores. The outer harbor is wide open to the middle harbor, but the middle harbor is somewhat closed off from the inner harbor by islands and peninsulas, between which, however, there is a clear passage. The outer harbor is suitable for anchorage of large ships, but the middle harbor is shallower, and the inner harbor more so, only suitable for vessels of shallow draft.

The City of Guaymas is situated at the head of a small bay on the northwestern side of the inner harbor.

Some shore collecting on rock and shingle in the middle and inner harbor and one dredging station, in 2-3 fathoms, in the middle harbor cover the activities here.

The rugged hills and mountains, which are conspicuous near the shore in the Guaymas region, do not last for long, but the low-lying shore and immediate background hold sway again for a great distance. From Guaymas Harbor to Ahome Point, approximately 175 miles, through three long, sweeping curves, there is little else than sandy shores, sandy islands, sandy shoals, and sandy lagoons, making it difficult to approach the shore, and with such little variety that it offers little attraction to a marine collector. No collecting has been done anywhere near this part of the coast.

From Point Ahome, the same type of coast extends directly southward for 20 miles to San Ignacio Point, a point on a small island of the same name that lies off a large island, Santa Maria Island, 13½ miles long, one of the many elongated, low islands, separated by lagoons or shallow water areas from the low mainland. The trend of the coast here is eastward; so the long axis of the island lies east and west. Its southern shore forms the boundary of San Ignacio Bay. The east point of the island, Santa Maria Point, delimits, to the westward, Topolobampo Harbor and its northwestern extension, San Carlos Bay.

Lying 13 miles west-southwestward of Santa Maria Point is San Ignacio Farallon, a conspicuous, white, barren rock, 465 feet high.

Shore collecting has been done on the rocks at San Ignacio Farallon, and dredging in San Ignacio Bay, in 3 to 90 fathoms.

Southeast of Topolobampo Harbor the coast is of the same type found throughout the whole State of Sinaloa, so that no collecting has been done for another 175 miles, where there is one dredging station in 6-8 fathoms off Point Piaxtla, which, for a change, forms a rocky headland. Even at Mazatlan, 35 miles farther south, no marine collecting has been done. The *Velero III* called here in December, 1931, but the collecting at this time was all inland collecting.

Although Mazatlan is the largest city on the coast between San Diego and Panama, only the outer harbor is accessible to large vessels. The entrance is between Creston and Chivos islands.

As Mazatlan is nearly directly east of Cape San Lucas, it may be considered to be the southeastern limit of the Gulf of California; but, commonly, Cape Corrientes, 175 miles farther south, is considered to be the limit.

For the first 70 miles from Mazatlan the trend of the coast line continues to the southeast and then turns more nearly southward. For about 100 miles from Mazatlan the coast is similar to that farther north, after which it becomes more bold and rugged and the sandy islands and the lagoons disappear.

Lying 17 miles offshore, 50 miles south of the boundary between Sinaloa and Jalisco and 90 miles north of Cape Corrientes, is Isabel Island, 1½ miles long, ½ mile wide, and 280 feet high, with several rocks or rocky islets offshore. The main island consists of three large crater cones, the half toward the water, in each case, having entirely disappeared. Two of them, in vertical section, have the appearance of lava formation, but the one facing south looks definitely like sandstone. Vegetation is sparse, but there is enough to show up distinctly on the northeastern slope, where it covers the surface quite fully. It is evidently a favorite resort and nesting place for myriads of frigate birds, terns, boobies, and tropic birds. Two of the outlying rocks, close to the northeast point of the island, are conspicuous. One of them is supposed to resemble a swan. The only sand beach is a small one near the southeastern end of the island.

This island has been visited on five occasions for specimens, on land, on sandy and rocky shore, on reefs, dipping near the surface, and on sand, coralline, and nullipore bottom in shallow water, 25 fathoms or less.

Approximately 40 miles to the southwest of Isabel Island are Las Tres Marias Islands. The northernmost island, San Juanito, is a small island, 2½ by 1¼ miles, and the three main islands, Maria Madre, Magdalena, and Cleopha, follow in a series to the southeast. The islands are volcanic, with their western sides high, barren, inaccessible cliffs and the sea bottom dropping abruptly into deep water, but with the eastern sides low, sandy, and less barren. From the shores of all the islands there are extensive reefs and outlying rocks.

Maria Madre, 2 miles from San Juanito Island, is the largest, 12 miles long and 3 to 6 wide. A channel, 4 miles wide, separates it from Magdalena Island, the second largest, 8 miles long and 4½ wide, which, in turn, is separated from Cleopha, a nearly circular island, with a diameter of 3 miles, by a channel, 8½ miles wide. There are one shore station on the east coast of Magdalena Island and two dredging stations east of this island.

Port San Blas is situated where the low, sandy shore and low back-country plains change over to the more rugged coast, where the mountains or high hills come much nearer the sea. Sandy beaches do not entirely disappear, but, when they do appear, there are usually rocky bluffs on each side and small islands offshore.

From Port San Blas, the coast turns eastward, then southward and southwestward to Punta Mita, 50 miles away, from which it turns abruptly eastward again to form the northern boundary of a 20-mile deep indentation, Banderas Bay, 15 miles across, with the southwestern limit at Cape Corrientes.

Fig. 129 George's Island, Gulf of California

Fig. 130 Tiburon Island, Gulf of California

Fig. 131 San Esteban Island, south shore

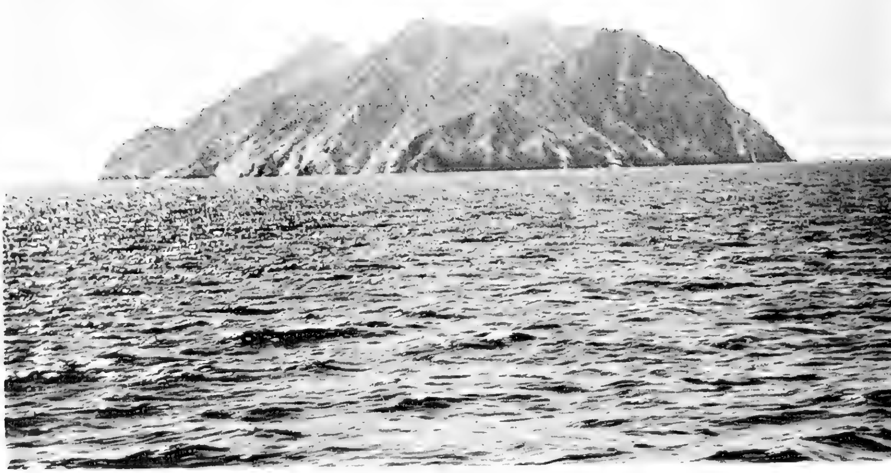


Fig. 132 San Pedro Nolasco Island

Fig. 133 (*left*) San Pedro Nolasco Island

Fig. 134 (*right*) Sonoran mainland from San Pedro Nolasco Island

Fig. 135 (*below*) Sonoran coast line, north of Guaymas

Fig. 136 Puerto San Carlos

Fig. 137 San Ignacio Farallon

Fig. 138 Puerto San Carlos, *las tetas de cabra*

Fig. 139 Guaymas Harbor, Mexico

Fig. 140 Mazatlan, Mexico

Fig. 141 Mazatlan, Mexico, beach south

Fig. 142 Crater Lake, Isabel Island, Mexico

Fig. 143 Isabel Island, Mexico, reef

Fig. 144 Panorama, Isabel Island

Fig. 145 Reef, Isabel Island

Fig. 146 Isabel Island, beach

Fig. 147a Tenacatita Bay, Mexico

Fig. 147b Navidad Head from Tenacatita Bay

PLATE 61

Fig. 129 George's Island, Gulf of California, is the nesting site of thousands of Brewster's boobies and lesser numbers of red-billed tropic birds. Chart 64, p. 402.

Fig. 130 A quiet inlet on the southeast shore of Tiburon Island, Gulf of California, home of the nomadic tribe of Seri Indians. A dwarf species of deer is said to occur on the island, which is exceedingly barren, mountainous, and with no apparent sources of fresh water. Chart 66, p. 403.

PLATE 62

Fig. 131 The south shore of San Esteban Island shows a type of undercutting by wave action which is characteristic of the unprotected shores of the Gulf of California. The ship's launch is shown in the foreground. Chart 66, p. 403.

Fig. 132 San Pedro Nolasco Island is located in the Gulf of California north and west of Guaymas. There are few landing places on its steep granite slopes. It is inhabited largely by pelicans, boobies, and rock iguanas. Chart 67, p. 403.

PLATE 63

Fig. 133 One of the several boulder-strewn canyons which rise precipitously from the eastern shore of San Pedro Nolasco Island, Gulf of California.

Fig. 134 Mainland of Sonora, Mexico, seen from the shores of San Pedro Nolasco Island, Gulf of California.

Fig. 135 The Sonora coast line north of Guaymas is exceedingly irregular. Perhaps no landmark in the entire Gulf is more distinctive than *las tetas de cabra* shown above the ship's telegraphic control.

PLATE 64

Fig. 136 Puerto San Carlos, a small landlocked bay in the vicinity of Guaymas, Sonora, affords ideal protection to small vessels. *Velero III* anchored outside in the larger Ensenada de San Francisco.

Fig. 137 San Ignacio Farallon is located in the southern portion of the Gulf of California about 18 miles from Topalobampo Harbor. (Like Consag Rock, it seems to bear no relation to its surroundings, the mainland territory being low and sandy.) Expedition members scaled the summit and found thousands of nesting sea birds, including tropic birds and Brewster's boobies. Chart 68, p. 403.

Fig. 138 The *las tetas de cabra* is a particularly eroded pinnacle located within sight of Guaymas, Sonora. Hancock Expedition scientists scaled all but the topmost pinnacle on two separate occasions. Chart 13, p. 371.

PLATE 65

Fig. 139 Panoramic view of the harbor at Guaymas, Sonora, showing cargo vessels in the foreground and the city in the middle distance. The boat landing is to the left of the cathedral spires shown above the lowest of the signal flags. Chart 13, p. 371.

Fig. 140 Beach at Mazatlan, Mexico, just west of the harbor, showing breakwater extending to Chivos Island in the center, in back and to the right of which a freighter may be seen. Chart 13, p. 371.

Fig. 141 Entrance to the harbor at Mazatlan, Mexico. The lighthouse is perched upon Creston Island at the right, fully 500 feet above the surface of the sea.

PLATE 66

Fig. 142 Crater Lake at Isabel Island, Mexico, showing one of the sea stacks at the left and *Velero III* at the right. The forest of low trees in the foreground is occupied by nesting man-o'-war birds. Chart 69, p. 404.

Fig. 143 Wave-worn coast of Isabel Island, Mexico, showing the *Velero III* and one of her launches in the left middle distance and a portion of the Mexican mainland beneath the cloud bank on the right horizon.

PLATE 67

Fig. 144 Panorama of Isabel Island, Mexico, showing on the left the highest portion of the eastern half of the island, in the center the two stacks, crater lake, and reef-enclosed landing place, and on the right the semi-detached headland behind which may be seen the *Velero III* and the cloud-banked mainland of Sinaloa.

Fig. 145 Reef on which much shore collecting was accomplished at Isabel Island, Mexico. Landings were made in the shallow cove to the right, which was reached through the narrow passage seen above the first headland.

PLATE 68

Fig. 146 Rocky beach at Isabel Island, Mexico, showing nesting blue-footed boobies in the lower left-hand corner and a much-eroded sea stack in the right background.

Fig. 147a Beach at Tenacatita Bay, Mexico, showing thatched huts occupied seasonally by palm nut harvesters in the middle distance. Chart 70, p. 404.

Fig. 147b The southeast shore of Tenacatita Bay, Mexico, from Tenacatita Head on the left to Navidad Head, the cluster of islets on the right, has an average elevation of from 400 to 500 feet. A grove of coquita nut palms may be seen beyond the beach.

Mexico from Cape Corrientes to Guatemalan Boundary

Plates 65-76; Charts 70-73

Cape Corrientes, of itself, is not a particularly noticeable landmark, but it is situated at the tip of a prominent convexity in the coast line, south of which the trend changes definitely from south or slightly southeast to but little south of east. Off the Cape, in consequence, there are strong currents and tide rips such as are usually found in such situations. It is a bold headland, 506 feet high, and the wooded country back of it rises rapidly to mountain heights.

There is little variety in the coast line from Cape Corrientes to the Guatemalan boundary. It consists, in the main, of a series of sand beaches separated by rocky points. The sand beaches vary much in length, and the rocky points may be small and low, or in the nature of high bluffs, or even headlands of considerable width. There are very few indentations significant enough to be called bays, but along the whole coast there are anchorages, safe enough in the dry season, from December to May. Where there are bays, there are commonly outlying rocks and islands. As a background to the shore, the surface of the land rises rapidly and far to the high mountain heights, so that some of the highest mountains in Mexico can be seen in clear weather from a few miles offshore. The lower portion of the rise is often quite barren looking, but, higher up, the mountain sides may be heavily wooded.

South of Cape Corrientes the first location explored is Tenacatita Bay, some 80 miles from the Cape, still in the large convexity of the coast. It lies between Brothers Point to the west and Navidad Head to the southeast and is 5 miles across the entrance. Brothers Point is a high, bluff headland, connected to the mainland by a low, sandy isthmus. Lying offshore are some rocks and rocky islets. The north shore and the head of the bay are sandy. Along this shore a lagoon running parallel to the shore empties into the bay. The land at the head of the bay is wooded in part, and there are large nutpalm groves. The southeast shore is higher and more rugged, becoming more so as it extends outward to form Navidad Head, which separates Tenacatita Bay from Navidad Bay. Extending southward from Navidad Head is a chain of rocky islands. There is deep enough water for anchorage in most of the bay, but, when the northwest wind blows, the bay is much exposed.

The bay has been visited several times. Some interesting material has been obtained at the entrance to the lagoon and along the rocky shore, especially at Navidad Head. Dredging toward the head of the bay was not very effective, but the rich fauna off Navidad Head more than makes up for any deficiency elsewhere. It is doubtful if any other location explored has so much to offer.

Leaving Tenacatita Bay to follow the coast with a trend somewhat south of eastward, there is nothing to record for over 200 miles, until Petatlan Bay is reached. The landward view is much like it has been, except that perhaps the high mountains come a little nearer the coast, and higher individual peaks come into view. The two Colima peaks, the western sentinels of a long volcanic chain, are situated in the Tenacatita Bay hinterland. In many cases the immediate foreground is low, and there are many lagoons similar to the one near shore in Tenacatita Bay, running parallel to the coast. Manzanillo, the port of entry for the State of Colima, is situated on the east shore of Manzanillo Bay, 30 miles from Tenacatita Bay.

Petatlan Bay, 7 miles across at the entrance, forms an indentation in the coast line 2½ to 3 miles deep, between a somewhat inconspicuous, rocky bluff to the northwest and Punta Gorda, the tip of a bold headland, 640 feet high, Morro de Petatlan, to the southeast. This headland is connected with the mainland by a low, wooded isthmus. On the bay side of the isthmus the shore is shingle or rock, but on the southeast side there is a long, sandy beach. On the seaward side of the headland the cliffs are abrupt, perpendicular in places, but they leave a low, narrow ledge between them and the water's edge at low spring tide. The east and north shores form a sandy beach.

Lying 1 to 1½ miles westward of Punta Gorda are the White Friars (Potoci), a group of 12 rocks, of which 4 are large enough to be dignified by the name of islands or islets. They serve as nesting places for a variety of marine birds and are covered by guano to such an extent that, since they stand out clearly from the shore, they can be recognized for a long distance, particularly in approach from the southward.

Lying a mile off the northwest entrance to the bay is the conspicuous Black Rock, 46 feet high, and steep on all sides. To the westward of the bluff at the northwest limit of the bay and of Black Rock is the small but safe and well-protected bay, Sihuatenejo Bay, in which the *Velero III* anchored December 11 and 12, 1931.

White Friars have provided ornithological material and photographs. The shore on the bay side of Morro de Petatlan is rather barren, but the small strip at the base of the cliffs on the seaward side is much more interesting. Dredging in the bay has given only fair results. Near the White

Friars it is much better, especially on the south side, i.e., between White Friars and Morro de Petatlan. Two hauls were made in deep water, 5 miles out from White Friars, in the mud, with not very encouraging results. The depths were 60 and 100-140 fathoms. From the deeper haul, a larval spiny lobster created some surprise.

East-southeastward from Morro de Petatlan, 115 miles, is Acapulco Harbor. The entrance lies between the Acapulco heads. In the entrance and farther in the bay there are several islands, islets, and individual rocks, but there are safe passages into what "is considered the finest (harbor) on the west coast of Mexico." From the main bay there are secondary bays, upon the shore of one of which, Santa Lucia Bay, is situated the city of Acapulco, the port of entry for the State of Guerrero. All around the harbor are high mountains that provide shelter. The *Velero III* anchored here, southbound, December 14-15, 1931, and northbound, February 12-13, 1932.

There is one dredging station 16 miles southeast of Acapulco Harbor, 2 miles offshore, in 11 fathoms, fine sand.

From Acapulco Harbor, with the trend of the coast in the same general direction, it is 115 miles to Chacahua Bay. From Acapulco eastward, the high hills in the foreground and the high mountains in the background gradually disappear, and for 50 or 60 miles they are little in evidence. They begin to show again before Chacahua Bay is reached, so that they take on much the same appearance as they do west of Acapulco. The entrance to Chacahua Bay, 6 miles across, lies between two high, rocky headlands, Punta Galera to the west and Morro Hermoso to the east, which, like so many of the headlands along the Mexican coast, are each connected with the mainland by a low isthmus. There are rocks and reefs off Punta Galera, but few of them off Morro Hermoso. At the head of the bay a sandbar separates the bay from Chacahua Lagoon. There are a shore station at the margin of the lagoon and one at the rocks at the entrance, where *Heliasters* are abundant. There are dredging stations in the shallow water in the bay in sand, and outside the bay in 45-50 fathoms, mud.

East of Chacahua Bay the coast line continues eastward and then swings to form a southward convexity before turning north of east again to Tangola Tangola Bay, 95 miles from Chacahua Bay.

Tangola Tangola Bay, the last of three shallow indentations of the coast, with sandy beaches and rocky points between, is preceded by Santa Cruz Bay and Guatulco Bay. It is only 6 miles across the mouth of the three of them. At a short distance offshore the three beaches appear to be continuous. From 10 miles out to sea these bays are difficult to locate or distinguish. In Tangola Tangola Bay there is a small island, Tangola Tangola Island. The bottom is sandy out to a depth of 25 fathoms, after which the sand is replaced by mud. A shore station on the rocky point and 3 dredging stations are located here.

West of Tangola Tangola Bay, 23 miles, situated on a small bay, is Port Angeles, the port of entry for the State of Oaxaca.

Beginning between Port Angeles and Tangola Tangola Bay, there is a long sweep of coast, northeastward, eastward, and southeastward, to form the Gulf of Tehuantepec. The distance across the mouth of the gulf, from Port Angeles to Suchiate Bar, where Mexico adjoins Guatemala, is about 250 miles. From such a line across the entrance to the head of the gulf it is 65 miles. This head is 120 miles southward of the southern shore of the Gulf of Mexico. From Salina Cruz the shore is a continuous, sandy beach, often backed by lagoons. Although throughout the whole of the Gulf there are few dangerous rocks, shoals, or obstructions, and although the sea bottom is even, deepening very gradually offshore, the effect of the strong winds coming across the trans-Mexican gap, which forms the Isthmus of Tehuantepec, which are felt for great distances out to sea, and the disturbance that these set up in the ocean currents in this region make the reputation of the Gulf of Tehuantepec anything but savory. In the days of sailing vessels passage across the Gulf was often hazardous, and even now, in the days of large steamships, it may be an unpleasant experience.

Salina Cruz, 55 miles east of Tangola Tangola Bay, the terminus of the Tehuantepec Railroad, was a busy port at one time, but after the completion of the Panama Canal it deteriorated badly. Apparently it is now coming into its own again.

The only collecting station in the whole Gulf is a dredging station, 20 miles offshore, State of Chiapas, 15° 41′ North, 94° 08′ West, in 35 fathoms, mud, where a catch of shrimps was the chief feature of the haul.

Central American Coast

Guatemala

Plates 77-80; Chart 74

The coast of Guatemala extends from Suchiate Bar, southeasterly and then easterly for 140 miles. The sandy coast is regular, with no indentations of importance, although there are several roadsteads, the most important of which are Champerico and San José. At both of these there are ports of entry, connected by rail with the interior. Champerico is 30 miles from the Mexican border, and San José 40 miles from the boundary of El Salvador. The landward slope from the shore is rather gradual, but it extends to a continuous range of high mountains in the interior, some of which are actively volcanic. The two most notable of these volcanoes, directly north of San José, are Agua, 12,334 feet, and Fuego, 12,603 feet, connected by a high ridge. When the atmosphere is clear, in the morning or early forenoon, these are readily visible far out to sea. Later in the day they are likely to be obscured by heavy smoke.

No shore collecting has been done off the coast of Guatemala, but there are several dredging stations, all in sand, in the vicinity of San José, in 3-5 fathoms inshore to 56 fathoms 30 miles out.

El Salvador

The coast of El Salvador extends slightly south of east from the Guatemalan boundary, approximately 140 miles, to the Gulf of Fonseca. The coast and its background are similar to that of Guatemala. The mountains are closer to the sea, but the highest of them are far from being as high as those in Guatemala. There is one irregular bay, Jiquilisco Bay, 30 miles west of the Gulf of Fonseca, but it is largely filled up with low islands. There are two ports of entry, Acajutla, 20 miles from the western boundary, and La Libertad, 30 miles east of Acajutla. No collecting has been done along the coast of El Salvador.

The Gulf of Fonseca is a large inlet, 19 miles wide at the entrance and practically that width for 12 miles, after which it diverges to a width of more than 40 miles, giving off a number of secondary inlets, the farthest point from the entrance being 25 miles. The landward portion consists largely of mud flats, and there are numerous islands, large and small, in various parts of the gulf.

Three countries share the coast line of the Gulf—El Salvador, the western shore, for 16 miles; Honduras, the northern and most of the western shore, for 38 miles; and Nicaragua, the remainder, 17 miles to

Monypenny Point and then 12 miles to the open sea at Punta Chiquirin. El Salvador has a port of entry, its most important port, at La Unión; Honduras has one at Amapala; but Nicaragua has none.

There is no collecting station in or near the Gulf of Fonseca.

Nicaragua

Plate 76

Around the Gulf of Fonseca and along the Nicaraguan coast, which extends southeasterly 160 miles, to Salinas Bay, the immediate background is low, and the mountains farther back are not so high. There is a distinct chain of these extending from the Gulf of Fonseca to Lake Managua, close to the shore at first, but gradually receding to the eastward. The chain contains many active volcanoes, of which Mount Viejo, 5,670 feet, inland from Corinto, and Monotombo, 3,910 feet, on the shore of Lake Managua, are probably the most prominent, as seen from the sea in clear weather.

The coast line is still regular, and there is no conspicuous inlet anywhere. The nearest approach to one is Corinto Harbor, 40 miles from the Gulf of Fonseca, on which is situated the Port of Corinto, the only port of entrance of importance. The *Velero III* anchored here February 6-9, 1932. There is one dredging station, 11 miles northwest of the port, in 1-3 fathoms, in sand and dead leaves.

Costa Rica—Cocos Island

Plates 76-81; Charts 75-78

In crossing the boundary between Nicaragua and Costa Rica, beginning with Salinas Bay, the nature of the coast becomes different. Instead of the regular coast line, inlets and peninsulas, with or without pointed headlands, follow in succession, so that the point-to-point measurement from Salinas Bay to Punta Burica of roughly 300 miles gives but a slight idea of the amount of actual coast line. Enough variety is introduced to kindle real enthusiasm in a marine zoologist.

The coast line, in general, is bolder, rising abruptly to form cliffs or bluffs, or more gradually to rolling hills that are never of great height. One misses the high mountains in the distant background, as they are too far inland to be seen from the sea. Sandy beaches are relatively scarce. The open coast often shows evidence of aridity, with but little except cactus in sight, but the shores of the bays may be quite well wooded.

Salinas Bay is a secondary extension of the larger inlet, the Gulf of Papagayo, which extends from San Juan del Sur in Nicaragua to Cape

Elena in Costa Rica, 22 miles, and landward 12 or 13 miles to the head of Salinas Bay or Elena Bay. The Gulf is well named, for the land breeze —papagayo—is prevalent, at least at some seasons of the year, from Corinto, Nicaragua, well down the Costa Rican coast, often getting away beyond the zephyr stage in this region.

There are three secondary extensions of the Gulf of Papagayo—Salinas Bay, Elena Bay, and Playa Blanca Bay. The shore of Salinas Bay forms a regular curve from Arranca Barba Point at the northwest entrance to Point Sacate at the southwest entrance. These points are 2½ miles apart, and the bay extends landward about 4 miles. The northern shore is high and bold, but the eastern and southern shores consist of sandy beaches separated by low bluffs. Salinas Island is situated not far from the center of the bay.

There are one shore station in the sandstone on the south shore of the bay and several dredging stations between Salinas Island and the mouth of the bay, in sand or mud, none deeper than 20 fathoms.

The peninsula between Salinas Bay and Elena Bay has a sea front of 2¼ miles, from Point Sacate to Descarte Point. Elena Bay is wide open to the westward. The north shore extends southeastward for about 5 miles; the head (east shore), 3½ miles across, consists of two smaller secondary bays; and the south shore extends for 11 miles almost directly westward to Punta Blanca, with but one break to form Port Parker, 4½ miles from the point.

Port Parker is an excellent landlocked harbor, but is not large, 2 miles long, 1 mile wide. The cliffs that guard the entrance on both sides do not extend to the head of the bay, for from the southern shore sand and mud flats extend outward for some distance. Collecting has been done on the rocky shore of a small island at the entrance of the port, and on the sand beach at the head coral masses have been collected; there are several dredging stations in 2 to 30 fathoms, in mud, sand, and shell.

Punta Blanca is a long point separating Elena Bay from Playa Blanca Bay. "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."

Playa Blanca Bay is shaped much like Elena Bay, but is not nearly so large. The entrance between Punta Blanca and Cape Elena is 6 miles wide. The north shore to the head of the bay is 2 miles, and the south, or southeast shore, 6 miles. The head of the bay is a sandy beach; the remainder of the shore is rocky. There are one shore station in shale, one for coral masses, and several dredging stations in 2 to 40 fathoms in a variety of bottom, mostly from the head of the bay along the north shore, out past Punta Blanca, but there is one near Cape Elena. The dredge hauls in the mud and dead shell were not very productive.

Cape Elena is a conspicuous, long, narrow, rocky ridge, like Punta Blanca, rising high, abruptly from the water's edge. South of Cape Elena, the Gulf of Culebra, larger than the Gulf of Papagayo, extends 32 miles to Cape Velas. Within the gulf and forming the head of it is an open bay, not named on the charts, 16 miles long and 7 miles wide. The north shore of the gulf is bold and hilly, but the remainder of the coast, in general, is relatively low. There are several small sandy beaches. On the north shore, between Cape Elena and the entrance to the inner bay, there are two small bays, wide open toward the south, Murcielago Bay, containing the Bat Islands and the Little Bat Islands, and Potrero Grande Bay, free of islands. Appearing as extensions of the southern portion of the inner bay, there are a number of small bays, the most important of which is Port Culebra; "the finest harbor in Central America is spacious, secure, and easy of access, with depths sufficient for the largest ships." The entrance to the southwest, 1 mile wide, lies between Mala Point, to the north, and Buena Point, to the south. Inside the entrance, it increases in width to 2 miles or more; the head is 4 miles from the entrance.

Off Point Mala are the North Viradores, two rocky islets, the outer of which has a conspicuous rocky column 60 feet high.

Although Buena Point is at the immediate entrance to Port Culebra, it might be considered that the southeast shore extends beyond this point to Cacique Point, 2 miles farther out, off which are the South Viradores, three small grass-covered islets that stand out similarly to the North Viradores to guard the entrance to the port.

Although the harbor is safe and secure, the papagayo that blows up during the day may make the surface choppy enough to materially disturb small boats. The coast here supplies a good example of the way in which the arid cactus-laden, sea-swept points lead inland to well-wooded surfaces or even good grazing land.

Shore collecting has been done along the slough on the south shore, on the rocks at Mala Point, Buena Point, and Cacique Point, dredging from the head of the bay, where mollusks and echinoderms are dominant, to out past the South Viradores, in depths of 20 fathoms or less. The bottom varies, there being mostly sand, mud, and shell at the head of the bay and sand, shell, and rock farther out, with a greater variety of species. Coral masses were obtained from near Point Mala.

Southwest of Cacique Point there is a small bay, 1½ miles wide, Cocos Bay, at the head of which is a port of entry. There is one dredging station near the head of this bay, in 2 fathoms, sand and shell.

The southwest extremity of Cocos Bay is Miga Point, and beyond it is Gorda Bay, extending 4 miles to Gorda Point, the southwest extremity of the inner bay. Southwest of Gorda Point is another point (unnamed) 2½ miles away, off which are the Brummel Islands, and the Catalina Islands, farther out. From this point to Cape Velas, 10 miles, there is a bight extending at the head to two smaller bays. This is the southern limit of the papagayos.

From Cape Velas, the coast, not quite regular, extends for 30 miles south-southeastward to Guionos Point, then east-southeastward, 21 miles, to Quinones Point, and from this point, much the same distance southeastward to Cabo Blanca, at the western entrance to the Gulf of Nicoya.

Much of the coastal area around the southern half of the Gulf of Culebra and on to Cape Velas is lower than the coast of Costa Rica, farther north, but after Cape Velas it becomes hilly again. Most of the shore line is bolder and there are few sandy beaches. There are no inlets of importance between Cape Velas and Cabo Blanca.

Cabo Blanca serves as a striking landmark, for here the coast turns and turns again so abruptly that a well-marked peninsular headland is formed. The point rises rapidly, so that within one mile it has an elevation of 1,200 feet. This height is kept with little change to form a tableland extending inland for 6 miles, after which there is a receding slope to a lower plain. Isla Blanca lies one mile south of the point.

Gulfo de Nicoya (Gulf of Nicoya) is a large body of water, 34 miles wide at the entrance, between Cabo Blanca and Punta Judas, extending into the land, first northward and then northwestward, 52 miles. From Cabo Blanca the shore extends northeastward 23 miles to Negritos Island, largely as a series of small bays, often with sandy shores, separated by rocky points. From Negritos Island to the head there are numerous islands and much shoal water off the shore. That is true to some extent of the northeast shore as well, but it is not carried to the same extreme. Punta Arenas, a 4-mile, slender tongue of land extending westward, separates the inner part of the gulf from the outer. Near it is the port of entry, Puntarenas, near which the water is too shallow for any but quite small boats.

From Punta Arenas to Herradura Point there is a long bight, from which the shore passes southeasterly 10 miles to Punta Judas, a bold point and headland, not so conspicuous as Cabo Blanca. Off this point the heavy breakers make it one of the principal danger points of the coast.

There are no dredging stations in the Gulf of Nicoya or its vicinity.

From Punta Judas the coast takes a long sweep, southeast and south, 73 miles to Llorena Point, the greatest depth of the bight being 21 miles. In general, the coast is bold from the water's edge or near it; but, even when it is low, it soon reaches an area of elevation to a chain of coastal mountains, higher than any others so near the coast for a long distance to the northwest. They are so near the shore that for some distance out at sea they hide the really high mountains farther inland. Mount Walker is 12,413 feet high. There are no very distinct irregularities in the shore of the bight.

Llorena Point is the western extremity of a large peninsula that separates the Gulf of Dulce, to the westward, from the open sea. The point itself is high and steep, and from it the coast extends 14 miles southeasterly to Sal Si Puedes Point, and then eastward for 18 miles to Matapalo Head at the entrance of the Gulf of Dulce. Three points are high and rocky, but most of the coast between them is low and sandy. Except for a ridge extending inland between the first two points, which remains low for some distance inland, the hilly country is not very far from the shore.

The Gulf of Dulce extends northward and then northwestward for 28 miles, with a width of 8½ miles at the entrance between Matapalo Point and Banco Point, and within the entrance varying from 5 to 11 miles. The west coast is low, with hilly country near; the head is bolder, but the hills are farther from shore. These appear again in the northern portion of the east shore, but soon disappear again, so that the southern portion is low. There are depths of over 100 fathoms in the gulf, unusual for the Central American coast. There are several small, secondary bays and plenty of good anchorages. Collecting has been done on the shore among the large basaltic boulders near Matapalo Head by dipping under the cargo light and by dredging near by in 10 to 40 fathoms, sand and mud.

From Banco Point, or perhaps more correctly from Platanal Point, 3 miles to the southeast, there is another wide bight, this time a very shallow one, extending to Punta Burica, 24 miles from Platanal Point, with practically no sign of any smaller irregularities in the coast line.

Punta Burica is the terminus of a 15-mile, narrow peninsula, extending almost directly southward, only 2 miles wide a short distance from the point and 6 miles wide at the base. At this point Costa Rica meets

Panama. There is a small island, Isla Burica, lying about ½ mile off the point and connected with it by a reef.

Before leaving Costa Rica, it might be well to consider one of its island possessions, Cocos Island, 5° 32′ North, 87° West, which lies 280 miles to the southwest of Burica Point and approximately twice that distance due west of Cape Corrientes, Colombia. Cocos Island is roughly rectangular, with the long axis northeast-southwest. Its greatest length is slightly over 4 miles and its greatest width over 2 miles, the circumference 13 miles. On the north coast there are two definite bays, Chatham and Wafer, but the remainder of the coast is regular. It is everywhere bold and quite precipitous. The whole island is covered with dense, tropical vegetation, as there is an abundance of moisture, with streams of water descending to the coast. One emptying into Wafer Bay is readily observed from the sea. The greatest height is reached in a peak, 2,788 feet high, near the west coast. There are several small islands near shore, the largest of which is Nuez Island, off Colnett Point, the northern tip of Cocos Island, at the western extremity of Chatham Bay.

Chatham Bay, which affords the best anchorage, is an indentation at the northeastern portion of the island, between Colnett Point and Pitt Head. Wafer Bay occupies the central portion of the northwest coast.

Three visits have been made to Cocos Island. Shore collecting has been done on the rocks, in the fresh-water stream; and by cargo-light dipping has been done in Chatham Bay. Collecting has been done on the rocks, in shingle, in fresh water, and in tide pools in Wafer Bay. Dredging has been done in Chatham Bay in shallow water, sand, and, farther out, off Nuez Island in coralline. There is only one dredging station in Wafer Bay.

Lying east of the peninsula that ends at Punta Burica, extending 30 miles to Isla Partida and landward 16 miles, is Bahia Charco Azul (David Bay). The western shore of the bay is high, but the northern shore is low and cut by several rivers. Isla Partida is the farthest seaward of an archipelago of deltas, large and small, 22 miles east and west and 15 miles north and south, at the mouths of the estuaries of several Panamanian rivers.

Eastward and southeastward of the archipelago is a sweep of coast line, over 40 miles to Punta Guarida, at the entrance to Bahia Honda. The coast is low like that adjacent to the archipelago, with estuaries and bays but with few deltas or other islands.

Panama and the Canal Zone

Plates 82-86; Charts 79-82

Southeast of the archipelago, 20 miles, is another small archipelago, but the islands here, Secas Islands, are rocky and irregular. Only two of them are large enough to be called islands, but besides these there are numerous islets and rocks. They are dotted over an area 5½ miles north and south and 3 miles east and west. They are arranged to form a rough crescent, with the concavity toward the east. Three visits have been made to these islands and 20 collecting stations established, at which much good material has been obtained. The interior of at least one of the islands has been explored, and as one result a land iguana, 5 feet 3 inches long, was obtained.

On the shore rocks, reefs, and tide flats have been inspected and some good coral masses obtained. There have been dipping by electric light and dredging in several locations, nowhere in more than 25 fathoms, with a variety of bottom, sand, mud, coralline, nullipores, and shell.

Farther west-southwestward, 23 miles, are Islas Ladrones, three rocky, barren islets. There are one dredging station 4 miles southeast of Islas Ladrones, in 54 fathoms, green mud, and another 15 miles east of these islands and 10 miles southwest of Secas Islands, in 20 fathoms, gray mud.

Southeast of Secas Islands, 13 miles, there is still another archipelago, Islas Contreras, but these have not been visited.

The small, irregular Isla Medidor lies 2 miles to the northwestward of Punta Guarida, and a smaller island, Isla Pacora, to the south of this, with a narrow, rocky channel between. There are one dredging station north of Medidor and three between Medidor and Pacora.

Bahia Honda is an excellent harbor for vessels of any size, being deep, safe, capacious, and easy of access. The entrance between Punta Guarida and Isla Centinela, off Punta Jabali, is 1,750 yards wide, but inside the bay, the width reaches 3½ miles. It is divided into two parts by Isla Talon, 1,350 yards long—the larger, Bahia Chinche, to the westward and the smaller, Bahia Legamo, to the eastward.

The shore is low and well wooded. Palm trees and bananas mark the position of single habitations, as well as that of the native village on Isla Talon.

Here there are shore stations in sand, rock, and rocky reefs, coral masses, dipping stations by electric light, dredging stations in depths of 5 to 35 fathoms on a variety of bottoms, but mostly on shell and nullipores.

The results obtained in the bay and near the entrance have not been so good as those from the channel between Medidor and Pacora islands.

Five miles off the entrance to Bahia Honda is Isla Canal de Afuera, and $6\frac{1}{2}$ miles southwest of this, the relatively large island, Isla Coiba, with a length of $21\frac{1}{2}$ miles and a width of 13 miles. South of the western part of the Isla Coiba and $3\frac{1}{2}$ miles from it is the triangular island, Isla Jicaron, $3\frac{3}{4}$ miles by 3 miles; and $\frac{1}{2}$ mile south of this again Isla Jicarita, 1 mile by $\frac{1}{2}$ mile. The northeast side of Jicarita is low and quite arid; the south shore is a perpendicular bluff and the west is much similar, although there are some small coves with a background of palm trees. There are one shore station on rock, with coral masses, on the northeastern part of the island, and dredging stations, one east of the northern part of the island, one to the west of the island, and one at the western entrance of the channel between Jicarita and Jicarón.

From Punta Jabalí southeastward there is a wide bight, extending 50 miles to Punta Mariato, with a large bay, Bahia Montijo, largely shut off from the open ocean by Isla Cebaco, extending northward 17 miles from the central portion. The first 15 miles of the shore of the bight is relatively rugged, but most of the remainder, especially that around Bahia Montijo, is quite low.

Punta Mariato is the southwestern point of a rectangular peninsula that lies between Bahia Montijo and the approach to the Gulf of Panama. The south shore extends 56 miles from Punta Mariato to Cape Mala, the southeastern point. The first portion is bold, but the remainder is low, although the deep water comes in quite close to the shore throughout the whole distance.

The west coast of the Gulf of Panama, extending from Cape Mala to the entrance to the Panama Canal, consists of two bights, a larger one, 25 miles across and 40 miles deep, and a much smaller one, 17 miles across and 8 miles deep, which forms the western part of Panama Bay. The whole coast is low, and the near-by water shallow. There are no significant, secondary irregularities.

South of the Balboa entrance to the Panama Canal, and 9 miles from it, are the two islands, Taboga and Taboguilla, 2 miles apart, with other islets and rocks in the neighborhood. Taboga is $2\frac{1}{4}$ miles long and $1\frac{1}{4}$ miles wide, almost divided into two parts by a cove on each side. Taboguilla is 1 mile long and $\frac{2}{3}$ mile wide. Both islands are wooded. Shore collecting in tide pools, on rocks, and on coral masses on Taboga and dredging in shallow water, 5 fathoms as a maximum, have been the only activities here.

Balboa, situated at the head of the narrowed approach to the Panama Canal, is the Pacific port for the Canal Zone, a strip of land, 10 miles wide, extending across the isthmus of Panama to Cristobal on the Caribbean Sea. At Balboa there is a wide tide range, said to be over 20 feet at some of the spring tides. Some collecting has been done from the piles of the wharf at low tide.

Visits have been made to the laboratory on Barro Colorado Island in Gatun Lake, but the collecting here has been incidental. Some bats have been obtained from a cave near the Madden Dam.

Balboa, Canal Zone

Plate 84; Chart 82

Ashore there is no separation between Balboa and Panama City, but along the shore there is a point of land between the two, and Panama faces on Panama Harbor to the east of the city. It is something to see a real city, after leaving the last one, San Diego, so far behind. The fish market provided the only specimens obtained here.

Separating the present Panama Harbor from the harbor of the Old Town of Panama, destroyed by Morgan, is another small point of land. There are collecting stations on the rocks adjacent to the harbor of the Old Town.

From Old Panama the coast line forms a 75-mile crescent to Punta Brava, at the entrance to Bahia San Miguel. The coast is low, and, although there are several small bays and estuaries, the water is too shallow for them to be of much use in navigation. The water deepens gradually even some distance out from shore. The vegetation is now becoming more extensive, as this is the approach to the belt of tropical rain forests.

Lying off the southern half of this crescent, 10 miles as a minimum, is the Archipelago De Las Perlas, extending 30 miles north and south and 20 miles east and west. Isla del Rey, 15 miles long and 7½ miles wide, is the largest of the group. There is no deep water between them and the mainland.

Bahia San Miguel, 14½ miles wide at the entrance, between Punta Brava and Punta Garachiné, is very irregular, with bays and estuaries straggling off from it. It extends about 20 miles to the eastward. From Punta Garachiné the coast continues south-southeastward to Punta Piñas, 36 miles, with but one significant point, Punta Caracoles, along the way. The coast here is bolder, and the offshore water deepens rapidly.

Punta Piñas is at the tip of a slender, southerly projecting peninsula that serves as a perfect protection for Bahia Piñas, a small bay, 1½ miles across at the entrance, extending northward for 2⅓ miles, to form an excellent, safe anchorage. Here there are shore stations on rocks and in coral masses and dredging stations in 3 to 35 fathoms, in sand, mud, rock, shell, and coralline.

After Bahia Piñas the coast line continues the same general trend, 25 miles, to the Panama-Colombia boundary, and another 28 miles to Cape Marzo, at the entrance to Octavia Bay. Before reaching the cape, however, there is a definite indentation facing the northwest, Humboldt Bay.

Colombia

Plates 87, 88; Charts 83-87

Cape Marzo is bold and rocky, with a reef and detached rocks extending 3 miles south of it. It forms the western extremity of Octavia Bay, the coast of which extends northward, eastward, and southeastward to Point Cruces, 15 miles from Cape Marzo. The 2-mile northward extension of the bay is well sheltered. Collecting on the shingle and in the coral masses of the extending peninsula and dredging in 30 to 75 fathoms were the only activities here. In the shallower hauls there were sand and gravel, but in the deep ones only gravel and mud.

Point Cruces is much similar to Cape Marzo, at the tip of a southerly extending peninsula, with rocky islets offshore. It forms the western boundary of the Gulf of Cupica, extending 22 miles to Solano Point, but receding behind these points to form Cupica Bay to the north and Solano Bay to the south.

Cupica Bay is 5½ miles wide and extends northward 3½ miles. The peninsula to the west of it serves as an excellent shelter, and the anchorage is a safe one. There are one shore station here, on the inside of the rocky point, and one electric light station.

From Solano Point the coast line extends southward for 7 miles, to pass into another bight, extending 36 miles to Alusea Point. Fourteen miles from the north end of this bight there is a small fiordlike inlet, Port Utria, receding northward 3 miles, almost parallel to the coast. At the entrance it is but ¼ mile wide, but farther in it may be twice that. It is separated to the westward from the open sea by a high, narrow peninsula, with two islets and some isolated rocks off its extremity. It forms a safe, well-protected anchorage. The shores of the peninsula and the islets are rocky, but the eastern shore of the port is mainly a sandy beach, extending outward to form a sandspit. Back of the shore the elevation increases rapidly; and, as this is well within the tropical rain-forest region, the hillsides are heavily wooded and the undergrowth is dense. Cocoanut palms, bananas, and papayas are grown in inhabited areas.

Port Utria has provided the stage for much endeavor. Three visits have been made to it, and 28 stations have been established in the vicinity. The shore stations are on the rocky shores of both the peninsula and the islands, and here too there are plenty of coral masses. In dredging in 10-50 fathoms the hauls made at and outside the entrance, and in the deeper water off the islands, were in mud; but nearer shore, outside the islands, and the channels between the islands, there are sand, shell, and rock, and here the fauna in evidence is much richer. Sea urchins and cake urchins are plentiful. Black and green sea snakes are very abundant.

The coast line from Alusea Point, 8 miles, to Cape Corrientes serves as the seaward face of a conspicuous, densely wooded promontory, with deep water coming close to shore. There is a 3-mile southern face to the promontory, east of which the coast turns north for a short distance to form the western shore of semicircular Cabita Bay, 3½ miles wide and 1¼ miles deep. The high rocky coast ends with the peninsula, and the east shore is the beginning of a long stretch of low coast, with sandy beaches or mud flats and numerous estuaries. In the vicinity of Cabita Bay the jungle must reach nearly the maximum of impenetrability.

The rocky shore of the peninsula and the sandy beach at the head of the bay have provided some specimens, but any attempts at dredging have been largely abortive. The bottom consists of such finely divided mud or silt that it has not enough consistency to trip the bottom-sampler. Possibly no other place explored offered such poor marine collecting.

From Cabita Bay the coast passes directly southward and then slightly westward to Chirambira Point, on one of the islands in the delta of the San Juan River, 72 miles from Cape Corrientes. The main mouth of the river is 10 or 12 miles farther south.

Directly west of the mouth of this river, 250 miles, is the 1-mile long, barren, high, perpendicular rock, Malpelo Island. There are three solitary rocks exposed north of the island, North Rocks, and five south of the island, South Rocks. The island is a pinnacle, 846 feet high, above water, that comes up from the bottom of what otherwise is a sea, mostly more than 1,000 fathoms in depth. A landing has been made on this island to do some shore collecting, but no attempt was made at dredging.

South of the mouth of the San Juan River, for a long way, the type of the coast line changes but little. It is 20 miles southeastward to Buenaventura Bay, 80 miles southwest from this, 35 miles westward, and 32 miles south-southwest to the entrance of Ensenada Tumaco, which is 23 miles wide at the entrance. It is 18 miles southwest of this, and then 14 miles southeast to the boundary between Colombia and Ecuador.

Ecuador

Plates 89-92; Charts 89, 90

Lying 16 miles off the islands in the delta of the Sangnianga River, in the western trend of this part of the coast, is Gorgona island, 5 miles long north-northeast and south-southwest, and 1½ miles wide, with three noticeable peaks, the highest 1,296 feet. In its ruggedness, in its lush vegetation, and in its abundant precipitation, it bears some resemblance to Cocos Island.

Just a quarter of a mile south of Gorgona is the smaller island, Gorgonilla, about a mile in length, with a precipitous shore except for a palm-laden beach near its northwest point. La Roca, a saillike or shiplike rock, 1½ miles south of Gorgonilla, is a conspicuous landmark that can be seen from the south for a long distance.

Three calls have been made at Gorgona Island, and 24 collecting stations established. The shore collecting has been largely confined to the north end and the east side, as far south as Watering Bay, some of it in the fresh-water stream there, mostly though on the rocks, and in the crevices and caves that abound around the northeast point. Coral masses are relatively abundant and easily obtained. For dredging, the east side of the island is not very good. The water deepens rapidly and the bottom is mostly mud, but not the silt variety near the mainland. Some mud brought up from 150 fathoms, northeast of the island, surely took the palm for real stickiness. North of the island, in rock and gravel, it is much better. Along the west side the water remains shallow much farther out, and in 30 fathoms or less the bottom is mostly shell. Sometimes the masses of shell are all dead and then the hauls are not so valuable. Farther south, toward Gorgonilla, the bottom is rocky, rough with corals, some of which may readily be seen in the clear, shallow water. In the channel between Gorgona and Gorgonilla the mud again appears.

From the Colombia-Ecuador boundary the coast extends southward, 80 miles, to Galera Point. Here the nature of the coast line begins to show a change, but it is a very gradual one. An occasional cliff or bluff appears to break the monotony of the low, level shore, but there are still many estuaries, deltas, and mud flats.

Galera Point is the northwest point of a high, rocky promontory, extending southward 11 miles to Cape San Francisco. It much resembles the promontory at Cape Corrientes, but the face is convex rather than concave. It is the most northerly of the westerly projecting points in Ecuador. Behind the cape there is a bay, San Francisco Bay, which is much similar to Cabita Bay. There is a northern projection—a narrower, shallower portion, runing farther inland. A small river, or stream, comes down to this portion, but at low tide is pretty well shut off from it by a sandbar. Near the mouth are clusters of graceful trees, outliers of the denser forests farther back. East of the mouth of the river is an extensive sand beach, behind which the native village of San Francisco is situated. Seining has been done in the mouth of the stream, and shore collecting on the rocky shore of the projecting peninsula. As in other places in this region, dredging in the mud is not effective. The only place to get worthwhile material is in shallow water over the reef, where dredging is anything but a smooth procedure.

From Cape San Francisco there is a wide bight, 65 miles, to Cape Pasado and then a less extensive one, 50 miles, to Cape San Lorenzo. The southern shore of the latter bight runs directly westward; and in it, 15 miles from Cape San Lorenzo, is the small indentation, Manta Bay, on which is located the town of Manta, the port for Montechristi, where the finest Panama hats are made. Coral masses have been collected in Manta Bay, and the rocky shores and the reefs have provided some material, but no dredging has been done in the vicinity.

La Plata Island lies 16 miles southwest of Cape San Lorenzo. It is 3½ miles long, northwest to southeast, and 1¼ miles wide. It reaches a height of 615 feet, and, in general, the shores are precipitous, although there is a somewhat more gentle slope in a ravine that passes down to a beach on the east shore. It is quite unlike Gorgona Island, since much of it is arid, although there is enough vegetation to support some cattle and numerous white goats. Shore collecting on the rocks and dredging in 10-15 fathoms near shore, and in 45-55 fathoms farther out, in mud, indicate the activities here. The shallow-water dredging is quite profitable, but the deeper dredging is too reminiscent of the coastal areas immediately to the northward to be satisfactory.

Directly south of Cape San Lorenzo, 33 miles, with a bight in the coast intervening, is a point off which Salango Island lies. There is a bar between the island and the mainland, but there is good anchorage northeast of the island. The island is 2 miles in circumference, high and covered with luxuriant vegetation. There are four dredging stations in sand near the anchorage, but no shore stations.

Thirty-eight miles south-southwest of Salango Island is Punta Santa Elena. There is a deep bight between, the southern portion of which forms Santa Elena Bay. Its eastern limit may be considered to be Centinella Point, 11 miles from Punta Santa Elena, and its depth is 3 miles. It is all shallow, with seldom more than 10 fathoms of water.

Punta Santa Elena is the tip of an abrupt, bare hill, 424 feet high, abrupt toward the land as well as toward the sea, for the remainder of the shore is low. The village of Salinas is situated on the shore 2 miles east of the point, and La Libertad, the port of Santa Elena, 1 mile inland, is 4 miles farther east than Salinas.

The shore has been explored off La Libertad, off Salinas, and along the open coast south of Punta Santa Elena. It is a suitable area for diving and dipping by electric light. Dredging in the open part of the bay, in sand, provides little; off Salinas it is somewhat better, but the real thrill comes in dredging in rough, rocky bottom at the entrance north of Punta Santa Elena, where almost every class of marine organism may be represented in a single haul. Gorgonids, echinoderms, and mollusks are particularly abundant. Mantas appeared to be more abundant off the point than anywhere else in the eastern tropical Pacific.

Punta Santa Elena is the northwestern extremity extending southwestward, between Santa Elena Bay and the Gulf of Guayaquil. The southwestern shore between Punta Santa Elena and Cape Morrow, 58 miles, faces on the outer part of the gulf.

The Gulf of Guayaquil is very large as gulfs and bays along the Pacific coast of South America go. The entrance from Punta Santa Elena, Ecuador, to Cape Blanco, Peru, is nearly 90 miles across, and from this entrance line to the mouth of the Guayas River it is over 100 miles. At the entrance to the inner part of the gulf, from Morro Point to Payana Point, it is still 36 miles wide. In the gulf there are several islands, the largest of which is Puná Island, 29 miles long and 8 to 13 miles wide, which lies to the southeastward of the peninsula already mentioned. There is one shore station just north of the eastern point of the island, near the Village of Puná, where pilots are taken aboard by ships going up the river.

There are some small islands lying off Salinas Point, the southwest tip of Puná Island, the most conspicuous of which is Santa Clara Island, 12 miles out, near the center of the channel. It is surrounded by reefs and breakers. The lighthouse on the summit of the island, 256 feet high, and the light itself at night are visible for 22 miles out to sea.

On more than one occasion the *Velero III* has gone across the gulf and up the River Guaymas 40 miles to Guayaquil, but these trips were side issues as far as marine collecting is concerned; so the route need not be considered here.

PLATE 69

Fig. 148 The White Friars, Mexico, a series of guano-covered rocks located near Acapulco and the site of a tremendous bird rookery. (Photographed by Wm. R. Taylor.)

Fig. 149 Morro de Petatalan, a conspicuous headland along the Guerrero Coast of Mexico and principal landmark in locating the White Friars, a series of bird rocks from which this picture was taken. The birds are Brewster's boobies. Chart 71, p. 405.

PLATE 70

Fig. 150 Fresh-water lagoon at Sihuatenejo, Mexico, in which several species of fish were netted by the expedition of 1931. Chart 71, p. 405, Station 3.

PLATE 71

Fig. 151 View of Acapulco Harbor, Mexico, showing *Velero III* in the center and *U.S.S. Wright* at anchor to the left. Chart 15, p. 373.

Fig. 152 Narrow entrance to the landlocked harbor of Acapulco, Mexico.

PLATE 72

Fig. 153 The harbor at Acapulco, Mexico, viewed from a promontory on the north side of the bay. The old fortress may be seen at the end of the peninsula in the middle distance. The city has built up considerably since the picture was taken in 1932. Chart 15, p. 373.

Fig. 154 Salina Cruz, located on the Gulf of Tehuantepec opposite the narrowest point of the Mexican Isthmus, and Pacific terminus of the shortest railroad across Mexico. Chart 15, p. 373.

PLATE 73

Fig. 155 Tangola Tangola Bay, Mexico, showing the sand beach and rock shingle on which marine collecting was accomplished. The bay is located at the northern limit of the Gulf of Tehuantepec. (Photograph by Wm. R. Taylor.) Chart 73, p. 405. *q*

Fig. 156a Chacahua Bay, Mexico, looking across the estuary of the lagoon toward the rocky promontory which provides such shelter as the bay affords. (Photograph by Wm. R. Taylor.)

Fig. 156b Chacahua Bay, Mexico, seen from the southeast. The conspicuous head at the left is Pt. Galero, elevation 190 feet. The lagoon entrance lies immediately to its right. Chart 72, p. 405.

PLATE 74

Fig. 157 These spectacular sea stacks occur off the northwest end of Clarion Island and are the remnants of a former continuation of the bluff to the right in a westerly direction. The largest is Monument Rock. Chart 47, p. 395.

Fig. 158 Braithwaite Bay, Socorro Island, as seen from the deck of *Velero III*. Mt. Everman, elevation 3,707 feet, is seen in the right background. Chart 46, p. 395.

PLATE 75

Fig. 159 The coral sand beach at Sulphur Bay, Clarion Island, Mexico, where Hancock Expedition members landed on the rocky spit shown at the left of the picture. Plant growth consists principally of cactus, although a few low trees offer nesting sites to birds. Chart 47, p. 395.

Fig. 160 Clipperton Island, only coral atoll in the eastern tropical Pacific Ocean. A 65-foot rock resembling a ship rises from the shallow lagoon. A few coconut trees are the only life visible. Chart 14, p. 372.

PLATE 76

Fig. 161 View of the volcano Viejo or Chinandega, elevation over 5,000 feet, located 17 miles from the city of Corinto, Nicaragua. The fringe of mangroves is characteristic of the Central American shore line of Guatemala, Nicaragua, and San Salvador.

Fig. 162 Port Parker, Costa Rica, presents a barren aspect in the dry season. A further touch of desolation is added by the black patches which represent burned areas. Numerous brush fires were raging at the time of the visit of the Hancock Expedition of 1939.

Fig. 163 Port Parker, Costa Rica, located well within the zone of *Papagayos,* or windstorms. *Velero III* scientists worked in the lee of the small island, which is one of a series of stacks joined to the north shore of the bay.

PLATE 77

Fig. 164 The beach at Gulf of Dulce, Costa Rica, showing lava reefs which make surf landing perilous. The dense jungle contains a few trees of notable height. Chart 77, p. 407.

Fig. 165 Expedition members shown accoutered for field work in photography, mammalogy, herpetology, and botany, and marine zoologists already at work on the volcanic rock shingle which juts into the Gulf of Dulce, Costa Rica, at Matapalo Head.

PLATE 78

Fig. 166 Lava rocks extending into the surf at Matapalo Head, Gulf of Dulce, Costa Rica. (Photograph by Wm. R. Taylor.)

Fig. 167 Precipitous shore of Cocos Island, Costa Rica. The island affords but two landing places, Chatham Bay and Wafer Bay. Except for the water courses, which are the natural highways throughout the island, the interior is difficult of access. Chart 78, p. 408.

PLATE 79

Fig. 168 Fresh-water stream at Wafer Bay, Cocos Island, Costa Rica. It was here that seine hauls were made for fishes occurring in the brackish water resulting from the mixture of salt and fresh water with the incoming tide. Shacks of treasure-seekers are located to the right of the picture. (Photograph by W. L. Schmitt.)

Fig. 169 The surf at Chatham Bay, Cocos Island, Costa Rica, showing Nuez Island in the right background.

PLATE 80

Fig. 170 Nuez Island, a satellite of larger Cocos Island, Costa Rica. Both are covered with dense tropical vegetation of a brilliant green color. The picture is taken from the deck of *Velero III* anchored in Chatham Bay.

Fig. 171 Estuary at Puerto Culebra, Costa Rica, showing punt used to negotiate the narrow channels, often overgrown with mangrove thickets. Chart 76, p. 407.

PLATE 81

Fig. 172 Puerto Culebra, Costa Rica, seen from behind a dense growth of columnar cacti.

Fig. 173 Skiff among coral heads exposed at an especially low tide on one of the islands of the Secas group, Panama, a favorite collecting ground for *Velero III* parties. Chart 79, p. 408.

Fig. 148 The White Friars, Mexico

Fig. 149 Morro de Petatlan, Mexico

Fig. 150 Lagoon at Sihuatenejo, Mexico

Fig. 151 Acapulco, Mexico, harbor

Fig. 152 Acapulco, Mexico, harbor

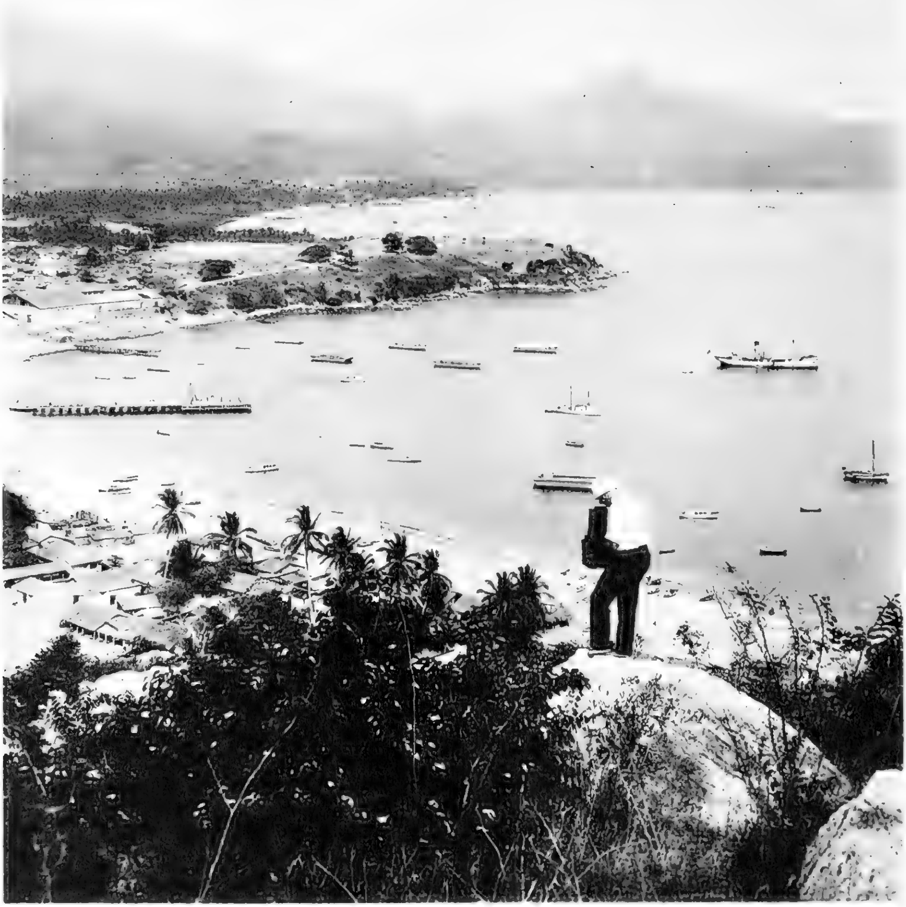


Fig. 153 Acapulco, Mexico, harbor

Fig. 154 Salina Cruz, Mexico

Fig. 155 Tangola Tangola, Mexico

Fig. 156a Chacahua, Mexico, lagoon entrance

Fig. 156b Chacahua Bay

Fig. 157 Clarion Island, Mexico

Fig. 158 Braithwaite Bay, Socorro Island, Mexico

Fig. 159 Clarion Island, Sulphur Bay

Fig. 160 Clipperton Island

Fig. 161 Volcano Viejo, Nicaragua

Fig. 162 Port Parker, Costa Rica

Fig. 163 Port Parker, Costa Rica

Fig. 164 Gulf of Dulce, Costa Rica

Fig. 165 Gulf of Dulce, Costa Rica

Fig. 166 Gulf of Dulce, Costa Rica

Fig. 167 Cocos Island, Costa Rica

Fig. 168 Wafer Bay, Cocos Island, Costa Rica

Fig. 169 Chatham Bay, Cocos Island, Costa Rica

Fig. 170 Nuez Island and Cocos Island, Costa Rica

Fig. 171 Puerto Culebra, Costa Rica

Fig. 172 Puerto Culebra, Costa Rica

Fig. 173 Secas Islands, Panama, coral heads

Fig. 174 Bahia Honda, Panama, seen from north shore

Fig. 175 Bahia Honda, Panama, north shore

Fig. 176a Panama, Jicarita Island

Fig. 176b Panama, Jicarita Island

Fig. 177 Panama, Taboga

Fig. 178 Panama City, Panama

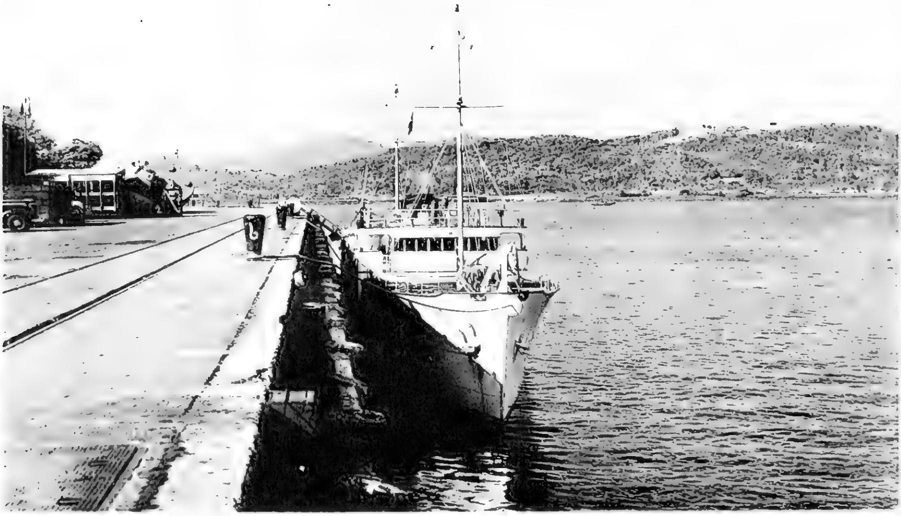


Fig. 179 Balboa, Canal Zone

Fig. 180 Gatun Lake from Barro Colorado Island

Fig. 181 Barro Colorado Island, Canal Zone

Fig. 182 (*left*) Piñas Bay, Panama
Fig. 183 (*right*) Piñas Bay, Panama
Fig. 184 (*below*) Malpelo Island, Colombia

Fig. 185 Entrance to Port Utria, Colombia

Fig. 186 Port Utria, Colombia

Fig. 187 Gorgona Island, Colombia

Fig. 188 Gorgona Island, Colombia

Fig. 189 Village, Cape San Francisco, Ecuador

Fig. 190 Lagoon, Cape San Francisco, Ecuador

Fig. 191 Panorama, Punta Brava, Santa Elena Peninsula, Ecuador

Fig. 192 La Plata Island, Ecuador

Fig. 193 La Libertad, Ecuador

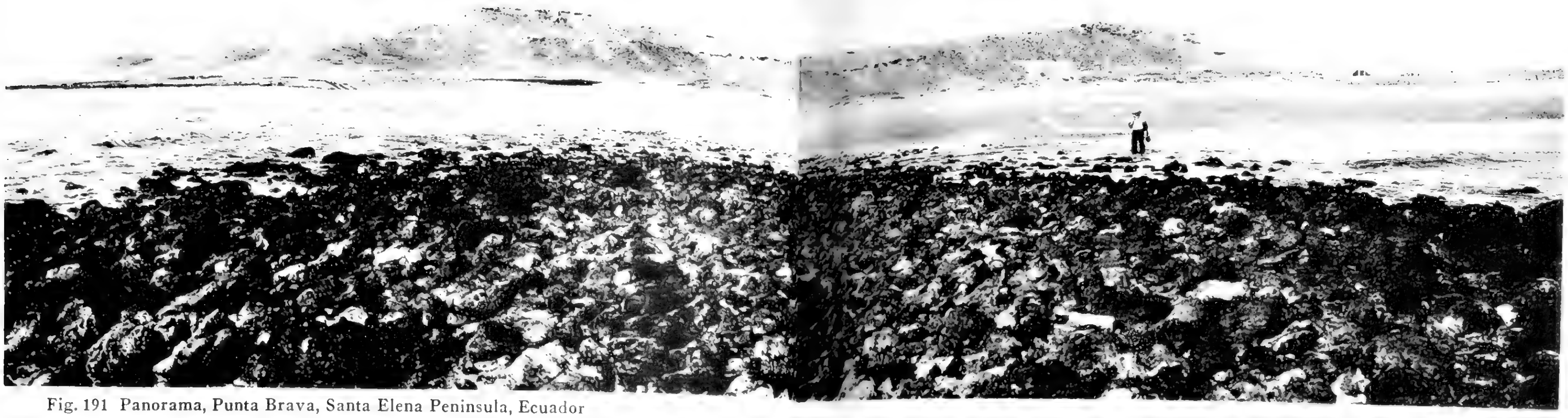


Fig. 191 Panorama, Punta Brava, Santa Elena Peninsula, Ecuador

Fig. 192 La Plata Island, Ecuador

Fig. 193 La Libertad, Ecuador

Fig. 194 Manta, Ecuador

Fig. 195 Guayaquil, Ecuador

PLATE 82

Fig. 174 The spacious harbor of Bahia Honda, Panama, seen from a slight elevation on the mainland in the northeast portion of the bay. The village lies on an island to the left, and is not shown in the picture.

Fig. 175 Native huts on the north shore of Bahia Honda, Panama, the homes of Panamanian fishermen. Collecting of marine invertebrates, particularly crustaceans, was accomplished in a small-rock shingle at the far end of the beach. Chart 80, p. 409.

PLATE 83

Fig. 176 a, b Two views of the exposed reef which extends for a mile or more along the shores of Jicarita Island, Panama, and probably represents an uplifted shore line. Jicarita Island is much smaller than, and is situated south of Jicaron Island. Chart 81, p. 409. (Photographs by Wm. R. Taylor.)

Fig. 177 The village on Taboga Island, Panama, is not large, but it commands directly the Pacific approach to the Panama Canal. Dredging in the vicinity of Taboga Island was the only offshore operation carried on by the *Velero III* within the Bay of Panama. Chart 82, p. 410.

PLATE 84

Fig. 178 Water front at Panama City, Panama, taken from near the president's palace. The small boats in the foreground are fishing vessels and fruit boats which bring their produce to the market in the early morning hours. Chart 82, p. 410.

Fig. 179 The *Velero III* alongside the dock in Balboa, Canal Zone. Vessels making the transit of the Canal pass up the channel directly astern. The clear spaces shown on the hills in the background represent recently burned-over areas. Chart 82, p. 410.

PLATE 85

Fig. 180 Gatun Lake in the Canal Zone seen from the head of the stairway leading to the Barro Colorado Island laboratories. The route of the canal crosses the picture from left to right about a mile beyond the small island in the center of the picture. (Photograph by W. L. Schmitt.)

Fig. 181 The New York Zoological Society's Laboratory of Tropical Research is located on Barro Colorado Island in the Canal Zone. The laboratory is reached by crossing Gatun Lake from the Frijoles Railroad Station on the Trans-Isthmian Railroad. The principal laboratory building is shown at the head of the stairway. (Photograph by W. L. Schmitt.)

PLATE 86

Fig. 182 Stream behind village at Piñas Bay, Panama, showing dense growth of tropical jungle. Chart 82, p. 410.

Fig. 183 A glimpse of Panamanian shore line at Piñas Bay. The promontory which forms the southern boundary of the bay is shown beyond the figures of the native boys, who in turn are standing beside a large mortar used in grinding flour.

Fig. 184 The island of Malpelo, Colombia, a solid mass of granite rising from the deep floor of the Bay of Panama. Here Hancock Expedition parties secured examples of the rare lizard, *Diploglossus hancocki,* and of the abundant land crab, *Gecarcinus malpelensis.*

It is desired to make a special acknowledgment to Dr. John S. Garth for his contribution of photographs used in the following figures: 82, 83, 87, 93, 97, 98, 104, 105, 106, 117, 120, 123, 124, 125, 133, 134, 139, 140, 141, 146, 147a, 149, 152, 157, 169, 171, 172, 173, 174, 182, 183, 187, 188, 195, 196, 197, 202, 204, 210, 214, 240, 242, 247, 248, 249, 257, 258.

PLATE 87

Fig. 185 The entrance to Port Utria, Colombia, is narrow, but deep. Hills are clothed with the luxuriant foliage of the tropical rain forest which extends to the water's edge. The few sand beaches are backed with groves of coconut palms beneath which are located native dwellings. Chart 85, p. 411.

Fig. 186 Beneath the roots of the coconut palm trees at Port Utria, Colombia, were found giant burrowing land crabs, while the forest in the interior abounded with tropical birds and butterflies. Rainfall in this region is almost incessant. Chart 85, p. 411.

PLATE 88

Fig. 187 Sea arch located at the north end of Gorgona Island, Colombia. It is one of a series of sea stacks composed of basaltic lava. Chart 87, p. 412.

Fig. 188 Rocky beach at Gorgona Island, Colombia, overgrown with dense tropical foliage. Chart 87, p. 412.

PLATE 89

Fig. 189 The village of Cape San Francisco, Ecuador, as little touched by civilization as any visited by the *Velero III*. Elevation of the bamboo and thatched houses to the second-story level is practiced in view of the abundant rainfall and consequent rapid runoff from the hillsides above in rainy periods.

Fig. 190 The lagoon at Cape San Francisco communicates with the sea by a narrow estuary which is navigable to small craft at high tide. Ecuadorian fishermen sail their tiny fishing vessels into the lagoon and beach them during stormy weather. Chart 88, p. 412.

PLATES 90, 91

Fig. 191 (A panorama.) Punta Brava, most westerly promontory of the Santa Elena Peninsula, Ecuador. Several ancient shore lines are seen on the promontories in the background. The reef in the foreground was an exceedingly profitable collecting locality for the marine zoologists. (Photographs by W. L. Schmitt.)

Fig. 192 Hancock Expedition members launching a native canoe through the surf at La Plata Island, Ecuador. Chart 90, p. 412.

Fig. 193 La Libertad, Ecuador, seaport of the Santa Elena Peninsula, at which ocean-going tankers take on oil from refineries located across the peninsula at Ancon. Native dwellings are constructed of bamboo and thatch and are invariably elevated. Chart 89, p. 412.

PLATE 92

Fig. 194 Manta, Ecuador, a thriving seaport town of the province of Manibí. Houses are made for the most part of bamboo, which is known locally as Guayaquil cane. Cathedral spires dominate the landscape. Chart 90, p. 412.

Fig. 195 The city of Guayaquil, located on the Guayas River about 40 miles from its mouth. It is the largest city in Ecuador, and from it a railroad leads to Quito, the capital, 300 miles inland and 9,000 feet high.

Peru

Plates 93-104; Charts 91-97

From Payana Point outward the south-southeastern shore forms the coast line of Peru. Fifteen or 16 miles from Payana Point the appearance of the coastal landscape changes very materially. The rich, green vegetation of the shores of the inner gulf and the north shore almost ceases. What there is, is low and scattered. It is 66 miles from Malpelo Point to Cape Blanco. There is one shore station 24 miles southwest of Malpelo Point and 9 miles from Zorritos Light.

South of Cape Blanco, 25 miles, is Parinas Point, the most westerly point of South America. The intervening coast is made up of two small bights, with Lobos Point between. Here and far south along the coast from here are numerous small bays that serve as anchorages for the many oil towns and villages on or near the coast.

From Parinas Point the coast stretches southwestward to Port Paita and westward again a short distance to Paita Point, 27 miles from Parinas Point. Paita Point is the northwest extremity of a 10-mile peninsula with Foca Point at the southwest extremity. Most of these points along this part of the coast form cliffs, often sandy, or bluffs higher than the coast and extending inland.

From Foca Point the trend of the coast for 30 miles is southeast to the entrance of a semicircular bay, Sechura Bay, 12 miles across the entrance to Pizura Point; or the whole indentation from Foca Point to Pizura Point may be called Sechura Bay. There are two dredging stations in the bay, both in 10 fathoms or less in sand and broken shell, the one 18 miles southeast of Foca Point and the other 10 miles northeast of Pizura Point.

Ten miles south of Pizura Point, where the oil fields are left behind, is Aguja Point, from which the coast line forms a regular convexity facing south for about 15 miles and then forms a regular, low-lying coast extending to the southeastward to Eten Head. Thirty-three miles southeast of Aguja Point and 9 miles offshore is Lobos de Tierra Island, $5\frac{1}{2}$ miles long from north to south and $\frac{1}{4}$ to 2 miles wide, with numerous islets and shoals offshore. The greatest height is 325 feet.

South and somewhat east of this, 28 miles, and 50 miles directly west of Eten Head are the Lobos de Afuera. There are two islands close together and several islets. They are barren, covered with guano, the most northerly of the "Bird Islands of Peru." Much of the shore is inaccessible, but there is anchorage in a bay to the northwest and in one to the southeast. The birds here are the main attraction, but some shore collecting and dredging in shallow water and rock in both north and south bays have been done.

For more than 100 miles in a south-southeasterly trend, from Eten Head to Huañape Hill, the coast line might be described as wavy, as there are no prominent points and no deep recessions. The coast is low, mostly with a sand beach, but this is occasionally broken by sand cliffs.

Six miles west of south from the point that projects from Huañape Hill are the Huañape Islands, two of them, with some outlying islets and rocks. The islands are small but are high and rocky. Some collections have been made along the rocky shore by making use of a skiff.

With the exception of 30 miles of coast, 45 miles from Huañape Hill, where there are several definite indentations, separated by projecting points, the coast south of Huañape Hill, for 135 miles, to Salinas Promontory is much the same in nature and trend as that north of the Hill. Salinas Promontory projects directly westward. It is 6 miles wide at the face, between Bajas Point to the north and Salinas Point to the west. Eastward of Bajas Point is the fair-sized Salinas Bay. Huara Islands, a chain of small islets, lie 14 miles to the southwest.

From Salinas Point there is a 53-mile sweep of the coast, southwestward, southward, and finally westward to Callao Point, off which is the island, San Lorenzo, which forms the southwest boundary of Callao Bay, the entrance of which extends 11 miles from Cape San Lorenzo, the northern tip of the island, to Bernal Point on the mainland to the northeast.

Callao, the principal Peruvian port, 8 miles from Lima, the capital city, is situated at the head of the bay, facing the northwest.

Callao Point projects a mile or so from the mainland; it is narrow, and the connection with the mainland is but 200 yards wide. From the point a shoal, Camotal Bank, extends westward for 1¾ miles, narrowing the real channel between the Bank and San Lorenzo Island, the Boquerón, to little more than half a mile. From the east shore of the bay, just north of Callao, at the mouth of the River Rimac, is another large bank, extending a mile seaward. Except for these banks the bay is free of dangers.

San Lorenzo Island, 4½ miles long, northwest to southeast, and 1 mile wide, with 1,220 feet as the greatest elevation, is separated from Callao Point by the Boquerón. There are several islands, islets, and rocks offshore, particularly off the south end. The largest of these is Fronton

Island, ¾ mile long and slightly more than ¼ mile wide. A bank from the main island extends around Fronton Island, as it does around some of the other small islands.

There is a shore station on the breakwater at Callao, but in this vicinity all the dredging has been done around Fronton Island and the adjacent portion of San Lorenzo Island.

West of Callao Bay, 37 miles from Bernal Point, is a small cluster of rocks, Hormigas de Afuera, guano covered and without vegetation. Here are two dredging stations, in 45 fathoms, mud and shell.

From Callao Point the coast line continues in the same general direction for 120 miles and then swings westward, 10 miles, to Paracas Point, with a southward indentation east of the point to form Paracas Bay, so that the Paracas Peninsula is cut nearly halfway through at the base. The peninsula is 7 miles wide at the face between Point Paracas and Point Huacas.

North of the peninsula, 10 miles, are the three small Chincha Islands, North, Middle, and South islands. The South Island is the smallest, and the Middle Island is but slightly smaller than the North Island. These islands are most definitely the "Bird Islands of Peru." So much guano has been exported that the height of the islands has materially decreased. Here again, the birds have been the big attraction, but there have been some shore collecting and considerable dredging. In shallow water, in sand, shell, and rock, fair results have been obtained, but in the deeper water, in mud, there is little but hosts of nematodes.

From Point Huacas the coast trends to the southeast and south, 20 miles, to Carretas Head, which extends southward to shut off the northern part of Independencia Bay. This large bay is 15 miles long, but is narrowed to 10 miles at the entrance between Carretas Head and Quemado Point. It is largely shut off from the open sea in its southern portion by the islands Viejas and Santa Rosa, but there is a wide channel, Trujillana Channel, between Viejas Island and Carretas Head. Here the water is much deeper than in most of the bay itself, where it is seldom more than 20 fathoms.

There are shore stations in rock and in sand on the mainland side of the bay south of Tungo Village and on the rocky shore on the east side of the island. Lobster traps have been set and dipping has been effective. There have been about 20 dredging stations off Tungo Village and south of this, east of Viejas Island, in the middle of the bay, in the central and southern portions, and in Trujillana Channel. In the shallow water in sand, shell, and rock results have been good, but in the mud it is mainly nematodes again.

Seventy-two miles southeast of Quemado Point is Beware (Santa Ana) Point, at the northwestern entrance to Port San Nicolas, a bay 9 miles wide at the entrance, between Beware Point and San Nicolas (Harmless) Point. This latter point projects sufficiently to form a semi-circular bay, 2 miles wide, that forms the southeastern extension of the larger bay. There are one shore station on the rocks near Point San Nicolas and one dredging station about ¾ mile east of this, near the south shore of the bay, in 10-25 fathoms, mud.

Southeast of San Nicolas Point is another indentation similar to that north of it, the southern extension, in particular, being similar. This is Port San Juan. The southwest point is San Juan Point, 8 miles southeast of Point San Nicolas. There are two shore stations on the rocks on the south shore of the bay, 2 dipping stations with electric light, and several dredging stations in the southern part of the bay and off Point San Juan, 10-45 fathoms, in sand, shell, rock, and mud.

Port San Juan is the southern limit of the *Velero III* exploration.

PLATE 93

Fig. 196 (A panorama.) An extensive view of the seaward side of Lobos de Afuera Islands, Peru, showing the lighthouse at the extreme left and a cove in which landings may be made in calm weather only. The nesting birds are pelicans.

Fig. 197 (A panorama.) Pelican rookery at Lobos de Afuera Islands, Peru. These are the northernmost of Peru's guano islands and are notable for the total absence of the white-breasted cormorant which occurs so abundantly on the more southerly islands. Chart 92, p. 413; Chart 93, p. 414.

PLATE 94

Fig. 198 The landing place at Lobos de Afuera Islands, Peru, a deep and quiet cove in which live the lighthouse keeper and the guardian of the island, representatives of the Peruvian Guano Administration. Chart 92 p. 413.

Fig. 199 The principal rookery at Lobos de Afuera contains about 200,000 of the Peruvian pelican. Most of the adult birds were at sea fishing at the time this picture was taken. Chart 92, p. 413.

PLATE 95

Fig. 200 The island of Huañape, most productive guano island with possible exception of the Chinchas group. Over 3,000,000 guanayes, or cormorants, nest on the slopes of this island. Young guanayes just learning to swim may be seen in the lower right-hand corner.

Fig. 201 Landing place at Huañape Island, Peru. The considerable rise and fall of the tide makes necessary the rope ladder and the extensible wooden stairway. A small army of several thousand workers descend upon the island every three years and shovel off the accumulated bird excrement.

PLATE 96

Fig. 202 (A panorama.) A portion of a rookery of over 3,000,000 white-breasted cormorants nesting on the island of Huañape, Peru. Terraces have been built to afford a maximum of level nesting territory.

Fig. 203 The seaward shore of Mazorca Island is precipitous and rocky. Every available nesting site is occupied by a pair of piqueros, or boobies, but because of the inaccessibility of the nesting sites their guano cannot be reclaimed.

PLATE 97

Fig. 204 Mazorca Island, Peru, seen from the deck of the *Velero III*. Officials of the Guano Administration are about to greet the Expedition and invite its scientists ashore.

Fig. 205 The Island of Mazorca, basaltic monolith surmounted by a lighthouse and radio station. The buildings in the foreground are occupied by workers of the Peruvian Guano Administration and are reached by means of the hanging ladders.

PLATE 98

Fig. 206 The water front at Callao, Peru, showing small fishing vessels which can be propelled either by oar or by sail. Large ocean-going vessels tie up at Callao wharves, some of which may be seen at the left background.

Fig. 207 The Peruvian coast line south of Callao, marked by sea stacks in various stages of disintegration as represented by the flattened islands at the left, the peninsula in the center, and the outlying rocks, Chart 94, p. 414.

PLATE 99

Fig. 208 The ruins at Pachacamac, visited by hundreds of tourists annually and included in the itinerary of a party from the *Velero III* at the time of 1938 cruise to Lima, Peru.

Fig. 209 Expedition photographer surrounded by white-breasted cormorants at Chinchas Islands, Peru. Elevation of Middle Chinchas is said to have been lowered over 100 feet in the removing of its crown of solid guano.

PLATE 100

Fig. 210 (A panorama.) The north island of the Ballestas group, Peru, taken from near the summit of the south island. The *Velero III* may be dimly seen immediately above a large patch of nesting birds located over the sea cave which is a prominent feature of the middle island.

Fig. 211 The Ballestas Islands, among the most eroded of the Peruvian guano islands. They support guanayes and piqueros in about equal numbers, the guanayes preferring the more level, the piqueros the more sloping, localities as shown on the promontory to the right. In the distance rises the cloud-enveloped summit of the island of San Gallan.

PLATE 101

Fig. 212 From the summit of Mazorca Island a magnificent panorama of ocean, rocky shore, and mist-filled valleys unfolds, the Peruvian Andes serving as a backdrop. The birds in the immediate foreground are piqueros, those on the lower slopes guanayes, or white-breasted cormorants.

Fig. 213 View of Independencia Bay, Peru, taken from the east side of Vieja Island, looking south. The Humboldt penguin burrows into the recent conglomerate stratum of the beach in the foreground. In the left background is the Peruvian mainland. Chart 96, p. 415.

PLATES 102, 103

Fig. 214 (A panorama.) A view of the peninsula which forms the southern boundary of San Juan Bay, Peru, southernmost locality visited by the *Velero III*. The Peruvian sea lion inhabits the rocky coves shown at the right of the picture, the Andean condor flying above the precipitous bluffs. Chart 97, p. 416.

Fig. 215 Rugged coast encountered off San Juan Bay, Peru, showing rookeries of the Peruvian sea lion, and large beds of kelp. The rocks in the distance make navigation exceedingly hazardous.

Fig. 216 San Juan Bay, Peru, most southerly point visited by the Allan Hancock Expeditions. The Expedition launch is about to land at a seal hunters' camp. A desolate portion of the Peru coast line is shown on the other side of the bay.

PLATE 104

Fig. 217 View of Viejas Island, Peru, looking across the southern channel of Independencia Bay from Santa Rosa Islands. The Santa Rosa Islands are a much eroded, uplifted plain, the summit of which affords nesting sites for thousands of white-breasted cormorants. Chart 96, p. 415.

Fig. 218 The various islands of the Santa Rosa group are connected by suspension bridges which greatly facilitate the work of the guano harvesters. The islands are the remnants of an uplifted, wave-cut bench.

Fig. 219 The Santa Rosa Islands, located at the southern end of Independencia Bay, Peru, and devoted exclusively to the culture of the guanaye or cormorant. Across the channel may be seen the southern end of Viejas Island, the summit of which is shrouded in mist.

Fig. 196 Lobos de Afuera Islands, Peru

Fig. 197 (*right*) Lobos de Afuera Islands, Peru, pelican rookery

Figs. 198, 199 Lobos de Afuera Islands, Peru, landing and rookery

Fig. 200 Huañape Island, Peru

Fig. 201 Huañape Island, Peru, landing

Fig. 202 Panorama, Huañape Island, Peru

Fig. 203 Mazorca Island, Peru, rookery and piqueros

Fig. 204 Mazorca Island, Peru

Fig. 205 Mazorca Island, Peru

Fig. 206 Callao, Peru, waterfront

Fig. 207 Peruvian coastline south of Callao

Fig. 208 Pachacamac, Peru, ruins

Fig. 209 Chinchas Islands, Peru

Fig. 210 Ballestas, Peru, north island

Fig. 211 Ballestas Islands, Peru

Fig. 212 Rookery, Bird Islands, Peru

Fig. 213 Independencia Bay, Peru

Fig. 214 Panorama, San Juan Bay, Peru

Fig. 215 San Juan Bay, Peru, sea lion rookery

Fig. 216 San Juan Bay, Peru, sea lion hunters' camp

Fig. 214 Panorama, San Juan Bay, Peru

Fig. 215 San Juan Bay, Peru, sea lion rookery

Fig. 216 San Juan Bay, Peru, sea lion hunters' camp

Figs. 217, 218 Santa Rosa Islands; 219 Vieja Island from Santa Rosa Islands, Peru

The Galapagos Islands

Plates 105-128; Charts 98-115

Apart from Culpepper and Wenman islands, which are outliers to the northwest, the Galapagos Islands form quite a compact archipelago, 600 miles from the coast of Ecuador, lying between 0° 40′ North and 1° 30′ South, and between 89° 15′ West and 91° 45′ West. Nearly all the large islands have Spanish as well as English names; one of them has two Spanish names and one English.

The main islands are arranged in three crescents lying in the same general direction. There is a northern crescent, with which Culpepper and Wenman may be included, consisting of Abingdon (Pinta), Bindloe (Marchena), and Tower; a central crescent, including the part of Albemarle (Isabela) north of Perry Isthmus, James (San Salvador), Indefatigable (Santa Cruz), Barrington (Santa Fe), and Chatham (San Cristobal); and a southern crescent, consisting of Narborough (Fernandina), the southern portion of Albemarle, Charles (Floreana or Santa Maria), and Hood (Española). The several small islands are usually adjacent to the larger ones.

All the islands are volcanic in origin, and some of them still show signs of activity or have been active recently. All the larger islands have the same general appearance. Each has one or more volcanic cones, the highest of them up to 5,000 feet. The coastal areas and lower portions of the slopes are dry and barren, the naked lava flows showing, or with more or less complete covering of cactus and prickly or spiny shrubbery, with leaves small or absent, practically devoid of green coloration. Farther up the slopes there may be some moisture or even an occasional spring, while the mountain tops themselves are often beclouded or befogged, and so get a share of moisture. In these higher areas the vegetation gets a better chance, and sugar cane, vegetables, and certain fruits, such as bananas and papayas, do very well. The soil formed from the eroded lava is evidently fertile when water is available.

Several of the islands have been inhabited at various times, and some of them are inhabited at present. In ordinary years conditions for a comfortable life in certain locations are quite favorable, but in an unusually dry year existence may become precarious.

At various times horses, donkeys, cattle, and goats have been taken to the islands, and there are still many of them which have gone wild. On some of the islands the goats, in particular, seem to have thrived to the detriment of other stock and indigenous animals that require the same type of food. The abundance of fish in the near-by seas is possibly the greatest attraction nowadays.

Culpepper Island, 1° 39′ North, 91° 49′ West, marks the northwestern limit of the Galapagos Archipelago. It is a small island, 2 miles long, with the greatest elevation 550 feet. It is reported to be quite inaccessible. The *Velero III* has not visited the island, but passed it, in plain sight, about 10 miles to the westward.

Wenman Island is 20 miles south and east of Culpepper, almost equidistant, 75 miles, from Albemarle and Abingdon islands. It is really a group of three islands, but appears as one even at no great distance. The main island is precipitous, 830 feet high, with a flat top. Although volcanic, the main island appearing to be about half the cone of a large volcano, the rock appears to be laid down in uniform layers, probably formed from successive flows. Although the gaps between the separate islands give some degree of shelter, there is no suitable anchorage.

A shore station on the ledges of rock provided much good material, and birds, marine iguanas, lizards, etc., are plentiful. Dredging opposite the channel between the large island and the smaller island to the north of it, in 100-150 fathoms, in nullipores and worm-tubes, gave good results, although the dead material was large as compared with the living material.

Abingdon Island, the northwestern island of the three main islands of the northern crescent, is 6½ miles long, north and south, 5 miles wide, 1,950 feet high. The shores are precipitous, but in some places there is a sea-level ledge at the foot of the precipice. There are numerous rocks or rocky islets lying offshore. The only reasonable anchorage is 1½ miles north of Cape Chalmers (the southwestern extremity) on the west side of the island. There is a shore station near this anchorage.

Bindloe Island is of much the same type as Abingdon, 8 miles long, northwest to southeast, and 5 miles wide, but with greatest height only 500 feet. It lies 13½ miles to the southeast of Abingdon Island. Here also the best protection is to the southwest of the island. There are one shore station on the rocks and two dredging stations in shallow water, in sand and rock, and a greater number of tangle stations in water up to 20 fathoms, rock.

Tower Island, 27 miles east of Bindloe, is a smaller island, 4 miles long, east and west, and 3 miles wide, not much like the other two. It is low (100 feet) and is far from being as rugged. Its most characteristic feature is Darwin Bay, a break in the south shore near the east end of the island, ½ mile wide at the entrance, but 1¼ miles wide farther in and nearly circular, with the water deepening rapidly from all the shore and becoming very deep. Most of the shore is rocky, but there is a beach on the north side of the bay. There are a small pond near the beach and a much larger one, apparently filling, or partly filling, an old crater, about a mile north of the north shore of the bay.

There are shore stations on the rocks, in the sand, at the shore lagoon and the crater lagoon, several for collecting coral masses, for diving, and for dipping under the electric light; and there are dredging stations in sand, rock, and coral, from 5 to 70 fathoms.

In 1933 the *Velero III* rediscovered the Galapagos Fur Seal at Tower Island. Sea lions are common here as well as at many of the other islands.

Narborough Island really belongs to the southern crescent; but, as it faces the concavity of Albemarle and is but 3 miles from it in the northern portion, it may well be taken here. It is almost the same in length and breadth, 16 or 17 miles, and it has but one large volcanic cone, 4,320 feet, not far from the center of the island. The slopes are quite steep in the upper portion, but more gradual in the portion toward the sea, so that a large part of the island is comparatively low. There has been violent activity on this island more recently than on any of the others, as recently as 1926. The lava flows to the east, southeast, and south of the main cone seem so fresh that they might have just cooled.

There are numerous indentations along the northeast shore of the island, almost, or entirely, shut off to form salt-water lagoons, some of which are much filled with mangroves. Sea lions and turtles are partial to these lagoons. The marine iguanas are numerous along this shore. The shore and land birds are plentiful but are not different from those on the other islands. One shore station is made to include collecting along the ragged rocks, in the tide pools, in the lagoons, and among the mangroves.

Albemarle Island is the largest in the archipelago, and in some respects the most interesting. It is shaped somewhat like a sock, with the foot a little broader than the leg. While the greatest length from north to south is about 75 miles, the leg, measured from the top to the heel, northwest to southeast, is 65 miles; and the foot, from the heel to the toe, northeast to southwest, is 45 miles. The greatest width of the leg is 18 miles, and of the foot 22 miles. Where the leg joins the foot, there is a strong constriction, Perry Isthmus, to a width of 5 miles, from Elizabeth Bay on the west coast to Cartago Bay on the east coast.

Perhaps no other area in the world, at least within easy reach, equals Albemarle Island as a demonstration of the various phases of volcanism. The other islands give some good illustrations, but, in this respect, Albemarle stands supreme. It consists, in the main, of five large volcanoes, or volcanic cones: three in the leg, 4,000, 4,000, and 3,780 feet; and two in the foot, 4,230 and 5,000 feet. Perry Isthmus is of low altitude, but the other valleys are much higher. Some of these cones are still active, but not violently so.

In many places the lava flows are still exposed from the crater rims down to the sea. On all slopes of the large cones there are innumerable cones and craters of all sizes. They are most pronounced on the northwestern slope of the northern volcano and on the western slope of the most southwesterly one. Adjacent to the sea, on the northwestern part of the island, many of the craters are incomplete, the seaward portion missing. Probably by some catastrophic action after the cones were formed, great portions, sometimes as much as half the cone, were split off, leaving a vertical section exposed. When the section is directly through the blowhole, it may give a perfect demonstration of the way in which the cone was built up, layer after layer in such noticeable stratification that it appears to be diagrammatic. When a large crater is exposed, it may show secondary or even tertiary cones within the crater.

The northeastern slope is much more gradual, down to Albemarle Point, the northeastern point of the island. This is true also of the southeastern slope.

The western slope of the southwestern cone, extending down to Cape Christopher, has so many cones, crowded and interspersed, that the appearance is fantastic in the extreme. It would be impossible to count these cones except from the air, and even then there are so many secondary and tertiary cones, some of them rather small, that it would be a difficult matter. Apparently most of the cones have been formed from the fluid or semifluid lava, as there appear to be few, if any, ash or cinder cones.

Because of all this seismic activity it is quite impossible to give in a few words any general description of the shores of such a large island. A large proportion of it is raggedly rugged, but it may be high or low. It is so rugged and so much of it is exposed so directly to the heavy surf, the Cape Christopher area, for example, that it is unsafe to try to make shore under any circumstances. There are numerous reefs and rocky ledges, but few sandy beaches. There is one small one south of Albemarle Point, at the northeast corner of the island, and some small ones in Cartago Bay, but here the mangrove has spread out so much that there is little of them exposed. There is a bay at each end of Perry Isthmus, Elizabeth Bay to the west and Cartago Bay to the east, and a bay on the west coast, Banks Bay, just south of Cape Berkeley, the northwest point of the island. There is no very safe anchorage in any of these; but there is one in Tagus Cove—a small, funnel-shaped inlet, shut off from the open sea by the north end of Narborough Island.

There are several small islands near the coast, the most noticeable being Redondo Rock, 14 miles off the north shore; White Rock, white with guano, off the entrance to Cartago Bay; and Crossman Islets and Tortuga Island, off the southeast convexity of the island. Near the head of Tagus Cove there is a saline lake in an old crater.

There are many collecting stations on or near Albemarle Island. Near the northeast point of the island, Albemarle Point, there has been collecting along the rough, rocky shore, in the tide pools, and among the mangroves in the small lagoon. There are an abundance of birds, some marine iguanas, and sea lions. One attempt at dredging in the shallow water was not much of a success. South of Cape Berkeley, at the northern entrance to Banks Bay, the rocky shore has been explored, and again at Black Bight at the southern entrance of this bay. Here also there has been dredging in 12 fathoms, rock. A short distance north of the northern entrance to Tagus Cove, there is a reef near the shore, with the surface exposed only at low spring tide. This has provided some good collecting. Tagus Cove has been a favored location; there have been 26 stations in or near it. The shore stations are on the rocks on both sides of the cove. On the west shore there are some interesting aggregations of solitary corals, forming almost as dense masses as the colonial corals do. There is one station on the shore of the near-by saline lake. At anchorage the electric light reveals a most interesting marine world. The plankton is plentiful and varied; many of the specimens are large enough to be seen readily. The large, graceful flying fish provide much of the visible motion to the picture, which may be quite a peaceful one until the ubiquitous shark intrudes.

The dredging stations from near the head of the cove to well out in the channel between Albemarle and Narborough provide a gradation from sandy bottom, in 10 fathoms or less, near the head, where such sand-loving species as *Amphioxus* are found, out through a coralline and nullipore bottom in 10-50 fathoms to the channel depths of 75 fathoms in rock.

There is one shore station 2 miles south of Tagus Cove, and there are no more until Cape Christopher. Here the shore is so rocky and broken and the surf is so violent that the collection is a scanty one.

On the east coast Cartago Bay provides all of the stations. Most of the shore stations are near where the rock and sand meet, near the northern entrance of the bay, but there is one station on the south side near the head. There is so much mangrove growing out from the shore in much of the bay that it is a difficult matter to make even a near approach to the shore. Much of the main part of the bay is shallow, with sandy bottom liberally sprinkled with patches of rock, and is not very satisfactory for dredging. At the entrance to the bay, and farther out, there is a nullipore bottom, and farther out still, near White Rock, there is mud. The electric light has been used several times at anchorage, but the plankton is not so interesting or so varied as it is at Tagus Cove.

James Island, 10 miles east of Albemarle and 10 miles south of the equator, is nearly rectangular, with greatest length from east to west, 20 miles, north to south, 12 miles. It has one high peak, 2,700 feet, near the center of the island; but other cones of considerable size make it quite rugged, particularly on the western slope, but not so much so as some sections of Albemarle. In the northeast the slope is more gradual, and there is a rather large area of low altitude near shore. The western slope, in general, is green and well wooded, the trees larger than on the other islands. On the western slope of the main peak, at a height of about 1,000 feet, there is a crater that contains a saline lake, from which salt has been obtained. The northern and eastern slopes are much more arid. The basal rock is a rough lava of the "aa" type, but over this, in places, there have been what appears to be three distinct, liquid lava flows: one, possibly the oldest, is reddish brown, somewhat like the basal lava in appearance; another is light gray; and the third is almost black. These give a distinctive appearance to that side of the island.

There are two sizable bays extending into the shore of the island, James Bay on the west side and Sulivan Bay at the north end of the east side. Off the northern portion of the west side is Albany Island, separated from James by a deep channel, ¼ mile wide; and off the northeast corner of the island is a somewhat larger island than Albany, Bartholomew Island, the channel between, at its narrowest, being less than 300 yards wide. As it extends to the northeast, it forms part of the boundary of Sulivan Bay.

Bartholomew is a picturesque little island. It consists of two main portions, east and west, joined by a neck of land, bordered by a sand beach on each side, the south beach backed by sand dunes. Most of the central portion of this neck is occupied by a mangrove lagoon. The larger, eastern portion reaches a height of 340 feet, as a volcanic cone, much of the base of which, toward the sea, has disappeared. The numerous small cones and craters give it the appearance of the southwestern portion of Albemarle in miniature. Many of the smaller craters broaden as they go down and have fine volcanic ash in them, as though they had recently been used as fireplaces. They may be as small as 10 feet high and 4 or 5 feet across the mouth of the crater.

The western portion is lower; but toward the Sulivan Bay side a single, huge rock, 50 or 60 feet high, narrowed almost to a point above, but otherwise precipitous with almost perpendicular sides, is broken off sheer from the remainder and makes a very distinct and picturesque landmark. It forms the central figure of a picture which, seen from out in Sulivan Bay, is possibly the most attractive in the Galapagos.

Except for the small sand beaches on Bartholomew Island and one on the shore of James Bay, the shore is wholly rocky and rugged. Just back of the beach at James Bay there is a lagoon, where a flock of flamingoes make their home.

In the James Bay region there are shore stations south of the southwest entrance of the bay on rocky ledges, on rock in the southern portion of the bay, on the beach near the lagoon, and on the shore of the lagoon itself. One is situated on the shore of the salt lake in the interior. There are three dredging stations off the north entrance of the bay between the main shore and Albany Island, from 30 to 75 fathoms, the deeper water being well in the channel, where there are rock and shell. The results have been satisfactory.

All other stations are in the Sulivan Bay area. Shore stations near the rock column on Bartholomew Island, on the shores of the narrow part of the channel, and along the main shore of James Island near the entrance to the channel, where large coral masses were obtained on the ragged, rocky shore, provided good collecting; but the beach on the south side of the neck of land and the lagoon were not so good. There is good dredging in Sulivan Bay in the shallower water, in rock bottom, when the rock is not too rough, as it is liable to be farther out in deeper water off the entrance.

Jervis (Rabida) Island is a small, rugged, barren island, 4 miles south of James Island, with very little vegetation. Although it is only 1¾ miles long, it has a height of 1,050 feet. It is not readily accessible, but in fair weather a landing may be made on the northwestern side of the island. The island has not been visited. Dredging in 145 fathoms was attempted without success at a point 4 miles east of the northern part of the island.

Indefatigable Island is the central island of the archipelago, 10 miles from James, 10 miles from Barrington, 15 miles from Albemarle, and 27 miles from Charles. It is the second largest island in the group, somewhat rectangular, 23 miles from east to west, 18 miles from north to south, with an additional narrow projection extending northward 5 miles toward South Seymour Island. It has but one important elevation, near the center, 2,296 feet. The smaller cones are not very numerous. The slope in the upper part is more rapid, but there is a flattening in all directions toward the coast. The lower portions are arid, of the regular Galapagos type; but on the steeper parts of the slopes, although it does not reach the summit, there is much greener vegetation.

There is little sandy beach, or beach of any kind; almost all of the shore is rugged and rocky. There are two bays, Conway Bay to the northwest and Academy Bay near the center of the south shore. Of the islands lying off the coast, the largest is Duncan (Pinzon), 6 miles to the westward. It is somewhat ellipsoidal, 3 miles by 2 miles, with a height of 1,300 feet, with dense, almost impenetrable vegetation. It has been a prominent feature in several expeditions, largely because of the extensive and intensive galápago hunting that has taken place. Now the Duncan Island species is almost, if not entirely, extinct. Some inland collecting has been done here and some coral masses have been obtained.

North Seymour and South Seymour islands with the Daphne group will be considered later.

Eden Island lies at the southwestern entrance to Conway Bay, and Gordon Rocks lie 1½ miles east of the eastern point of the island.

In the Conway Bay region there are shore stations on the mud flats of Eden Island, on the rocks of the main island shore near by, and near the northern entrance to the bay; a dipping station at the anchorage; and one dredging station in 8 fathoms, sand, near the center of the bay. There are several stations in the vicinity of Academy Bay, some shore stations on the north shore of the bay, at the landing and east of it; electric light stations at the anchorage; dredging stations, well inshore in 8 to 12 fathoms and farther out in 15 to 25 fathoms (where algae are unusually abundant for the Galapagos). There are a coral mass station at the shore at Gordon Rocks and three dredging stations not far away, in 20-45 fathoms, rock. There is one deep station, 15 miles east of Gordon Rocks, in 392 fathoms, sand.

Mention has been made of the slender northward extension of Indefatigable Island. This projection reaches out past the boundary of the island, but it is cut through by two narrow channels, to leave South Seymour and North Seymour islands, extending for another 5½ miles northward. The islands are both low and flat, with much of the surface easily traveled, but there are areas of broken lava rock and low boulders that make it rough. The vegetation is sparse, cactus being most conspicuous, made more sparse by the activities of the numerous goats that roam the islands, or, at least, South Seymour. South Seymour is the home of a large species of land iguana, of a reddish brown color that blends very well with the color of the lava rock where it lives.

There are strong tide rips and crosscurrents around and north of the islands. Most of the shore is rocky, but on the west shore of South Seymour there is a sand beach, probably the largest and finest in the archipelago, with the most conspicuous faunal feature, the large burrowing hermit crab, which leaves trails everywhere in the sand when the tide is out. On the shores of a small bay (which has been named Velero Bay) near the north end of the west coast of South Seymour, there is an interesting fossil-bearing stratum exposed.

Two rocky islets, Daphne Major and Daphne Minor, lie offshore to the westward, a short distance from South Seymour. They are precipitous and conspicuous. It is only with difficulty that a landing can be made on either of them. They increase the channel area in this region.

Collecting in the Seymour Island region has been confined to the west side of the islands and the adjacent waters. There are shore stations on the rocks of North Seymour, in Velero Bay, on the rocks and on the sand beach of South Seymour; inland collecting; several electric light stations; and dredging stations in shallow water, mostly in sand or in sand with rock patches, all along the west coast of both islands and in deeper water, up to 80 fathoms, in shell and rock in the channel between the Daphne Islands and South Seymour. The results from the deeper dredging have been gratifying, since several species were obtained here that did not appear in any of the other Galapagos collections.

Barrington Island, 10 miles southeast of Indefatigable Island, is a rugged island, 6 miles long, east and west, and 3½ miles wide, with a height of 900 feet. Its shores are so precipitous that landing is difficult except at the southern end of the east coast, and even here the anchorage is poor. On the southeast shore there are shore stations on the rocks and among the coral masses, and a diving station in 2 fathoms. There are one dredging station in shallow water near by and others in deeper water, 45 to 75 fathoms, 2 miles and 6 miles north of the island.

Chatham Island, 27 miles east of Barrington, lies with its main axis 24 miles long, northeast and southwest, and is 8 miles wide, with two main peaks nearer the west end, 2,490 and 1,927 feet, with a saddleback connecting them. There are other cones of considerable height, making both ends of the island descend quite abruptly to the sea. There is a better fresh-water supply on this island than on any of the others in the archipelago, so that there is richer vegetation, particularly toward the summit of the hills. Some land is under cultivation, and there is a town, Progreso, the capital of the Galapagos, located on the saddleback between the two summits, 5 miles from the shore at Wreck Bay.

The coast is more irregular than it is on the other islands, as there are more projecting points and indenting bays, some small islands, and many outlying rocks and reefs. The most conspicuous, rocky islet, Kicker Rock, at the entrance to Stephens Bay, 2 miles off Bassa Point, looks as though it were composed of a few very large boulders. It is 486 feet high. Dalrymple Rock, 62 feet high, off Lido Point at the entrance to Wreck Bay, also stands out clearly.

Of the bays, three should be mentioned. Wreck Bay (Porto Chico) is on the north shore, near Wreck Point, the western tip of the island. Here there is a safe and well-protected anchorage, but there are so many shoals and reefs on each side of the entrance that the passage may be difficult in bad weather. It is the main port of the island, the only port of call for vessels coming to the islands from Guayaquil. This is one place in the Galapagos where one may see a wharf or pier. Lido Point stands out prominently at the northeast entrance.

From Lido Point to Bassa Point, the western limit of Stephens Bay (Puerto Grande), there is a ragged coast line. Stephens Bay offers a good anchorage, with safe approach. The entrance, from Bassa Point to Finger Point, is 5 miles across, and the depth of the bay is 2 miles. There is a farther extension of the bay to form Sappho Cove, but here the bottom is strewn with large boulders, and, in consequence, the cove is not suited for anchorage.

On the south side of the island there is a bay or, better, an open roadstead, Freshwater Bay, into which a fresh-water stream empties after a fall over a lava cliff. There is little or no shelter for boats.

On Chatham Island there are two inland stations—one on the shore of El Junco Lake, not far from Progreso, and the other ½ mile upstream from Freshwater Bay. The shore stations, all on rock, are located at Bassa Point, in Wreck Bay, west of Wreck Bay, toward Wreck Point, and in Freshwater Bay. The dredging stations are at the entrance of Stephens Bay, farther out than Kicker Rock, in 32-40 fathoms, sand and coralline, and in shallower water, 8-12 fathoms, at the entrance to Sappho Cove, where the large boulders on the bottom made dredging difficult. Here gorgonids are at their largest and best. There is one station, about 3 miles offshore at Freshwater Bay, in 400 fathoms, coarse sand.

In the southern crescent, Narborough Island and the southern part of Albemarle have already been discussed. As no dredging, and very little shore collecting, has been done at or near either of them, they do not come into the distribution picture. The two remaining islands, Charles and Hood, have received much attention. They show very well the greater effect of the Humboldt Current than do the islands in the other two crescents. In the swing of the Humboldt Current north and south in seasonal succession, these islands are seldom, if ever, outside the influence of the current.

Charles Island lies midway between Albemarle and Hood islands, 35 miles from each, 27 miles south of Indefatigable Island. It is about 10 miles long, east to west, and 7 miles wide. There are two rather large volcanic cones, 1,500 and 1,780 feet, toward the southern coast, both visible from the western approach to Black Beach Anchorage. The slope to the north shore is quite gradual, and there are few secondary cones. There are some springs on the island, but they do not supply enough water for irrigation, except to a limited extent. In very dry seasons, like that in 1934, they may nearly dry up. There is vegetation on much of the island, with a greater relative number of trees and shrubs, as compared with cactus, than on some of the other islands. There is suitable stock fodder; cattle, goats, pigs, and donkeys are said to be somewhat abundant on the island.

What few sand beaches there are, at Black Beach, Post Office Bay, etc., are very small. The south shore is high and abrupt, the remainder lower and more irregular, with rocky points, islets, and reefs outlying. The chief islands, none of them large, are Onslow Island, off Cormorant Point to the north, and Caldwell and Gardner islands to the southeast. The bays are rather insignificant, none of them offering much protection in a storm; but, since storms are rare, they serve as good anchorages. Black Beach Bay on the west coast, just north of Saddle Point, is a small bight, with a pocket, sand beach that is protected by the rocks enough to make a good landing place. There is much algal growth in shallow water near the rocky shore, but farther out the bottom is sandy.

Post Office Bay is on the north coast, just east of Daylight Point, the northwest point of the island. It is 1¼ miles across at the entrance and extends inshore ¾ mile. The inner part of the bay is pretty well free of obstructions, but there are shoals and reefs at both sides of the entrance.

Lying just east of the point (not named on the chart) that bounds Post Office Bay to the east is Cormorant Bay, extending ¾ mile to Cormorant Point. At the head it is divided into two by a projecting point near its center. Back of the head of the bay there is a salt-water lagoon, inhabited by a flock of flamingoes.

There has been some inland collecting, particularly at the springs near Black Beach and near the south side of the island. There are numerous shore stations on the west coast south of Saddle Point, on the rocks and in the tide pools around the point that forms the southern limit of Black Beach, on the north shore of Black Beach, at the head of Cormorant Bay, on the shore of the salt lagoon east of Cormorant Point, and on Onslow Island, where coral masses were obtained. There are several electric light stations in Black Beach Anchorage and in Post Office Bay. There are dredging stations in shallow water, 4-6 fathoms, and farther out in 35-40 fathoms, in and off Black Beach Bay, several in Post Office Bay, and one in Cormorant Bay. Northwest of Post Office Bay there are three stations, 5 miles from Daylight Point in 40-45 fathoms, 7 miles in 65-70 fathoms, and 10 miles in 250 fathoms.

Between Charles, Indefatigable, and Albemarle islands there is a wide open space in which there have been but few soundings and much fewer bottom indications. This makes dredging here a matter of groping in the dark. To make matters worse, there are strong currents, varying so much in direction and force that the dredge may be carried as many as three different directions in sinking from the surface to the bottom in the deeper portions of this area. There may be quiet periods with little current, but the currents have not been studied; so it is impossible to know when the quiet periods are likely to come. In spite of the difficulties, some stations have been established in this area, most of them between Charles and Indefatigable but one between Charles and Albemarle, in depths ranging from 60 to 200 fathoms. In some of them the material obtained was not very extensive, but there was always something of great interest from the distribution standpoint.

Hood Island, the most southerly of the islands of the archipelago, is elliptical in shape, the long axis, 8 miles, running east and west, and 5 miles wide. It has no high volcanic cones, the highest being 640 feet. The slope to the north and northeast is gradual. There is more vegetation on it than on some of the others. Most of the shore is rocky, but there is a long, sandy beach facing Gardner Bay.

There is only one outlying island of any size, Gardner Island, lying $\frac{3}{4}$ mile east of the northeastern portion of Hood Island. There is deep enough water in the channel for large vessels to pass through, but off the northern entrance, in Gardner Bay, Magicienne Rock is but 14 feet below the surface, and right in the channel is a small island, Osborn Island. The water is very shallow between Osborn and Hood, but is deeper between Osborn and Gardner. Gardner Island itself is steep and rocky on its western side, but the descent to the beach to the northeast is low. Gardner Bay, the only significant bay off Hood Island, lies between Hood and Gardner islands.

The Gardner Bay region has a rich fauna, possibly as rich as any explored in the Galapagos, and, in consequence, much collecting has been done here. There are shore stations on Gardner Island, on Osborn Island, and on the main island at the head of Gardner Bay and at the northwest entrance to the bay. There are diving stations off the Hood Island shore and electric light stations at the anchorage in Gardner Bay. There are dredging stations in many parts of the bay from shallow water, 2-4 fathoms at the head to 30-50 fathoms at the entrance, and farther out in 50-100 and 140-160 fathoms, mostly in sand but some rock. There is one station 8 miles southeast of the island in 300 fathoms, sand and rock.

Little has been said concerning the distribution of such species as the galápago, the sea lion, the marine iguana, and various sea and land birds among the islands; but these have been written up at length in so many reports that it does not seem necessary to go into detail concerning them here. Observations have been made on them and these have been recorded. In general, though, these do not come within the range of marine biology.

The Galapagos Archipelago has been, and is, of very great interest. Even the preliminary exploration of the marine fauna and flora has proved to be much worth while. As the material collected is being examined, a more definite basis for further work is being established.

PLATE 105

Fig. 220 Hancock Expedition members landed at Wenman Island, Galapagos, by means of the rocky shelf shown in the foreground, and made their way precariously up the almost perpendicular basaltic lava cliffs to the flattened summit of the headland. The island is the nesting site of fork-tailed gulls, man-o'-war birds, and boobies. (Photograph by H. W. Manter.)

Fig. 221 The precipitous sides of Wenman Island, Galapagos, suggest that it is the remnant of a volcanic crater. The landing was effected inside the flat-topped headland shown at the center of the picture. Dredging operations were conducted at a depth of 100 to 150 fathoms near by. Chart 100, p. 417.

PLATE 106

Fig. 222 Marchena or Bindloe Island, Galapagos, showing lava flows which seem so fresh that they might have cooled but yesterday. They have blotted out every vestige of plant life, except perhaps on the distant summits, which appeared to have escaped burial in this manner.

Fig. 223 On the black lava sand at Marchena or Bindloe Island was discovered the signal of distress erected by shipwrecked mariners of the sloop *Dinamita*. Their desiccated bodies had been found ten days previously by Portuguese fishermen. Chart 99, p. 417.

PLATE 107

Fig. 224 Tide pools at Darwin Bay, Tower Island, Galapagos. The mud flats at the right were inhabited by fiddler crabs, while frigate birds nested on the rocks to both right and left. The lava is fractured into rectangular blocks. (Photograph by W. L. Schmitt.) Chart 98, p. 416.

Fig. 225 Marine collectors at work on a rocky beach at Darwin Bay, Tower Island, Galapagos. The headland marking the northern limit of the entrance to Darwin Bay is shown in the distance, and between it and the shore are two rocky reefs which prevent the ship's launch from coming farther inshore. (Photograph by W. L. Schmitt.)

PLATE 108

Fig. 226 The landing place at Darwin Bay, Tower Island, consisting of an arching beach and a small lagoon behind which rise the basaltic walls of the rim of a volcanic crater.

Fig. 227 The *Velero III* anchored in 27 fathoms in Darwin Bay, scarcely 150 yards from shore. The bay represents the cone of a mile-wide crater, a portion of which has weathered away, admitting the sea.

PLATE 109

Fig. 228 Lava shores of Narborough Island, Galapagos, showing mangrove thickets in the distance. (Photograph by Wm. R. Taylor.) Chart 101, p. 418.

Fig. 229 The island of Narborough, located across a narrow channel from Tagus Cove. It is shield volcano 4,000 feet high and without the irregularities of shape which characterize the other islands. Volcanic activity has been observed at Narborough as recently as 1927.

PLATE 110

Fig. 230 Crater Lake, Albemarle Island, Galapagos. Tagus Cove may be seen to the left, at a considerably lower level. (Photograph by H. W. Manter.)

Fig. 231 Two miles south of Tagus Cove, Albemarle Island, lies what is probably the largest crater lake in the archipelago. Although a mile or more in length, it does not appear on any chart and must be located anew by each expedition by means of directions handed down by preceding expeditions.

PLATE 111

Fig. 232 Lava beach north of Tagus Cove, Galapagos. A grove of mangrove trees indicates a lagoon on the right. One of the five large volcanoes of Albemarle Island rises majestically in the distance.

Fig. 233 Tagus Cove, Albemarle Island, the most protected anchorage in the islands, but unfortunately too small to hold many vessels at one time. Visiting ships have left their names whitewashed against the dark lava rocks. Tagus Cove is the home of the Galapagos penguin and the flightless cormorant. Chart 102, p. 418.

PLATE 112

Fig. 234 The area around Christopher Point, Albemarle Island, is perhaps the most desolate in the entire Galapagos. Here many small spatter cones may be explored within a mile radius, provided one is fortunate in arriving in one of those rare periods in which a landing can be made. (Photograph by Wm. R. Taylor.)

Fig. 235 One of the most massive single formations in the Galapagos archipelago is this perpendicular headland at Cape Berkeley, Albemarle Island. It is composed of volcanic ash and shows landslides resulting from the undercutting. A fairly safe anchorage for the tuna fleet is found close in at its base. (Photograph by H. W. Manter.)

PLATE 113

Fig. 236 Members of the 1938 Hancock Expedition explore a huge crack in the misshapen mass of *pahoe hoe* lava at Cartago Bay, on the east side of Albemarle Island. Mangrove trees form an almost impenetrable barrier between the sand beach and the lava rock.

Fig. 237 The *Velero III* anchored in Tagus Cove, Albemarle Island. The successive beds of volcanic ash of which the island is composed are nowhere seen better than along the south rim of the cove.

PLATE 114

Fig. 238 Academy Bay, Indefatigable Island, showing houses in the middle distance which were occupied prior to 1938 by a Danish-American family named Rader. A garrison of Ecuadorian soldiers was stationed at the fort, which is known locally as Puerto Ayora. Chart 106, p. 420.

Fig. 239 The large rock shingle at Barrington Island, Galapagos, was a profitable collecting ground for early Hancock Expeditions. The cactus-studded interior of the island is the home of land iguanas, hawks, and doves. Chart 106, p. 420. (Photograph by W. L. Schmitt.)

PLATE 115

Fig. 240 Conway Bay, Indefatigable Island, showing stretches of coral sand separated by rocky promontories representing ancient lava flows. Such beaches are the homes of the ghost crab *Ocypode*. Chart 107, p. 420.

Fig. 241 Conway Bay, Indefatigable Island, Galapagos, showing Eden and Guy Faulkes islands in the distance. The reef in the foreground was a collecting station of the marine zoologists. Chart 107, p. 420.

PLATE 116

Fig. 242 Interior of a crater at Daphne Major Island, Galapagos. The floor of the crater is of sand and is occupied by families of nesting blue-footed boobies.

Fig. 243 Inlet at Academy Bay, Indefatigable Island, Galapagos, showing perpendicular lava cliffs and the two principal cactus types, *Opuntia* and *Pachycereus*. Chart 108, p. 421. (Photograph by Wm. R. Taylor.)

PLATE 117

Fig. 244 South Seymour Island, which extends northward from Indefatigable Island, separated from it by a narrow channel. Its flora is similar to that of the parent island, dominant forms being the bursera tree and *Opuntia* cactus.

Fig. 245 The veldt-like interior of South Seymour Island, Galapagos, showing bursera trees growing among lava boulders. (Photograph by C. McLean Fraser.)

PLATE 118

Fig. 246 A view from South Seymour Island showing the many cones of Indefatigable Island. The beach in the foreground is marked with the tracks of the green sea turtle and the holes dug by the female turtle for egg-laying purposes. Chart 106, p. 420.

Fig. 247 North Seymour Island showing land iguanas from South Seymour Island being landed in a transplantation experiment, there being no land iguanas previously on North Seymour. A nameless island, composed largely of sand, may be seen in the right background. It lies in the narrow channel separating North and South Seymour islands. Chart 106, p. 420.

PLATE 119

Fig. 248 Agaves, or Century plants, line the red clay road which leads from Wreck Bay, Chatham Island, to Progreso, three miles to the interior. Here the plants appear to grow wild, but at higher elevations they form neat hedgerows separating the plantations. Chart 113, p. 423.

Fig. 249 Village of Progreso, situated at an elevation of over 1,000 feet in the interior of Chatham Island, Galapagos. The houses are built of cane imported from the mainland, and many of them are elevated from the ground in the manner of houses of the Santa Elena Peninsula. The population of Progreso is said to be around 300. Chart 113, p. 423.

PLATE 120

Fig. 250 The few buildings located at Wreck Bay, Chatham Island, consist of headquarters for the governor and his military aides, and a lighthouse. They are built of bamboo, or "Guayaquil cane," the same type of construction found in the maritime provinces of Ecuador. Chart 113, p. 423.

Fig. 251 Wreck Bay, Chatham Island, the principal port of the Galapagos and home of the military governor. A treacherous reef at the harbor entrance obliges vessels the size of *Velero III* to anchor outside, while small sailing vessels may anchor near the wharf.

PLATE 121

Fig. 252 Post Office Bay, Charles Island, a favorite collecting ground for *Velero III* scientists. Within a short radius may be found sandy beach, rocky shore, brackish lagoon, and a sizable cave in which were trapped many of the now extinct Charles Island tortoise. Chart 111, p. 422.

Fig. 253 Captain Allan Hancock standing beside the barrel post office at Post Office Bay, Charles Island, perhaps the best-known single feature in the Galapagos Islands. This old barrel, or one like it, has been in continuous use since the days of Gloucester whalers, 150 years or more ago.

Fig. 220 Wenman Island, Galapagos, landing

Fig. 221 Wenman Island, Galapagos

Fig. 222 Marchena Island, Galapagos

Fig. 223 Marchena Island, Galapagos

Fig. 224 Darwin Bay, Tower Island, Galapagos

Fig. 225 Darwin Bay, Tower Island, Galapagos

Fig. 226 Darwin Bay, Tower Island, landing place, Galapagos

Fig. 227 Darwin Bay, Tower Island, Galapagos

Fig. 228 Narborough Island, Galapagos, near Mangrove Point

Fig. 229 Narborough Island, Galapagos, seen from Tagus Cove

Fig. 230 Tagus Cove and Crater Lake, Albemarle Island

Fig. 231 Panorama of Crater Lake south of Tagus Cove, Albemarle Island

Fig. 232 Beach north of Tagus Cove, Albemarle Island

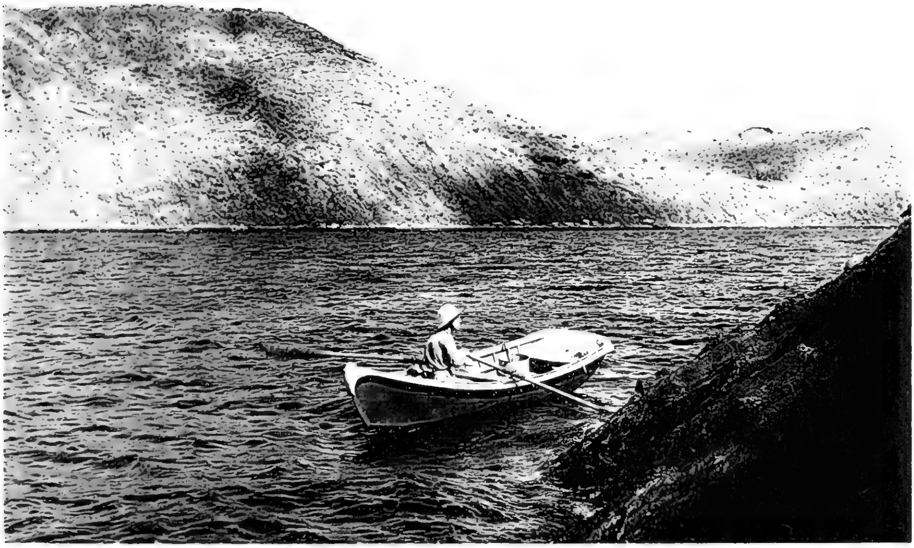


Fig. 233 Tagus Cove, Albemarle Island

Fig. 234 Cristofer Point, Albemarle Island

Fig. 235 Cape Berkeley, Albemarle Island

Fig. 236 Cartago Bay, Albemarle

Fig. 237 Tagus Cove, Albemarle

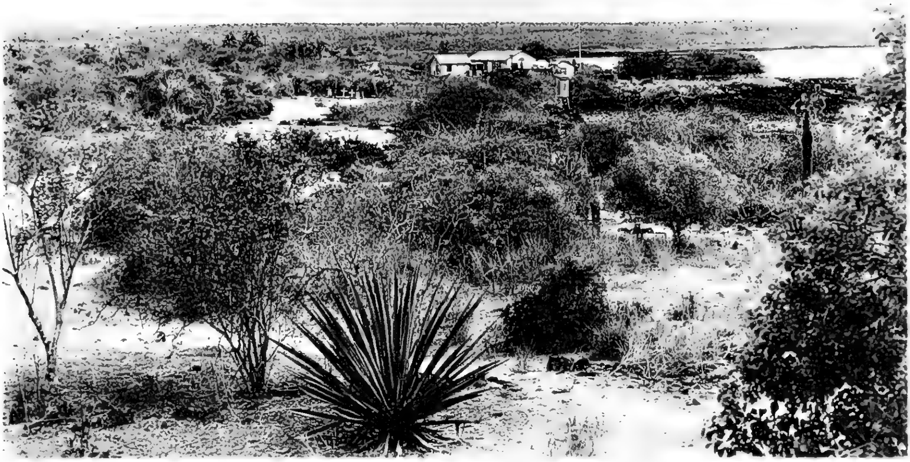


Fig. 238 Academy Bay, Indefatigable Island

Fig. 239 Barrington Island, Galapagos

Fig. 240 Conway Bay, Indefatigable Island

Fig. 241 Reef in Conway Bay, Indefatigable Island

Fig. 242 Daphne Major Island, Galapagos

Fig. 243 Academy Bay, Indefatigable Island

Fig. 244 South Seymour Island from Indefatigable

Fig. 245 South Seymour Island

Fig. 246 South Seymour Island looking toward Indefatigable

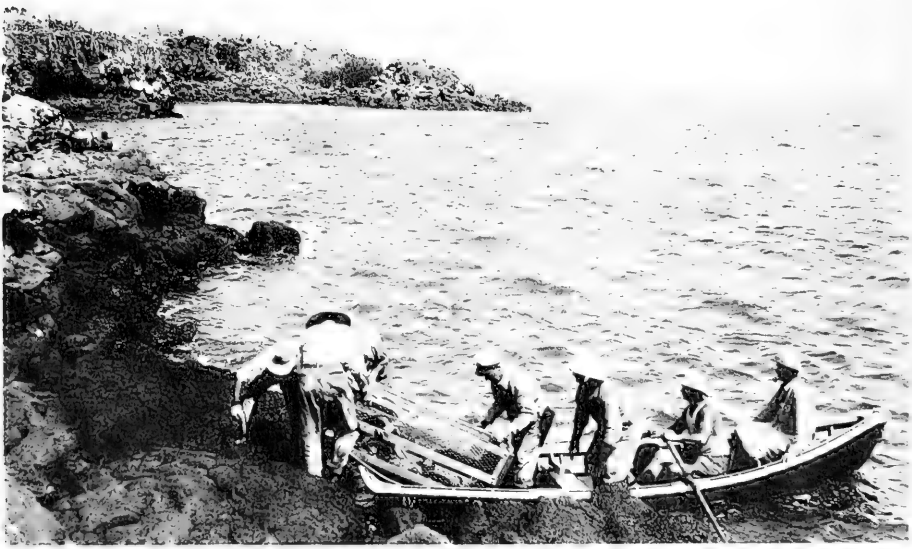


Fig. 247 North Seymour Island

Fig. 248 Chatham Island

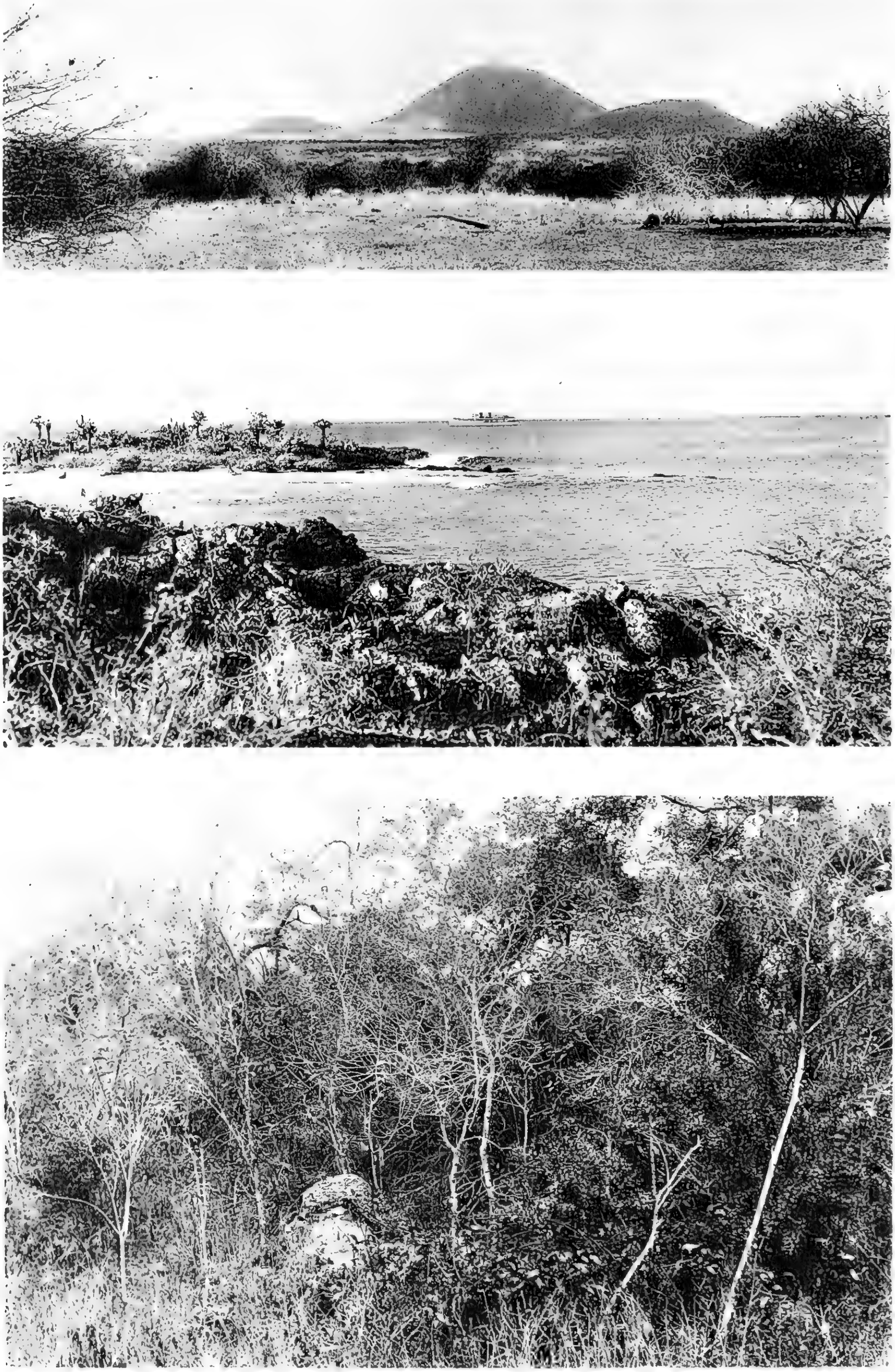
Fig. 249 Chatham Island, village of Progreso

Fig. 250 Chatham Island, Wreck Bay Lighthouse

Fig. 251 Chatham Island, Wreck Bay

Fig. 252 Post Office Bay, Charles Island

Fig. 253 Captain Hancock at barrel post office



Figs. 254-256 Charles Island, vicinity of Black Beach

Fig. 257 Charles Island, lagoon, Post Office Bay

Fig. 258 Hood Island, Galapagos

Fig. 259 James Bay, James Island, looking north

Fig. 260 James Bay, James Island

Fig. 261 Interior of James Island

Fig. 262 Crater lake of James Island

Fig. 263 Panorama, Sulivan Bay, James Island

Fig. 264 Landing, Sulivan Bay, James Island

Fig. 265 Sea stack, Sulivan Bay, James Island

Fig. 263 Panorama, Sulivan Bay, James Island

Fig. 264 Landing, Sulivan Bay, James Island

Fig. 265 Sea stack, Sulivan Bay, James Island

Fig. 266 James Island, Galapagos seen from Bartholomew Island

Fig. 267 Spatter cones, Bartholomew Island

PLATE 122

Fig. 254 Craters of Charles Island, Galapagos, top the gentle rise from Black Beach Anchorage, on the east side of the island. A three-mile trail led to Friedo, home of Dr. Ritter, and a seven-mile trail to Paradiso, home of the Baroness Wagner-Bosquet.

Fig. 255 Black Beach, Charles Island, anchorage most frequented by *Velero III* in the Galapagos Islands. Shore collecting was accomplished on the rocky beaches in the foreground, and Black Beach served as a starting point for numerous treks to the interior. Chart 110, p. 422.

Fig. 256 The highlands of Charles Island, Galapagos, above an elevation of 1,000 feet, are covered with brush tangles formed by bursera trees and other vegetation, including citrus groves planted by early settlers, which have now gone wild. Such rank vegetation is found only in the belt of fog, or "garua" as it is locally known. (Photograph by W. L. Schmitt.)

PLATE 123

Fig. 257 Lagoon at Post Office Bay, Charles Island, Galapagos, showing flamingos which feed upon a pink alga which grows beneath the surface. Fiddler crabs occur around the margins of the lagoon. The shadowy forms on the distant hills are bursera trees. (Photograph by W. L. Schmitt.)

Fig. 258 View of the east coast of Hood Island, Galapagos, looking north toward Osborn Island and Gardner Bay. An albatross rookery occupies the level portion of the promontory in the middle distance during a portion of the year. Chart 114, p. 424.

PLATE 124

Fig. 259 View looking across James Bay, James Island, from the abandoned habitations located at the south side of the Bay. An apparently fresh lava flow is seen in the middle distance. A trail leads off to the right to a crater lake mentioned by Darwin. Chart 103, p. 419.

Fig. 260 The headland which marks the northern limit of James Bay, James Island, Galapagos, has been cut by wave action, the perpendicular cliff exposing a cross section of the lava cap which covers this portion of the island. The Expedition launch is shown in the foreground. (Photograph by W. L. Schmitt.)

PLATE 125

Fig. 261 The interior of James Island contains some of the tallest trees which are to be found in the archipelago, although those of southern Albemarle in the region of Villamiel are said to be larger. An Expedition member stands on the trail leading from the beach to the crater lake. (Photograph by W. L. Schmitt.)

Fig. 262 The crater lake at James Bay, James Island, was visited by Darwin over 100 years ago. It has been a source of salt to visitors to the Galapagos Islands for an even longer period. The bottom of the crater was reached by a cable car, cable and windlass now lying rusted and useless. (Photograph by W. L. Schmitt.)

PLATES 126, 127

Fig. 263 Panorama of Sulivan Bay, Galapagos, showing, from left to right, summit, landing place, and sea stack of Bartholomew Island; landing place, lava flows, and craters of James Island. In taking the picture the camera described an arc of almost 180 degrees, or from southeast of the anchorage to almost northwest. (Photograph by Dr. Waldo L. Schmitt.)

Fig. 264 Curving strand opposite the constriction cut by Sulivan Bay, James Island, into Bartholomew Island, which forms its southern boundary. The channel separating Bartholomew and James islands passes between the lava cone in the right background and the dark promontory in the left center and may be seen above the row of mangrove trees. Chart 105, p. 419.

Fig. 265 The sea stack at Sulivan Bay, James Island, one of the most conspicuous landmarks in the entire Galapagos group. It is located on Bartholomew Island, which forms the southern shore of the bay. A narrow channel separates Bartholomew Island from James Island itself. Chart 105, p. 419.

PLATE 128

Fig. 266 View of James Island, Galapagos, from the summit of Bartholomew Island. Sulivan Bay is shown at the right, dominated by a lava stack and a comparatively recent lava flow. The small arm of the sea which cuts off Bartholomew Island from James Island may be seen just beyond the promontory to the left. (Photograph by Wm. R. Taylor.)

Fig. 267 View of James Island from Bartholomew Island showing numerous small spatter cones with which the smaller island is studded. Chart 105, p. 419. (Photograph by Wm. R. Taylor.)

ALLAN HANCOCK PACIFIC EXPEDITIONS

VOLUME 1 NUMBER 3

GENERAL ACCOUNT OF THE SCIENTIFIC WORK OF THE *VELERO III* IN THE EASTERN PACIFIC, 1931-41

PART III

A Ten-Year List of the *Velero III* Collecting Stations (Charts 1-115)

BY

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An Appendix of Collecting Stations of the Allan Hancock Foundation for the Year 1942

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GENERAL ACCOUNT OF THE SCIENTIFIC WORK OF THE *VELERO III* IN THE EASTERN PACIFIC

A Ten-Year List of the *Velero III* Collecting Stations

The *Velero III* has now been in use for Pacific Exploration for ten years. A list of the collecting stations occupied during these ten years, with appropriate data concerning these, is here presented.

The information supplied is a compilation of data, the basis for which has been supplied by the officers of the ship and various members of the Pacific Expeditions. The officers have provided exact geographic positions (latitude and longitude) and depths, in many cases, particularly in the last three years. The Expedition members have made note of positions, depths, and types of bottom, as well as other items of interest very necessary in making up the list.

Of these Expedition members, Mr. John Garth, of the Foundation staff, who has been on all the longer cruises, Mr. Fred Ziesenhenne, also of the Foundation staff, who has been on nearly all the cruises, and Dr. Waldo L. Schmitt, of the National Museum staff, who has been on several of them, have provided the greater proportion of the information, without which the list could not have been compiled.

The primary objective of the Pacific Expeditions has been marine biological investigation, and it is with this investigation that this list of stations is almost entirely concerned.

Most of the stations, especially in the later years, have been dredging stations, although stations where shore collecting has been done are numerous. In many instances members of a shore party have made observations on terrestrial fauna and flora, but seldom has any of these observations been given a station number, unless collections definitely associated with marine investigation were made.

A smaller number of stations represents dipping by using the cargo light at night, when the ship was at anchor, diving, seining, et cetera. Much fishing has been done for taxonomic and life history work, and for work on fish parasites, but ordinarily the fish boat wanders too far afield to place it with a station number.

The *Velero III* exploration is not confined to biological investigation. Observations in physical and chemical oceanography, in geology, and in sedimentation have been made, but the stations occupied, although they have been given numbers, are not included in this list. Ethnology has been much to the fore, but most of the records here are photographic. The locations are usually associated with the shore stations, but they are not referred to in this list.

In the first long cruise, 1931-32, collecting for the Foundation was rather incidental and was confined to shore and inland collecting near each anchorage used. These stopping places have been numbered in order and the geographic position is given for each; however, the numbers have not the same meaning as the numbers for the later stations. For that reason, numbering for actual collecting stations was again started at "1" on the next cruise, and these have been continued in chronological order since that time.

On the second cruise, starting in late December, 1932, shore collecting was still the chief means of obtaining specimens, although diving, seining, setting lobster traps, and collecting coral heads brought good results. Dredging by hand from a motorboat helped out materially.

On the third cruise, December, 1933, to March, 1934, better equipment for dredging really started a new era. One of the ship's motorboats was fitted up with a power winch, shearlegs, and sorting table and was provided with 250 fathoms of steel cable for dredging. This worked very well and has been used, with some slight changes, ever since.

In 1938 the *Velero III* was equipped for dredging, and this equipment has been used extensively for dredging in deeper water and in shallower water, as well, if the bottom is not too rough.

For shore stations and for those where the motorboat is used, readings of latitude and longitude have not been taken directly, but have been determined from the position of the starting point as shown on the hydrographic charts. They are not of uniform accuracy, as the charts vary much in scale.

Since the *Velero III* has been in action for dredging, the exact position can readily be determined, and it has been so determined at the beginning and the end of the haul. The depth (fathometer reading) also is taken at these times.

When the small dredge is used, the haul is usually short, and two or more are often taken in a restricted area with depth and bottom similar over the area, in which case both or all of these hauls have been included as a single station. When the large dredge is used from the *Velero III,* the hauls are usually longer; however, if more than one haul is made in a restricted area, with depth and bottom similar throughout, the same station number is used throughout, but the hauls are distinguished by letters, a, b, et cetera, following the number.

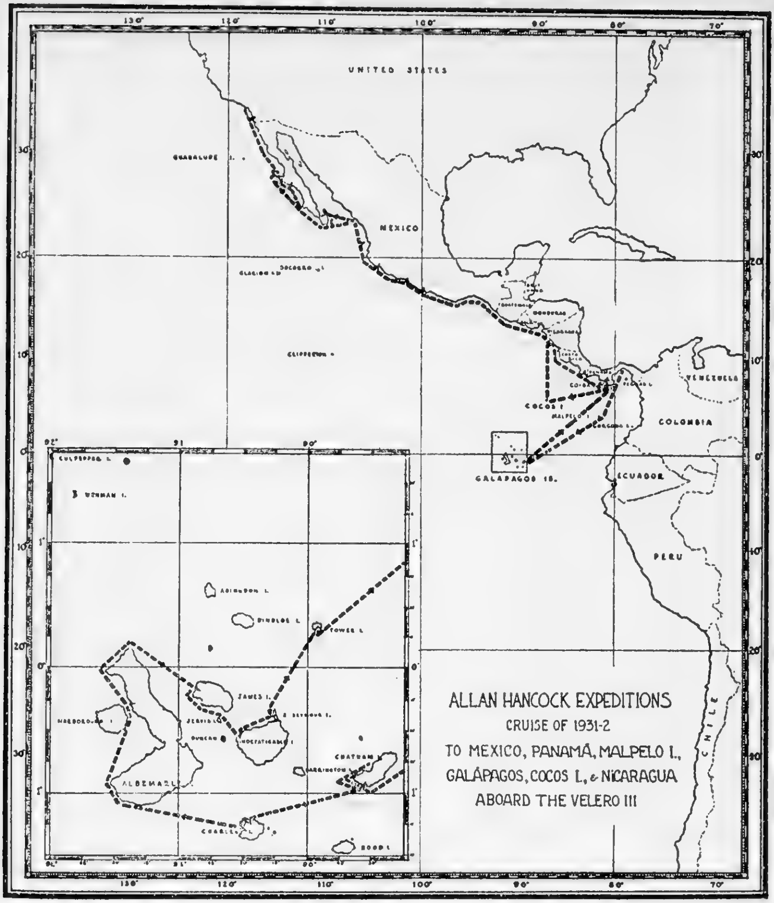
Chart Illustrations

Since to make use of the location of a station as given in latitude and longitude, it is necessary to have recourse to hydrographic charts, a less definite location may be sufficient in many cases, more particularly for one who is familiar with the coast. Consequently, the position of each station relative to some geographic feature, e.g., island or bay, is given as well as the latitude and longitude.

When the list of collecting stations of the Allan Hancock Pacific Expeditions was in progress of compilation, the position of each station with its number was marked on a hydrographic chart. A distinctive color was used for the stations established each year. This provided a visual record of all the stations of such a nature that it is possible to see at a glance the extent of the collecting in each area shown on each chart in each year that this area has been visited. It has done more than this in indicating where it would be most profitable to do further work.

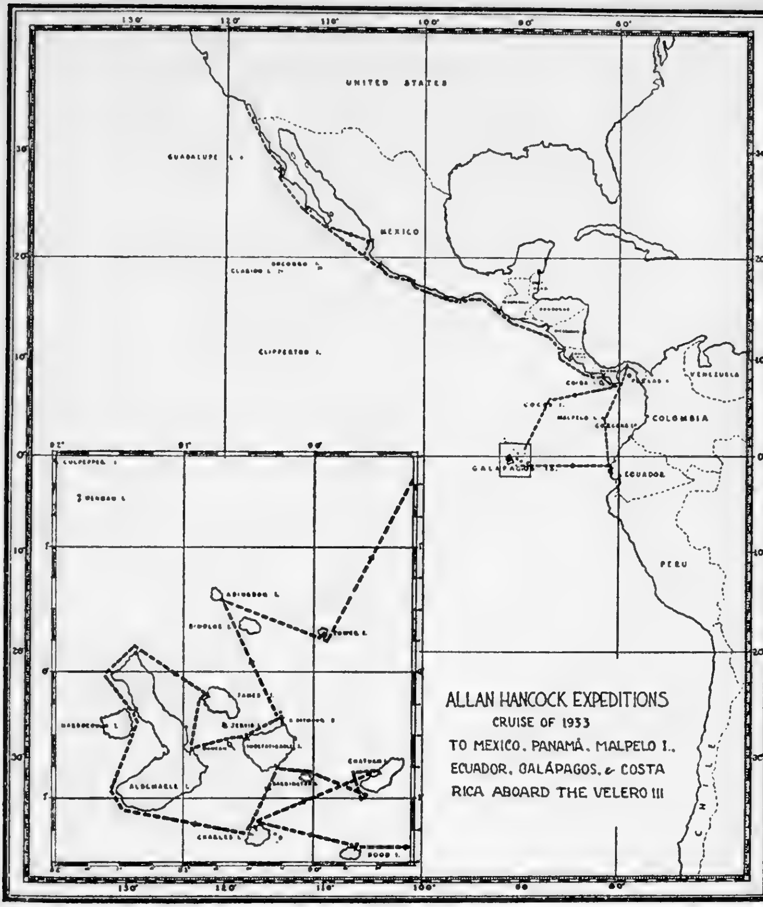
It is out of the question to reproduce these three dozen charts in this publication, but much of the visual aid may be obtained by reproducing numerous small sections of the charts where collecting has been concentrated. This has been done in such a way that the position of all the stations, except a very few isolated ones, is indicated. Tracings were made directly from the marked charts (the chart number and the latitude and longitude indicated in each case), and these have been prepared for reproduction by Mr. Anker Petersen of the Foundation staff.

Charts 1 to 10 explain the ten expeditions of the *Velero III* and are called Expedition charts. Number 11 gives the orientation of charts 12 to 18 in connection with the collecting stations of the *Velero III* in Eastern Pacific waters. Charts 19 to 115 are called Distribution charts. (See pp. 368-424 for the list and their localities.)



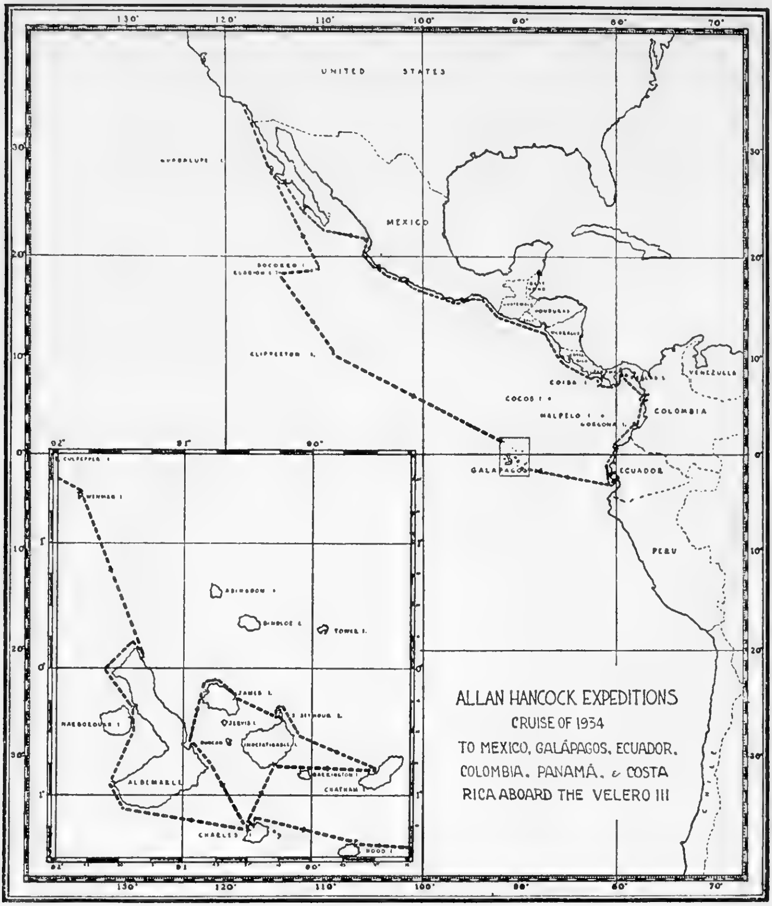
EXPEDITION CHART 1
December 3, 1931, to February 27, 1932
Stations 1-23, pp. 272-273

The term Expedition Chart for charts numbered 1-10 has been used here to emphasize the actual areas visited by the *Velero III* and to avoid possible confusion. Official numbers of the Hydrographic charts of the Hydrographic Office of the U.S. Navy appear on the lower right-hand corner as a part of the chart.



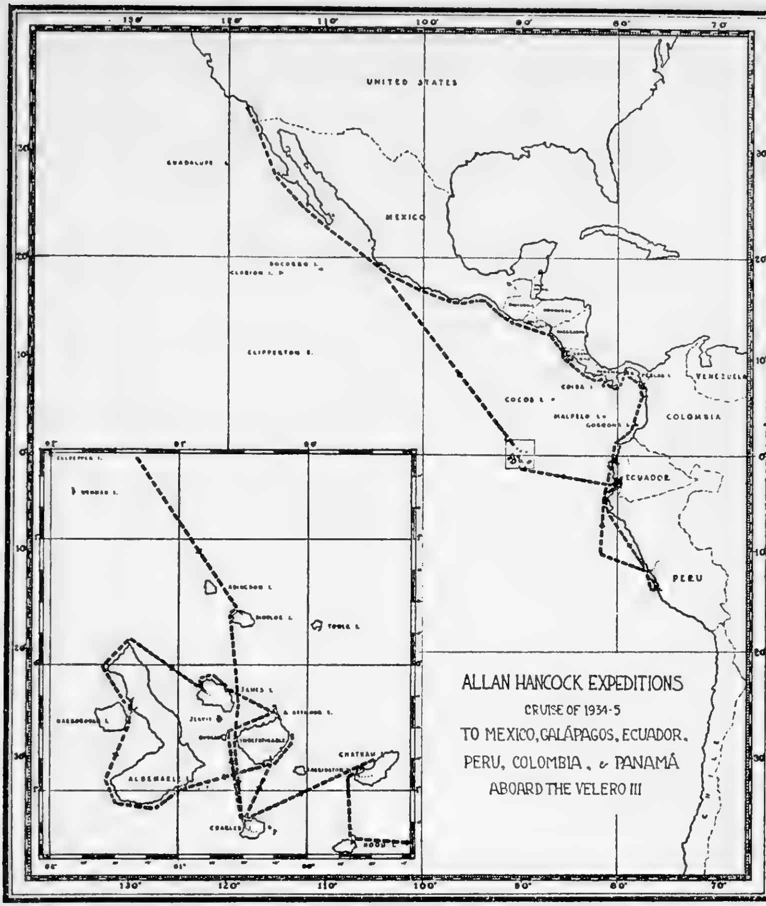
EXPEDITION CHART 2

December 29, 1932, to March 23, 1933
Stations 1-33 to 127-33, pp. 274-280



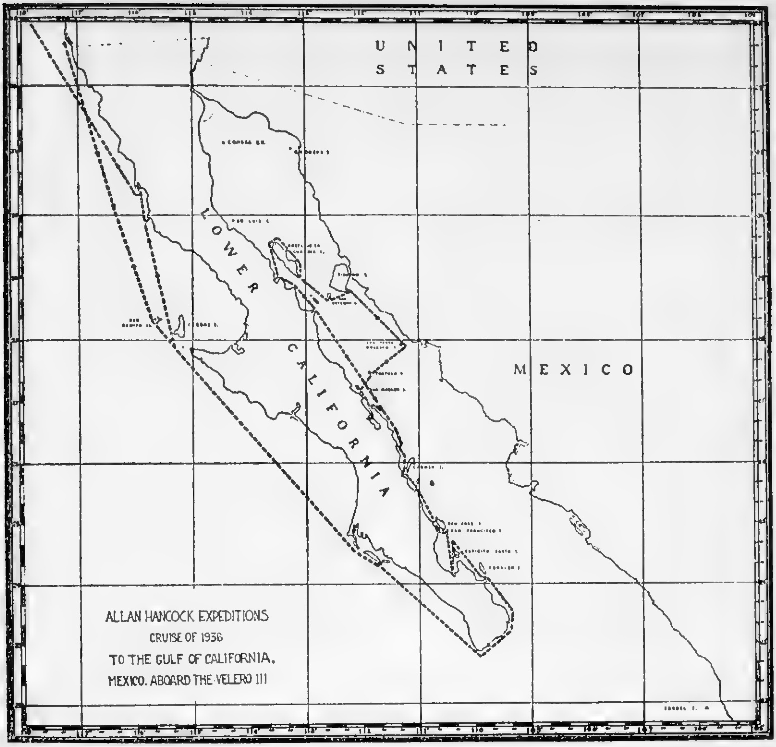
EXPEDITION CHART 3

December 30, 1933, to March 14, 1934
Stations 128-34 to 288-34, pp. 280-288



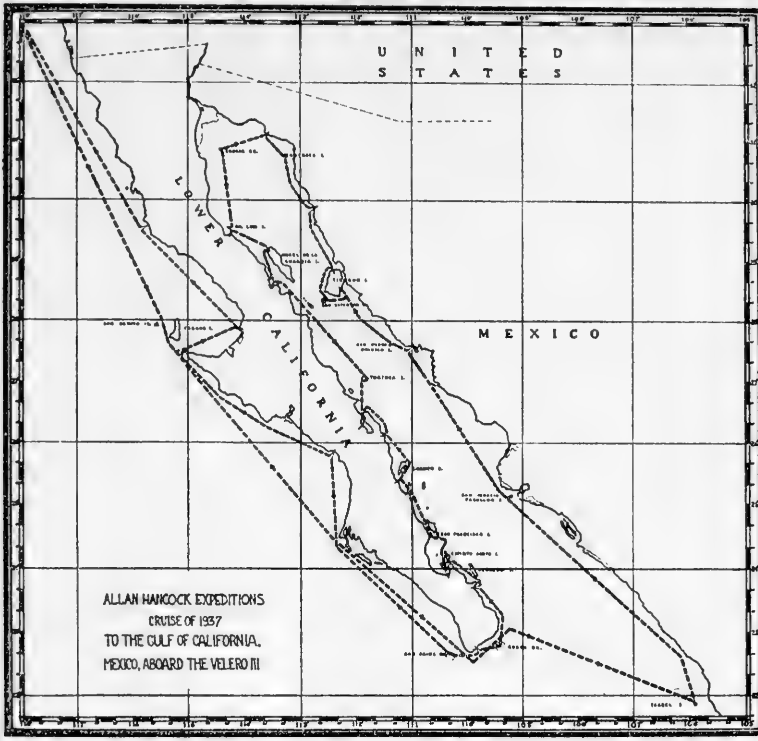
EXPEDITION CHART 4

November 23, 1934, to April 12, 1935
Stations 306-35 to 487-35, pp. 289-297



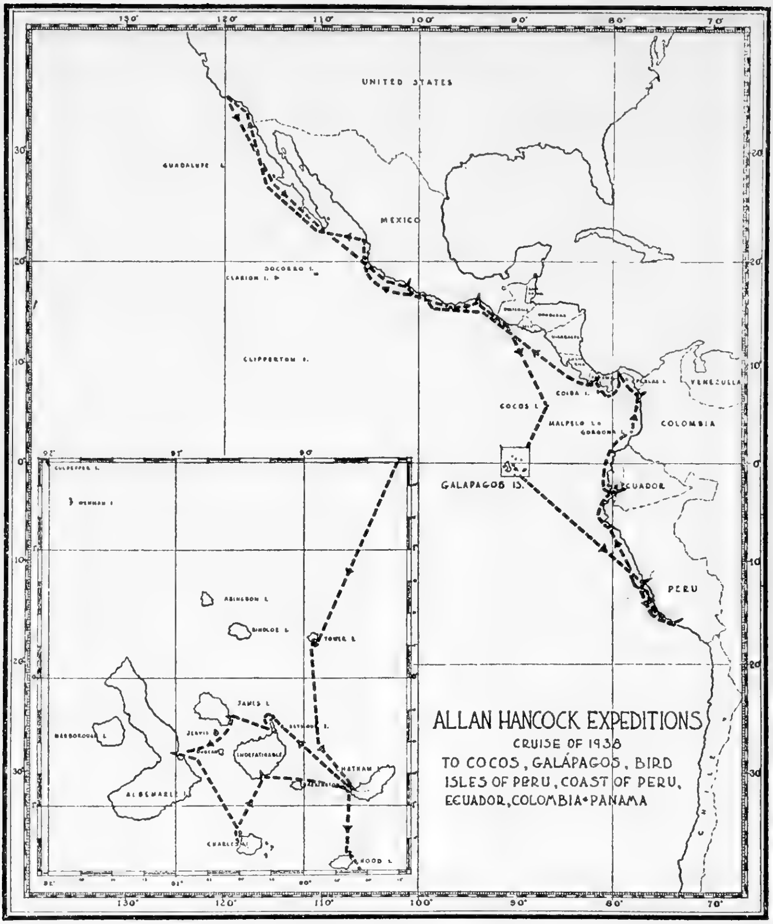
EXPEDITION CHART 5

February 14, 1936, to March 26, 1936
Stations 488-36 to 609-36, pp. 297-304



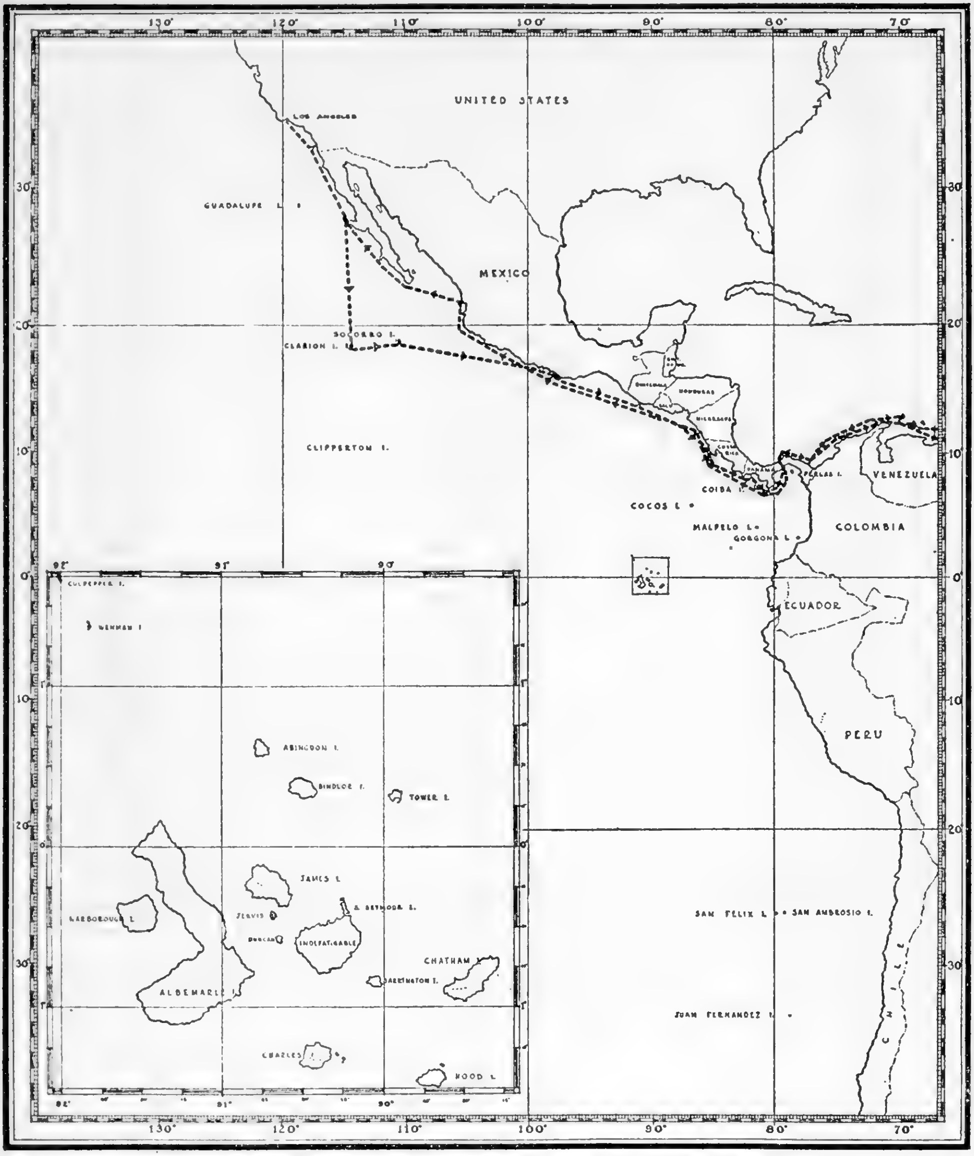
EXPEDITION CHART 6

February 26, 1937, to April 8, 1937
Stations 610-37 to 752-37, pp. 304-311



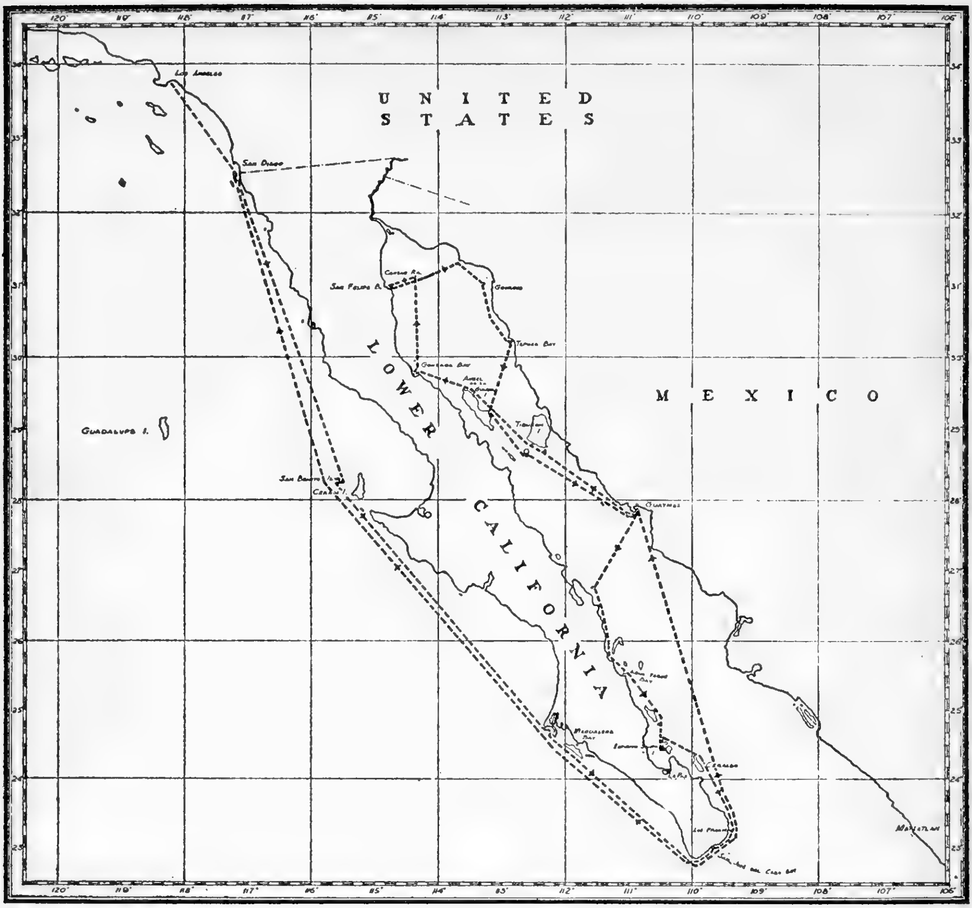
EXPEDITION CHART 7

January 3, 1938, to March 13, 1938
Stations 760-38 to 871-38, pp. 312-318

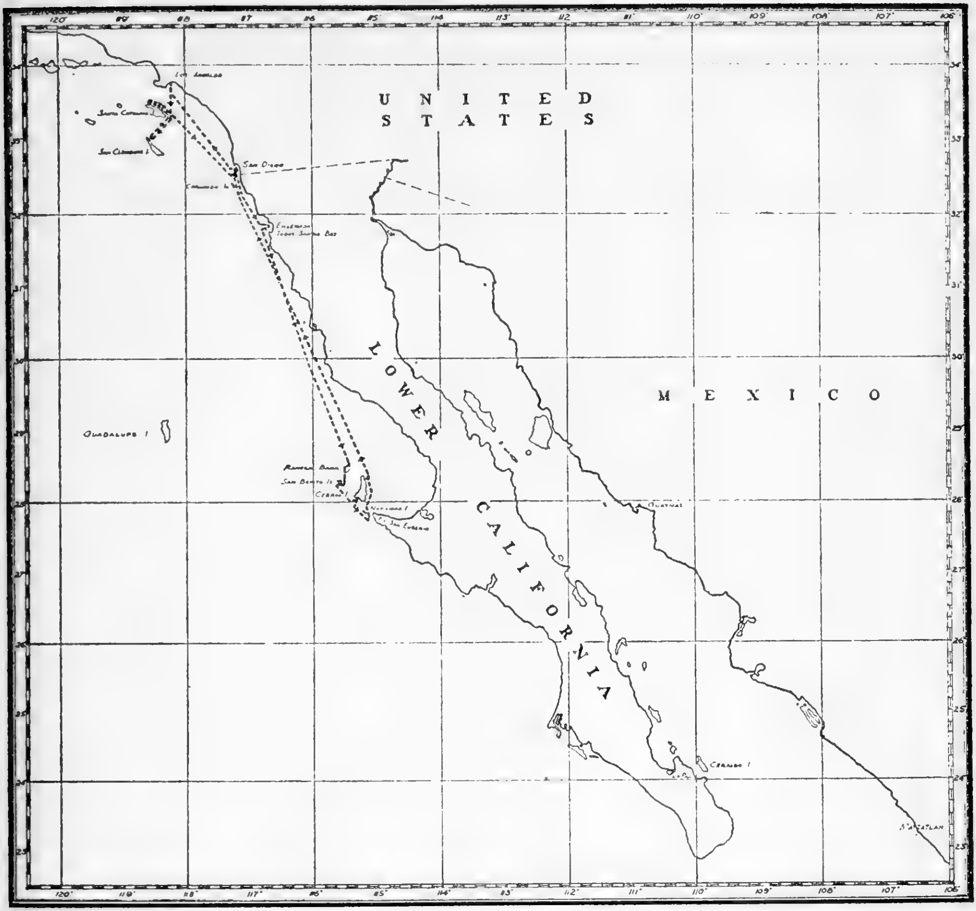


EXPEDITION CHART 8

Allan Hancock Expeditions of 1939 to west coast of Mexico, Guatemala, Costa Rica, and Panama, March 12 to April 1, 1939, in the Pacific Ocean, stations 915-39 to 956-39. Allan Hancock Atlantic Expedition, in the Atlantic Ocean, from Cristobal, Canal Zone, to Port of Spain, Trinidad, April 3 to April 26, 1939, stations A1-A59. In the Pacific Ocean, May 2 to May 9, 1939, dredging in the vicinity of Taboga Island, Panama, White Friars, Tenacatita Bay, Magdalena Island, and Tres Marias Islands, Mexico, stations 957-39 to 974-39. (Pp. 320-323.)



EXPEDITION CHART 9
Allan Hancock Expeditions, cruise of 1940, west coast of Lower California, Mexico, and Gulf of California, west and east coasts, January 17 to February 20, 1940, stations 1030-40 to 1119-40, pp. 328-336.



EXPEDITION CHART 10

Allan Hancock Expeditions, cruise of 1941, to San Diego Bay, California, and Cedros and San Benito islands, Mexico, February 22 to March 2, 1941, stations 1238-41 to 1265-41, pp. 347-350.

ALLAN HANCOCK PACIFIC EXPEDITION OF 1931-1932

Station	*Date*	*Locality*	*Bearings*	
		Mexico		
	Dec. 1931			
1	7-8	Mazatlan, Mexico	106 26 N	23 11 W
2	9-10	Tenacatita Bay, Mexico	19 16 50 N	104 50 25 W
3	11-12	Sihuatanejo Bay, Mexico	17 37 N	101 33 W
4	14-15	Acapulco, Mexico	16 51 N	99 56 W
		Panama		
5	21-22	Bahia Honda, Panama	7 44 35 N	81 31 40 W
6	23-27	Balboa, Canal Zone	8 57 N	79 34 W
		Galapagos Islands		
7	31	Stephens Bay, Chatham Island	0 47 40 S	89 30 W
	Jan. 1932			
8	1-3	Black Beach, Charles Island	1 16 46 S	90 29 56 W
9	4-9	Tagus Cove, Albemarle Island	0 16 13 S	91 22 41 W
10	9-12	James Bay, James Island	0 12 02 S	90 52 08 W
11	12-14	Conway Bay, Indefatigable Island	0 32 S	90 33 10 W
12	14-18	West of South Seymour Island	0 24 20 S	90 20 W
13	19-24	Darwin Bay, Tower Island	0 19 15 N	89 56 42 W
		Panama		
14	27-31	Balboa, Canal Zone	8 57 N	79 34 W
		Costa Rica		
	Feb. 1932			
15	2-4	Chatham Bay, Cocos Island	5 33 20 N	87 59 10 W

Station	*Date*	*Locality*	*Bearings*
	Feb. 1932		**Nicaragua**
16	6-9	Corinto, Nicaragua	12 27 N 87 11 W
			Mexico
17	12-13	Acapulco, Mexico	16 51 N 99 56 W
18	15	Tenacatita Bay, Mexico	19 16 50 N 104 50 25 W
19	16	Isabel Island, Mexico	21 52 20 N 105 51 30 W
20	17-20	Espiritu Santo Island, Gulf of California	24 25 15 N 110 21 10 W
21	23	Asunción Island, West Coast, Lower California	27 06 N 114 16 40 W
22	24	Turtle Bay, West Coast, Lower California	27 39 40 N 114 52 15 W
23	25	Cedros Island, West Coast, Lower California	28 21 10 N 115 11 10 W

ALLAN HANCOCK PACIFIC EXPEDITION OF 1933

Station	*Date*	*Locality*	*Bearings*		*Remarks*
	Dec. 1932	**Mexico**			
1-33	31	46 miles off San Juanico Point, Lower California	25 58 25 N	113 08 40 W	Deck specimens in storm.
	Jan. 1933				
2-33	3	Tenacatita Bay, Mexico	19 17 55 N	104 49 30 W	Shore and land collecting.
3-33	4	Petatlan Bay, Mexico	17 32 N	101 28 W	Shore and land collecting.
4-33	6	Tangola Tangola Bay, Mexico	15 45 N	96 06 W	Shore and land collecting.
		Panama			
5-33	10	Bahia Honda, Panama	7 44 35 N	80 31 40 W	Shore and land collecting.
6-33	13	Balboa, Canal Zone	8 57 N	79 34 W	Shore and land collecting
		Colombia			
7-33	16	Malpelo Island,Bay of Panama	3 59 N	81 34 W	Shore collecting. Rock.
		Ecuador			
8-33	17	Off La Libertad, Ecuador	2 12 05 S	80 55 12 W	At anchorage. Electric Light.
9-33	18	Off La Libertad, Ecuador	2 12 30 S	80 55 05 W	3-5 fathoms. Sand.
10-33	18	South of Santa Elena Point, Ecuador	2 12 S	81 00 25 W	Shore. Rock.
11-33	18	Off La Libertad, Ecuador	2 12 05 S	80 55 12 W	At anchorage. Electric Light.
12-33	19	Off beach at La Libertad, Ecuador	2 12 15 S	80 53 40 W	4 fathoms. Sand.
13-33	19	Off La Libertad, Ecuador	2 12 05 S	80 55 12 W	At anchorage. Electric Light.
14-33	20	Off La Playa, Santa Elena Bay, Ecuador	2 12 30 S	80 56 35 W	2-7 fathoms. Sand with rock patches.
15-33	20	Off La Libertad, Ecuador	2 07 30 S	80 56 30 W	10 fathoms. Sand, shell.
16-33	20	South of La Libertad, Ecuador	2 13 17 S	80 55 24 W	Shore. Rock.
17-33	20	Off La Libertad, Ecuador	2 12 05 S	80 55 12 W	At anchorage. Electric Light.
18-33	21	La Libertad, Ecuador	2 11 14 S	80 58 45 W	2 fathoms. Diving near cable station.
19-33	21	Point Brava, Santa Elena Bay, Ecuador	2 12 23 S	81 00 05 W	Shore. Rock.

Station	Date	Locality	Bearings		Remarks
	Jan. 1933		Galapagos Islands		
20-33	21	Off La Libertad, Ecuador	2 12 05 S	80 55 12 W	At anchorage. Electric Light.
21-33	22	Salango Island, Ecuador	1 35 05 S	80 52 09 W	Shore and land collecting.
22-33	22	La Plata Island, Ecuador	1 16 S	81 05 10 W	Shore and land collecting.
23-33	22	Off La Plata Island, Ecuador	1 15 25 S	81 05 15 W	10 fathoms. Rock, nullipores.
24-33	24	Gardner Bay, Hood Island	1 22 52 S	89 39 15 W	Shore, Osborn Island. Rock.
25-33	24	Gardner Bay, Hood Island	1 23 05 S	89 39 40 W	2 fathoms. Sand.
26-33	24	Gardner Bay, Hood Island	1 22 15 S	89 39 40 W	Anchorage. Electric Light.
27-33	25	Gardner Bay, Hood Island	1 23 10 S	89 39 55 W	Shore. Rock.
28-33	25	Gardner Bay, Hood Island	1 22 40 S	89 40 10 W	2 fathoms. Diving.
29-33	25	Gardner Bay, Hood Island	1 22 15 S	89 39 40 W	Anchorage. Electric Light.
30-33	26	Gardner Bay, Hood Island	1 22 52 S	89 39 15 W	Shore. Rock.
31-33	26	Gardner Bay, Hood Island	1 22 52 S	89 39 15 W	4 fathoms. Diving.
32-33	26	Black Beach Anchorage, Charles Island	1 16 46 S	90 29 56 W	Anchorage. Electric Light.
33-33	27	Black Beach, Charles Island	1 16 36 S	90 29 42 W	Shore. Rock.
34-33	27	Post Office Bay, Charles Island	1 14 58 S	90 27 49 W	Anchorage. Electric Light.
35-33	28	Ritter's, Charles Island	1 18 S	90 28 35 W	Land Collecting.
36-33	28	Baroness Wagner's, Charles Island	1 20 25 S	90 24 25 W	In seepage from cliff.
37-33	28	Post Office Bay, Charles Island	1 14 58 S	90 27 49 W	Anchorage. Electric Light.
38-33	29	Southeast of Cormorant Point, Charles Island	1 14 59 S	90 25 50 W	Shore. Rock.
39-33	29	Flamingo Lagoon, near Cormorant Bay, Charles Island	1 14 58 S	90 26 09 W	Shore of lagoon.
40-33	29	Post Office Bay, Charles Island	1 14 58 S	90 27 49 W	Anchorage. Electric Light.
41-33	30	East of Wreck Bay, Chatham Island	0 50 40 S	89 32 55 W	4 fathoms. Rock.
42-33	31	Stephens Bay, Chatham Island	0 49 40 S	89 31 10 W	Shore opposite Kicker Rock. Rock.

Station	Date	Locality	Bearings		Remarks
	Jan. 1933				
43-33	31	Stephens Bay, Chatham Island	0 48 30 S	89 30 20 W	12 fathoms. Rock, Sand.
	Feb. 1933				
44-33	1	Freshwater Bay, Chatham Island	0 55 55 S	89 29 30 W	Upstream ½ mile.
45-33	1	Off Barrington Island	0 50 S	90 W	Townet astern.
46-33	2	Barrington Island	0 51 35 S	90 02 W	4-10 fathoms. Rock.
47-33	2	Barrington Island	0 51 35 S	90 02 W	2 fathoms. Diving.
48-33	2	Barrington Island	0 51 35 S	90 02 W	Shore. Rock.
49-33	3	Academy Bay, Indefatigable Island	0 45 13 S	90 20 28 W	Shore. Rock.
50-33	3	Academy Bay, Indefatigable Island	0 45 55 S	90 20 45 W	Anchorage. Electric Light.
51-33	4	Academy Bay, Indefatigable Island	0 45 35 S	90 20 10 W	4-10 fathoms. Sand.
52-33	4	Academy Bay, Indefatigable Island	0 45 14 S	90 20 11 W	Shore. Rock.
53-33	4	Academy Bay, Indefatigable Island	0 45 55 S	90 20 45 W	Anchorage. Electric Light.
54-33	5	South of Indefatigable Island	0 59 S	90 20 20 W	110 fathoms. Rock.
55-33	5	Northeast of Charles Island	1 03 30 S	90 17 30 W	60 fathoms. Rock.
56-33	5	Flamingo Bay, off Cormorant Bay, Charles Island	1 14 53 S	90 26 18 W	Shore. Rock.
57-33	6	Post Office Bay, Charles Island	1 15 25 S	90 25 48 W	4 fathoms. Sand, rock.
58-33	6	Cormorant Bay, Charles Island	1 14 47 S	90 26 26 W	Shore. Rock.
59-33	6	Off Cormorant Bay, Charles Island	1 14 31 S	90 26 30 W	13 fathoms. Rock.
60-33	6	Post Office Bay, Charles Island	1 14 58 S	90 27 49 W	Anchorage. Electric Light.
61-33	7	Tagus Cove, Albemarle Island	0 16 13 S	91 22 41 W	Anchorage. Electric Light.
62-33	8	Black Bight, Albemarle Island	0 12 55 S	91 22 30 W	Shore. Rock.
63-33	8	Black Bight, Albemarle Island	0 12 55 S	91 24 45 W	12 fathoms. Rock.
64-33	8	Tagus Cove, Albemarle Island	0 16 13 S	91 22 41 W	Anchorage. Electric Light.

Station	Date	Locality	Bearings		Remarks
	Feb. 1933				
65-33	9	Reef, north of Tagus Hill, Albemarle Island	0 15 40 S	91 24 W	Reef. Rock.
66-33	9	Tagus Cove, Albemarle Island	0 16 17 S	91 22 41 W	10-20 fathoms. Sand, nullipores.
66a-33	9	Tagus Cove, Albemarle Island	0 16 17 S	91 22 41 W	2-3 fathoms. Baited roach trap attached to lobster pot. *Parapinnixa.*
67-33	9	Tagus Cove, Albemarle Island	0 16 13 S	91 22 41 W	Anchorage. Electric Light.
68-33	10	South of Cape Berkeley, Albemarle Island	0 03 15 S	91 35 35 W	Shore. Rock.
69-33	11	Albemarle Point, Albemarle Island	0 09 N	91 23 W	Shore. Rock, tide pools.
69a-33	11	Albemarle Point, Albemarle Island	0 09 N	91 23 W	Shallow water. Mud sample.
70-33	12	James Bay, James Island	0 12 02 S	90 52 08 W	Anchorage. Electric Light.
71-33	12	James Bay, James Island	0 11 56 S	90 51 20 W	Shore. Rock, sand.
72-33	12	Cartago Bay, Albemarle Island	0 35 58 S	90 55 24 W	Anchorage. Electric Light.
73-33	13	Cartago Bay, Albemarle Island	0 34 10 S	90 57 55 W	North Shore. Rock, sand, mangroves.
74-33	14	Cartago Bay, Albemarle Island	0 34 38 S	90 57 45 W	3-6 fathoms. Sand with rock patches.
75-33	13	Cartago Bay, Albemarle Island	0 35 58 S	90 55 24 W	Anchorage. Electric Light.
76-33	14	Cartago Bay, Albemarle Island	0 34 10 S	90 57 55 W	North Shore. Sand.
77-33	14	Cartago Bay, Albemarle Island	0 35 58 S	90 55 24 W	Anchorage. Electric Light.
78-33	15	Conway Bay, Indefatigable Island	0 32 S	90 33 10 W	Anchorage. Electric Light.
79-33	15	Duncan Island	0 25 20 S	90 43 50 W	Inland collecting.
80-33	15	Duncan Island	0 25 20 S	90 43 50 W	Shallow water. Coral.
81-33	16	Conway Bay, Indefatigable Island	0 32 40 S	90 33 W	6 fathoms. Sand.
82-33	17	Conway Bay, Indefatigable Island	0 31 25 S	90 32 15 W	Shore of small island. Rock.
82a-33	17	Conway Bay, Indefatigable Island	0 35 20 S	90 33 30 W	Shore opposite Eden Island. Mud flats. Fiddlers.
83-33	17	Off South Seymour Island	0 24 20 S	90 20 W	Anchorage. Electric Light.
84-33	18	Off South Seymour Island	0 25 25 S	90 20 50 W	13 fathoms. Sand.

Station	*Date*	*Locality*	*Bearings*		*Remarks*
	Feb. 1933				
85-33	18	North Seymour Island	0 23 15 S	90 18 25 W	Shore. Rock.
85a-33	18	North Seymour Island	0 23 15 S	90 19 25 W	Shore. Rock.
86-33	18	Off South Seymour Island	0 24 20 S	90 20 W	Anchorage. Electric Light.
87-33	19	Off South Seymour Island	0 23 20 S	90 19 40 W	15 fathoms. Sand, shell.
88-33	19	South Seymour Island	0 24 45 S	90 19 15 W	West Shore. Rock, sand.
88a-33	19	South Seymour Island	0 24 45 S	90 19 15 W	Freshwater pools.
89-33	19	Off South Seymour Island	0 24 20 S	90 20 W	Anchorage. Electric Light.
90-33	20	Abingdon Island	0 33 30 N	90 47 W	Shore. Rock.
91-33	20	Darwin Bay, Tower Island	0 19 15 N	89 56 42 W	Anchorage. Electric Light.
92-33	21	Darwin Bay, Tower Island	0 19 15 N	89 56 42 W	Anchorage. Electric Light.
93-33	22	Darwin Bay, Tower Island	0 19 28 N	89 56 45 W	Shore. Lagoon Beach.
94-33	22	Darwin Bay, Tower Island	0 19 18 N	89 57 14 W	Shallow water. Coral.
95-33	23	Darwin Bay, Tower Island	0 20 45 N	89 57 02 W	Shore of lake in crater.
95a-33	23	Darwin Bay, Tower Island	0 19 28 N	89 56 57 W	Offshore. Fish traps.
96-33	24	Darwin Bay, Tower Island	0 19 18 N	89 57 14 W	Shallow water. Rock.
97-33	24	Darwin Bay, Tower Island	0 19 18 N	89 57 14 W	Shallow water. Coral.
98-33	25	Darwin Bay, Tower Island	0 19 18 N	89 57 14 W	Shore. Rock.
99-33	25	Darwin Bay, Tower Island	0 19 24 N	89 56 50 W	3-4 fathoms. Tangles.
100-33	25	Darwin Bay, Tower Island	0 19 15 N	89 56 42 W	Anchorage. Electric Light.
101-33	26	Darwin Bay, Tower Island	0 19 18 N	89 57 14 W	Shore. Rock.
101a-33	26	Darwin Bay, Tower Island	0 19 18 N	89 57 14 W	Shallow water. Coral.
102-33	26	Darwin Bay, Tower Island	0 19 15 N	89 56 42 W	Anchorage. Electric Light.

Station	Date	Locality	Bearings		Remarks
	Feb. 1933		Costa Rica		
103-33	28	Chatham Bay, Cocos Island	5 32 56 N	86 59 28 W	Freshwater stream.
104-33	28	Chatham Bay, Cocos Island	5 33 20 N	87 59 10 W	Anchorage. Electric Light.
	Mar. 1933				
105-33	1	Wafer Bay, Cocos Island	5 32 45 N	87 00 10 W	Shore. Rock.
106-33	1	Chatham Bay, Cocos Island	5 33 20 N	87 59 10 W	Anchorage. Electric Light.
107-33	2	Wafer Bay, Cocos Island	5 32 45 N	87 00 10 W	Shore. Rock.
108-33	2	Wafer Bay, Cocos Island	5 32 45 N	87 00 25 W	2-4 fathoms. Sand.
109-33	3	Chatham Bay, Cocos Island	5 32 56 N	86 59 18 W	Freshwater stream.
			Panama		
110-33	6	Barro Colorado Island, Canal Zone	9 13 35 N	79 53 45 W	Biological Station. Land, freshwater stream.
111-33	9	Bahia Honda, Panama	7 45 15 N	81 33 10 W	Shore. Rock.
112-33	9	Bahia Honda, Panama	7 45 15 N	81 33 10 W	Freshwater pool.
113-33	9	Bahia Honda, Panama	7 45 18 N	81 32 51 W	5-8 fathoms. Sand.
114-33	10	Bahia Honda, Panama	7 43 46 N	81 31 54 W	Shallow water. Coral.
			Costa Rica		
115-33	12	Port Culebra, Costa Rica	10 25 20 N	85 40 20 W	Shore. Along slough.
116-33	13	Cocos Bay, south of Port Culebra, Costa Rica	10 33 35 N	85 42 30 W	2 fathoms. Sand, shell.
117-33	13	Port Culebra, Costa Rica	10 35 20 N	85 40 20 W	Seining at mouth of slough.
			Mexico		
118-33	16	Tangola Tangola Bay, Mexico	15 45 50 N	96 06 15 W	Shore. Rock, sand.
119-33	16	Tangola Tangola Bay, Mexico	15 46 10 N	96 06 15 W	Fresh water.
120-33	17	Petatlan Bay, Mexico	17 31 30 N	101 27 15 W	Shore. Rock.

Station	*Date*	*Locality*	*Bearings*		*Remarks*
	Mar. 1933				
121-33	17	Tenacatita Bay, Mexico	19 16 50 N	104 48 27 W	Shore, head of the bay. Rock, sand.
122-33	18	Tenacatita Bay, Mexico	19 17 17 N	104 48 40 W	4-10 fathoms. Sand, mud.
123-33	18	Tenacatita Bay, Mexico	19 16 50 N	104 48 27 W	Land collecting in from shore.
124-33	19	Isabel Island, Mexico	21 51 30 N	105 53 35 W	Shore. Rock.
125-33	19	Isabel Island, Mexico	21 51 30 N	105 53 35 W	Shallow water. Porites coral.
126-33	21	Santa Maria Bay, Lower California	24 45 N	112 13 30 W	5-25 fathoms. Gray sand.
127-33	21	Santa Maria Bay, Lower California	24 47 10 N	112 16 15 W	Shore, at mouth of Lagoon.
		ALLAN HANCOCK PACIFIC EXPEDITION OF 1934			
	Jan. 1934		Mexico		
128-34	2	Braithwaite Bay, Socorro Island	18 42 45 N	110 56 50 W	Shore. Rock with large stones and boulders.
129-34	3	Braithwaite Bay, Socorro Island	18 42 30 N	110 56 13 W	14-18 fathoms. Sand, nullipores.
130-34	3	Braithwaite Bay, Socorro Island	18 42 45 N	110 56 50 W	Shore. Rock, large shingle, tide pools.
131-34	3	Braithwaite Bay, Socorro Island	18 42 45 N	110 56 50 W	Shallow water. *Pocillopora* coral.
132-34	4	Braithwaite Bay, Socorro Island	18 41 15 N	110 56 15 W	40 fathoms. Rock, sand, nullipores.
133-34	4	Braithwaite Bay, Socorro Island	18 42 N	110 50 35 W	20 fathoms. Sand.
134-34	5	Sulphur Bay, Clarion Island	18 20 35 N	114 44 20 W	14 fathoms. Rock, nullipores.
135-34	5	Sulphur Bay, Clarion Island	18 20 20 N	114 44 25 W	25 fathoms. Sand.
136-34	5	Sulphur Bay, Clarion Island	18 20 05 N	114 44 40 W	32 fathoms. Nullipores.
137-34	5	Sulphur Bay, Clarion Island	18 19 05 N	114 45 25 W	57 fathoms. Nullipores.
138-34	5	Sulphur Bay, Clarion Island	18 19 45 N	114 44 35 W	30-50 fathoms. Nullipores. Tangles.
139-34	5	Sulphur Bay, Clarion Island	18 20 50 N	114 44 10 W	Shore. Rock, sand, dry lagoon.
140-34	5	Sulphur Bay, Clarion Island	18 20 50 N	114 44 10 W	Shallow water. Coral.
141-34	5	Sulphur Bay, Clarion Island	18 20 50 N	114 44 10 W	Shore. Shingle.
142-34	6	Off Clipperton Island (To France)	10 40 N	109 25 W	65 fathoms. Rough rock.

Station	*Date*	*Locality*	*Bearings*		*Remarks*
	Jan. 1934		Galapagos Islands		
143-34	11	Off Wenman Island	1 23 10 N	91 48 45 W	100-150 fathoms. Coral, nullipores, worm tubes.
144-34	11	Wenman Island	1 22 40 N	91 49 W	Shore. Rock.
145-34	12	Albemarle Point, Albemarle Island	0 08 45 N	91 21 30 W	6-7 fathoms. Sand with rock patches.
146-34	12	Albemarle Point, Albemarle Island	0 09 N	91 23 W	Shore. Rock, tide pools.
147-34	13	Tagus Cove, Albemarle Island	0 16 38 S	91 22 44 W	30 fathoms. Rock, coral, nullipores.
148-34	13	Tagus Cove, Albemarle Island	0 16 41 S	91 22 39 W	12-25 fathoms. Rock, nullipores.
149-34	13	Tagus Cove, Albemarle Island	0 16 44 S	91 22 38 W	20 fathoms. Rock, nullipores.
150-34	13	Tagus Cove, Albemarle Island	0 16 06 S	91 22 31 W	Shore. Rock.
151-34	13	Tagus Cove, Albemarle Island	0 16 13 S	91 22 41 W	Anchorage. Electric Light.
152-34	14	Tagus Cove, Albemarle Island	0 16 08 S	91 22 44 W	Shallow water. Coral.
153-34	14	Northeast point of Narborough Island	0 17 S	91 25 40 W	Shore. Lava rock, tide pools, mangroves.
154-34	15	Reef north of Tagus Hill, Albemarle Island	0 15 40 S	91 24 W	Reef. Rock.
155-34	15	Off Tagus Cove, Albemarle Island	0 16 45 S	91 22 52 W	50-60 fathoms. Rock, nullipores, bryozoa.
156-34	15	Off Tagus Cove, Albemarle Island	0 16 50 S	91 23 04 W	80-100 fathoms. Rock.
157-34	15	Tagus Cove, Albemarle Island	0 16 08 S	91 22 38 W	10-18 fathoms. Sand, shell.
158-34	15	Tagus Cove, Albemarle Island	0 16 13 S	91 22 41 W	Anchorage. Electric Light.
159-34	16	North of Christopher Point, Albemarle Island	0 52 45 S	91 31 W	Shore. Rock.
160-34	16	Off Black Beach, Charles Island	1 16 46 S	90 29 56 W	Anchorage. Electric Light.
161-34	17	Off Black Beach, Charles Island	1 16 40 S	90 29 46 W	3 fathoms. Rock, algae.
162-34	18	Black Beach, Charles Island	1 16 36 S	90 29 42 W	Shore. Rock.
163-34	18	Black Beach, Charles Island	1 16 36 S	90 29 42 W	Shore. Rock.
164-34	18	Ritter's Spring, Charles Island	1 18 S	90 28 35 W	Freshwater.

Station	*Date*	*Locality*	*Bearings*		*Remarks*
	Jan. 1934				
165-34	18	Baroness Wagner's, Charles Island	1 20 25 S	90 24 25 W	Inland.
166-34	19	Black Beach, Charles Island	1 17 38 S	90 29 55 W	Shore. Rock.
167-34	19	Post Office Bay, Charles Island	1 14 37 S	90 28 08 W	15 fathoms. Rock.
168-34	20	Academy Bay, Indefatigable Island	0 45 14 S	90 20 11 W	Shore. Rock.
169-34	20	Academy Bay, Indefatigable Island	0 46 18 S	90 19 27 W	15-25 fathoms. Sand, rock, algae.
170-34	21	Stephens Bay, Chatham Island	0 47 30 S	89 31 W	32 fathoms. Fine sand, corallines.
171-34	21	Off Stephens Bay, Chatham Island	0 46 10 S	89 30 10 W	35-40 fathoms. Fine sand, corallines.
172-34	21	Stephens Bay, Chatham Island	0 47 40 S	89 29 40 W	12 fathoms. Rock, boulders, gorgonids.
173-34	22	Off South Seymour Island	0 25 10 S	90 19 25 W	5 fathoms. Sand with rock patches.
174-34	22	South Seymour Island	0 24 20 S	90 20 W	West shore. Rock, sand, land collecting.
175-34	22	North Seymour Island	0 23 15 S	90 19 25 W	Shore. Rock.
175a-34	22	South Seymour Island	0 24 20 S	90 20 W	Shore. Sand, *Ocypode.*
176-34	22	Off South Seymour Island	0 24 20 S	90 20 W	Anchorage. Electric Light.
177-34	23	Sulivan Bay, James Island	0 16 30 S	90 35 15 W	5-20 fathoms. Rock with sand patches.
178-34	23	Sulivan Bay, James Island	0 16 S	90 35 W	40 fathoms. Rough rock.
179-34	23	Bartholomew Island, near James Island	0 17 S	90 34 45 W	Shore. Lava rock.
180-34	23	Sulivan Bay, James Island	0 17 02 S	90 35 12 W	Shallow water. Coral.
181-34	24	Off James Bay, James Island	0 11 02 S	90 52 12 W	20 fathoms. Rock.
182-34	24	Off James Bay, James Island	0 10 56 S	90 52 14 W	30 fathoms. Coarse sand.
183-34	24	Between Albany and James Islands	0 10 45 S	90 52 08 W	50-70 fathoms. Rock, shell.
184-34	24	James Bay, James Island	0 12 35 S	90 51 40 W	Shore. Rock and lagoon.
185-34	25	Off Cartago Bay, Albemarle Island	0 34 57 S	90 53 44 W	32 fathoms. Mud.

Station	Date	Locality	Bearings		Remarks
	Jan. 1934				
186-34	25	Off Cartago Bay, Albemarle Island	0 34 12 S	90 52 31 W	32 fathoms. Coarse sand, nullipores.
187-34	25	Cartago Bay, Albemarle Island	0 36 18 S	90 57 11 W	8-10 fathoms. Sand with rock patches.
188-34	25	Cartago Bay, Albemarle Island	0 34 10 S	90 57 55 W	North shore. Rock, sand.
189-34	25	Cartago Bay, Albemarle Island	0 37 37 S	90 51 23 W	Shallow water. Coral.
190-34	26	East of south end of Albemarle Island	0 55 S	90 30 W	58-60 fathoms. Sand, nullipores.
191-34	26	East of south end of Albemarle Island	0 55 S	90 30 W	70 fathoms. Sand.
192-34	27	East of south end of Albemarle Island	1 04 S	90 39 W	120 fathoms. Rough rock.
193-34	27	Post Office Bay, Charles Island	1 14 47 S	90 27 32 W	8-10 fathoms. Sand, rock, algae.
194-34	27	Onslow Island, north of Charles Island	1 14 20 S	90 26 07 W	Crater. Coral.
195-34	29	North of Charles Island	0 59 S	90 25 W	70-80 fathoms. Rock, sand.
196-34	29	Post Office Bay, Charles Island	1 14 56 S	90 28 11 W	8-10 fathoms. Rough rock.
197-34	29	Off Post Office Bay, Charles Island	1 11 15 S	90 31 10 W	35-40 fathoms. Rock.
198-34	29	Northwest of Post Office Bay, Charles Island	1 09 40 S	90 33 W	55-65 fathoms. Sand.
199-34	30	Black Beach, Charles Island	1 17 38 S	90 29 55 W	Shore. Rock.
200-34	30	Off Black Beach, Charles Island	1 16 56 S	90 30 15 W	25-40 fathoms. Rock.
201 34	31	Off Gardner Bay, Hood Island	1 21 55 S	90 40 05 W	25-35 fathoms. Rock.
202-34	31	Osborn Island, Gardner Bay, Hood Island	1 22 52 S	89 39 15 W	Shore. Rock.
203-34	31	Gardner Bay, Hood Island	1 21 20 S	89 40 40 W	20 fathoms. Rock.
204-34	31	Gardner Bay, Hood Island	1 20 40 S	89 39 15 W	30 fathoms. Sand.
	Feb. 1934	Ecuador			
205-34	8	Santa Elena Bay, off La Libertad, Ecuador	2 10 36 S	80 55 50 W	8-12 fathoms. Sand, shell.
206-34	8	Santa Elena Bay, off La Libertad, Ecuador	2 10 36 S	80 55 50 W	Floating Sargassum.
207-34	8	South of Point Santa Elena, Ecuador	2 12 23 S	81 00 05 W	Shore. Rock.

Station	*Date*	*Locality*	*Bearings*		*Remarks*
	Feb. 1934				
208-34	9	Santa Elena Bay, Ecuador	2 09 45 S	80 56 35 W	7-8 fathoms. Sand, small shells.
209-34	9	Off Santa Elena Bay, Ecuador	2 08 20 S	81 00 15 W	8-10 fathoms. Rock, large shells, gorgonids.
210-34	9	Near south shore, Santa Elena Bay, Ecuador	2 11 25 S	80 58 W	5-7 fathoms. Rock, shells, gorgonids.
211-34	10	La Plata Island, Ecuador	1 16 S	81 05 10 W	Shore. Rock.
212-34	10	Off La Plata Island, Ecuador	1 15 S	81 04 15 W	45-55 fathoms. Rock, mud.
213-34	10	Off La Plata Island, Ecuador	1 15 25 S	81 05 15 W	7-10 fathoms. Rock, nullipores.
214-34	11	Off Cape San Francisco, Ecuador	0 39 30 N	80 06 30 W	2 fathoms. Mud, rock.
215-34	11	San Francisco Bay, Ecuador	0 38 40 N	80 05 40 W	2 fathoms. Mud, debris.
216-34	11	San Francisco Bay, Ecuador	0 35 50 N	80 07 W	20 fathoms. Muck.
217-34	11	Off Cape San Francisco, Ecuador	0 40 N	80 08 50 W	2 fathoms. Rock, reef.
		Colombia			
218-34	12	Off Gorgona Island, Colombia	3 00 30 N	78 11 45 W	Shore. Rock.
219-34	12	Off Gorgona Island, Colombia	3 01 N	78 10 55 W	45 fathoms. Mud.
220-34	12	Off Gorgona Island, Colombia	3 01 25 N	78 09 W	150 fathoms. Mud, gravel.
221-34	12	Off Gorgona Island, Colombia	3 01 25 N	78 10 W	20 fathoms. Rock, shell.
222-34	12	Gorgona Island, Colombia	2 59 30 N	78 11 40 W	Shallow water. Coral.
223-34	12	Off Gorgona Island, Colombia	3 00 50 N	78 13 40 W	35 fathoms. Sand with small shells.
224-34	12	Off Gorgona Island, Colombia	2 59 45 N	78 13 20 W	10 fathoms. Gravel, shell.
225-34	12	Off Gorgona Island, Colombia	2 58 55 N	78 13 45 W	8-10 fathoms. Large dead shells.
226-34	12	Off Gorgona Island, Colombia	2 57 50 N	78 14 W	20 fathoms. Gravel, nullipores.
227-34	12	Off Gorgona Island, Colombia	2 57 N	78 14 10 W	5-6 fathoms. Coral.
228-34	12	Between Gorgona and Gorgonilla Islands, Colombia	2 56 20 N	78 14 W	Mud, sand.

Station	Date	Locality	Bearings		Remarks
	Feb. 1934				
229-34	13	Cabita Bay (Cape Corrientes), Colombia	5 29 20 N	77 29 35 W	Shore near stream. Sand.
230-34	13	Cabita Bay (Cape Corrientes)	5 28 20 N	77 30 55 W	10-15 fathoms. Mud.
231-34	13	Off Cape Corrientes, Colombia	5 28 N	77 31 W	10 fathoms. Mud.
232-34	14	Port Utria, Colombia	5 59 10 N	77 20 20 W	Shore. Rock.
233-34	14	Port Utria, Colombia	5 58 50 N	77 21 W	20 fathoms. Mud.
234-34	14	Port Utria, Colombia	5 58 39 N	77 21 40 W	20 fathoms. Sand, shell.
235-34	14	Off Port Utria, Colombia	5 58 30 N	77 21 25 W	15-20 fathoms. Sand, shell, urchins.
236-34	15	Off Port Utria, Colombia	6 00 15 N	77 23 10 W	40 fathoms. Shell, dead leaves.
237-34	15	Off Port Utria, Colombia	5 59 30 N	77 21 45 W	15 fathoms. Rock.
238-34	15	Off Port Utria, Colombia	5 59 25 N	77 21 50 W	20 fathoms. Sand, shell, cake urchins.
239-34	15	Port Utria, Colombia	5 59 40 N	77 21 30 W	Shore. Reef inside outer island.
		Panama			
240-34	20	Off Jicarita Island, Panama	7 12 30 N	81 47 05 W	24 fathoms. Shell.
241-34	20	Off Jicarita Island, Panama	7 13 05 N	81 48 30 W	15 fathoms. Rough rock.
242-34	20	Off Jicarita Island, Panama	7 13 15 N	81 49 W	30 fathoms. Sand, shell.
243-34	20	Jicarita Island, Panama	7 12 50 N	81 48 05 W	Shore. Rock.
244-34	21	South of Medidor Island, off Bahia Honda Panama	7 44 19 N	81 35 23 W	30-35 fathoms. Coarse sand, shell, mud.
245-34	21	Off Pacora Island, off Bahia Honda, Panama	7 44 19 N	81 35 23 W	15-25 fathoms. Rock, shell, nullipores.
246-34	21	Bahia Honda, Panama	7 43 15 N	81 32 40 W	Rocky reef.
247-34	21	Bahia Honda, Panama	7 43 32 N	81 32 19 W	Shallow water. Coral.
248-34	22	Off south point of bay, Bahia Honda, Panama	7 43 N	81 33 07 W	25-30 fathoms. Mud, shell.
249-34	22	Bahia Honda, Panama	7 43 16 N	81 32 55 W	15-20 fathoms. Rock.

Station	*Date*	*Locality*	*Bearings*		*Remarks*
	Feb. 1934				
250-34	22	Secas Islands, Panama	7 57 55 N	82 00 30 W	25 fathoms. Mud, shell.
251-34	22	Secas Islands, Panama	7 57 50 N	82 01 15 W	15 fathoms. Rock, nullipores.
252-34	22	Secas Islands, Panama	7 57 10 N	82 00 45 W	Shallow water. Coral.
		Costa Rica			
253-34	24	Port Culebra, Costa Rica	10 37 15 N	85 40 W	10 fathoms. Mud, shell.
254-34	24	Port Culebra, Costa Rica	10 37 50 N	85 39 15 W	3-10 fathoms. Sand, shell.
255-34	24	Buena Point, Port Culebra, Costa Rica	10 35 25 N	85 41 45 W	Shore. Rock.
256-34	24	South of Mala Point, Port Culebra, Costa Rica	10 36 30 N	85 42 15 W	Shore. Rock.
257-34	25	Off South Viradores Islands, Port Culebra, Costa Rica	10 35 N	85 43 15 W	10 fathoms. Sand, shells.
258-34	25	Near South Viradores Islands, Port Culebra, Costa Rica	10 34 30 N	85 42 50 W	Shallow water. Coral.
		Mexico			
259-34	28	Tangola Tangola Bay and Santa Cruz Bay, Mexico	15 45 N	96 06 12 W	15-20 fathoms. Sand, gravel, mud.
	Mar. 1934				
260-34	1	Tangola Tangola Bay, Mexico	15 45 37 N	96 05 24 W	Shore on small island in bay. Rock.
261-34	1	Tangola Tangola Bay, Mexico	15 45 37 N	96 05 24 W	Shallow water. Coral.
262-34	2	5 miles off White Friars, Mexico	17 28 15 N	101 33 W	100-140 fathoms. Mud.
263-34	2	Off White Friars, Mexico	17 28 35 N	101 31 40 W	80 fathoms. Mud.
264-34	2	South of White Friars, Mexico	17 30 50 N	101 29 55 W	25 fathoms. Rock, gorgonids.
265-34	3	Petatlan Bay, Mexico	17 31 45 N	101 27 34 W	5-10 fathoms. Hard sand, shell.
266-34	3	South of Morro de Petatlan, Mexico	17 30 N	101 27 40 W	15 fathoms. Rock.
267-34	3	West of Morro de Petatlan, Mexico	17 30 30 N	101 28 40 W	25 fathoms. Sand.

Station	*Date*	*Locality*	*Bearings*	*Remarks*
	Mar. 1934			
268-34	3	North of White Friars, Mexico	17 31 30 N 101 29 27 W	25 fathoms. Coarse sand.
269-34	3	East of White Friars Islands, Mexico	17 31 20 N 101 29 W	5-10 fathoms. Rock, coral, nullipores.
270-34	3	Petatlan Bay, Mexico	17 31 30 N 101 27 15 W	Shore. Rock.
271-34	4	Tenacatita Bay, Mexico	19 17 57 N 104 50 35 W	10 fathoms. Mud, sand, shell.
272-34	4	Tenacatita Bay, Mexico	19 16 38 N 104 50 35 W	25 fathoms. Coarse sand.
273-34	4	West of islands off Navidad Head, Tenacatita Bay, Mexico	19 13 40 N 104 50 47 W	45 fathoms. Muddy sand.
274-34	4	South of Islands off Navidad Head, Tenacatita Bay, Mexico	19 12 50 N 104 50 50 W	50 fathoms. Mud, sand.
275-34	4	West of islets off Navidad Head, Tenacatita Bay, Mexico	19 12 50 N 104 49 48 W	25-35 fathoms. Rock.
276-34	4	Tenacatita Bay, Mexico	19 17 37 N 104 51 10 W	Shore. Rock.
277-34	5	Off Isabel Island, Mexico	21 51 35 N 105 54 30 W	All around the island. 10-25 fathoms. Sand, nullipores.
278-34	5	Isabel Island, Mexico	21 51 30 N 105 53 35 W	Shore in cove. Sand, Rock.
279-34	7	Santa Maria Bay, off Hughes Point, Lower California	24 44 45 N 112 15 20 W	10 fathoms. Rough rock.
280-34	7	Santa Maria Bay, south of Hughes Point, Lower California	24 43 10 N 112 16 15 W	30-40 fathoms. Sand.
281-34	7	Santa Maria Bay, off Hughes Point, Lower California	24 45 05 N 112 19 W	30 fathoms. Shell.
282-34	7	Santa Maria Bay, Hughes Point, Lower California	24 44 20 N 112 16 W	Shore. Rock.
283-34	9	Off Thurloe Head, Lower California	27 36 50 N 114 50 50 W	8-10 fathoms. Rock with gorgonids.
284-34	9	Off Thurloe Head, Lower California	27 37 10 N 114 52 20 W	30 fathoms. Coarse sand.

Station	Date	Locality	Bearings	Remarks
	Mar. 1934			
285-34	9	Off Thurloe Head, Lower California	27 37 30 N 114 52 55 W	30 fathoms. Shell.
286-34	9	Thurloe Bay, Lower California	27 37 30 N 114 50 45 W	Shore. Sand.
287-34	10	South Bay, Cedros Island	28 04 45 N 115 21 05 W	10-15 fathoms. Rock along margin of kelp bed.
288-34	10	South Bay, Cedros Island	28 05 20 N 115 20 20 W	Shore. Rock.
		ALLAN HANCOCK SUMMER CRUISE OF 1934		
	June 1934	Mexico		
289-34	8	Southeast of Cape Rule, Socorro Island	18 41 50 N 110 57 20 W	4-15 fathoms. Sand, nullipores.
290-34	8	Southeast of Cape Rule, Socorro Island	18 42 10 N 110 57 20 W	4-10 fathoms. Coral.
291-34	8	Off Cape Rule, Socorro Island	18 42 15 N 110 57 05 W	4-10 fathoms. Sand.
292-34	8	Off Braithwaite Bay, Socorro Island	18 42 N 110 57 W	30 fathoms. Sand, rock.
293-34	8	Southeast of Cape Rule, Socorro Island	18 41 50 N 110 57 20 W	20 fathoms. Sand, nullipores.
294-34	8	Southeast of Cape Rule, Socorro Island	18 41 50 N 110 57 20 W	20 fathoms. Sand, nullipores.
295-34	8	Off Braithwaite Bay, Socorro Island	18 42 25 N 110 55 40 W	20 fathoms. Sand, nullipores.
296-34	9	Cornwallis Bay, Socorro Island	18 44 15 N 110 59 40 W	Shore. Rock.
297-34	9	East of Cape Rule, Socorro Island	18 42 25 N 110 57 40 W	Diving and netting.
298-34	10	Sulphur Bay, Clarion Island	18 20 50 N 114 44 10 W	Shore. Rock, tide pools.
299-34	11	Off Sulphur Bay, Clarion Island	18 20 05 N 114 43 50 W	35 fathoms. Sand.
300-34	11	Off Sulphur Bay, Clarion Island	18 19 50 N 114 43 45 W	40 fathoms. Sand.
301-34	11	Off Sulphur Bay, Clarion Island	18 19 35 N 114 44 20 W	55 fathoms. Nullipores, coralline, algae.
302-34	11	Off Sulphur Bay, Clarion Island	18 19 50 N 114 44 25 W	40 fathoms. Nullipores, coralline.
303-34	11	Off Sulphur Bay, Clarion Island	18 20 10 N 114 44 15 W	30 fathoms. Nullipores, coralline.
304-34	11	Off Sulphur Bay, Clarion Island	18 20 25 N 114 44 30 W	20 fathoms. Nullipores, algae.
305-34	11	Off Sulphur Bay, Clarion Island	18 20 30 N 114 44 30 W	15 fathoms. Sand, nullipores.

ALLAN HANCOCK PACIFIC EXPEDITION OF 1935

Station	Date	Locality	Bearings		Remarks
	Dec. 1934	Galapagos Islands			
306-35	2	Bindloe Island	0 20 45 N	90 33 W	Reef. Lava rock.
307-35	3	Off Bindloe Island	0 17 50 N	90 30 30 W	20 fathoms. Rock. Tangles.
308-35	3	Off Bindloe Island	0 18 55 N	90 30 30 W	3-5 fathoms. Sand.
309-35	3	Off Bindloe Island	0 20 N	90 31 10 W	8 fathoms. Rock.
310-35	3	Off Bindloe Island	0 18 20 N	90 31 W	15 fathoms. Rock. Tangles.
311-35	3	Off Bindloe Island	0 17 50 N	90 30 30 W	20 fathoms. Rock. Tangles.
312-35	5	Black Beach, Charles Island	1 16 36 S	90 29 42 W	Shore. Rock.
313-35	6	Black Beach, Charles Island	1 17 38 S	90 29 55 W	Shore. Rock.
314-35	7	Academy Bay, Indefatigable Island	0 45 14 S	90 20 11 W	Shore. Rock.
315-35	8	Opposite Gordon Rocks, Indefatigable Island	0 34 10 S	90 11 W	Shallow water. Coral.
316-35	8	Off Gordon Rocks, Indefatigable Island	0 33 35 S	90 10 40 W	20 fathoms. Rock.
317-35	8	Off Gordon Rocks, Indefatigable Island	0 33 30 S	90 09 45 W	25-30 fathoms. Rock.
318-35	8	Off Gordon Rocks, Indefatigable Island	0 32 45 S	90 09 25 W	45 fathoms. Rock.
319-35	8	Academy Bay, Indefatigable Island	0 45 56 S	90 19 56 W	8-15 fathoms. Rock.
320-35	8	Academy Bay, Indefatigable Island	0 46 03 S	90 20 07 W	8-10 fathoms. Coral *(Pocillopora)*.
321-35	8	Academy Bay, Indefatigable Island	0 45 47 S	90 20 W	12 fathoms. Sand.
322-35	10	Tagus Cove, Albemarle Island	0 16 08 S	91 22 38 W	15 fathoms. Coarse black sand.
323-35	10	Tagus Cove, Albemarle Island	0 16 17 S	91 22 41 W	15 fathoms. Sand.
324-35	10	Tagus Cove, Albemarle Island	0 16 42 S	91 22 50 W	45 fathoms. Rock, nullipores.
325-35	10	Off Tagus Cove, Albemarle Island	0 16 47 S	91 23 01 W	80 fathoms. Rock.
326-35	10	Tagus Cove, Albemarle Island	0 16 26 S	91 22 42 W	15 fathoms. Sand, nullipores.
327-35	10	Tagus Cove, Albemarle Island	0 16 16 S	91 22 39 W	12 fathoms. Sand, nullipores.
328-35	10	Tagus Cove, Albemarle Island	0 16 23 S	91 22 46 W	14 fathoms. Sand, nullipores.

Station	*Date*	*Locality*	*Bearings*		*Remarks*
	Dec. 1934				
329-35	10	Tagus Cove, Albemarle Island	0 16 08 S	91 22 38 W	12 fathoms. Sand, nullipores.
330-35	10	Tagus Cove, Albemarle Island	0 16 16 S	91 22 39 W	12 fathoms. Sand, nullipores.
331-35	10	Tagus Cove, Albemarle Island	0 15 56 S	91 22 35 W	Salt Lake, near shore.
332-35	10	2 miles south of Tagus Cove, Albemarle Island	0 19 S	91 21 25 W	Shore. Rock.
333-35	11	West coast of James Island	0 16 10 S	90 53 45 W	Shore. Rocky ledges.
334-35	11	Crater Lake 2 miles from shore, James Bay, James Island	0 14 15 S	90 50 W	
335-35	11	Sulivan Bay, James Island	0 17 02 S	90 35 12 W	Shore. Rock.
336-35	12	Sulivan Bay, James Island	0 16 30 S	90 35 20 W	20 fathoms. Rock, red algae.
337-35	12	Sulivan Bay, James Island	0 17 S	90 35 10 W	2-5 fathoms. Rock, algae.
338-35	12	Sulivan Bay, James Island	0 16 30 S	90 34 55 W	30 fathoms. Rock and sand. Tangles.
339-35	12	Sulivan Bay, James Island	0 17 20 S	90 35 10 W	10 fathoms. Rock, algae. Tangles.
340-35	12	Sulivan Bay, James Island	0 17 20 S	90 35 10 W	8 fathoms. Rock. Tangles.
341-35	12	Sulivan Bay, James Island	0 16 30 S	90 35 20 W	20 fathoms. Rock with sand patches, red algae.
342-35	12	Bartholomew Island, near James Island	0 17 S	90 34 35 W	Shore. Rock.
343-35	12	Sulivan Bay, James Island	0 17 S	90 35 13 W	Shore. Rock.
344-35	12	Bartholomew Island, near James Island	0 17 S	90 34 35 W	Shallow water. Coral.
345-35	13	Between Seymour and Daphne Islands	0 24 50 S	90 21 40 W	30 fathoms. Mud, shell.
346-35	13	Between South Seymour and Daphne Islands	0 24 25 S	90 21 50 W	55 fathoms. Mud, shell.
347-35	13	Off North Seymour Island	0 25 S	90 19 50 W	3 fathoms. Sand, rock, shell.
348-35	13	Off North Seymour Island	0 24 15 S	90 20 10 W	15 fathoms. Rock, sand, shell.
349-35	13	Off South Seymour Island	0 25 25 S	90 20 50 W	15 fathoms. Sand, shell.
350-35	13	South Seymour Island	0 24 20 S	90 20 W	Shore. Rock, sand.

Station	Date	Locality	Bearings		Remarks
	Dec. 1934				
351-35	14	South of Black Beach, Charles Island	1 19 40 S	90 13 15 W	Shore. Turnable rocks.
352-35	15	Between Wreck and Stephens Bays, Chatham Island	0 48 50 S	89 31 40 W	35 fathoms. Rock, sand. Tangles.
353-35	15	Stephens Bay, Chatham Island	0 47 45 S	89 30 15 W	20 fathoms. Sand, rock.
354-35	15	Wreck Bay, Chatham Island	0 53 55 S	89 36 35 W	Shore. Rock.
354a-35	16	El Junco Lake, Chatham Island	0 53 30 S	89 30 W	Shore of lake.
355-35	17	Off Gardner Island, near Hood Island	1 22 20 S	89 39 37 W	12 fathoms. Rock. Tangles.
356-35	17	Hood Island, at Gardner Bay	1 22 20 S	89 40 23 W	12-15 fathoms. Rock. Tangles.
357 35	17	Gardner Bay, Hood Island	1 22 18 S	89 39 15 W	Shallow water. Coral.
358-35	17	Hood Island, at Gardner Bay	1 22 30 S	89 40 23 W	Shore. Rock.
359-35	19	Osborn Island in Gardner Bay, Hood Island	1 22 52 S	89 39 15 W	Shore. Rock.
360-35	19	Gardner Bay, Hood Island	1 22 52 S	89 39 52 W	3 fathoms. White sand.
361-35	19	Gardner Bay, Hood Island	1 22 30 S	89 39 55 W	12 fathoms. Sand, algae.
362-35	19	Gardner Bay, Hood Island	1 22 07 S	89 39 58 W	20 fathoms. Rock, kelp, algae.
			Ecuador		
363-35	23	Puná Island, Ecuador	2 44 30 S	79 53 45 W	Shore. Fresh water.
	Jan. 1935		**Peru**		
364-35	10	Off Lorenzo Island, near Callao, Peru	12 05 52 S	77 12 45 W	Sand.
365-35	10	Off Lorenzo Island, near Callao, Peru	12 06 25 S	77 11 07 W	10 fathoms. Rock.
366-35	10	South of Lorenzo Island, near Callao, Peru	12 06 55 S	77 12 05 W	8 fathoms. Rock.
367-35	10	South of Lorenzo Island, near Callao, Peru	12 06 45 S	77 11 45 W	25 fathoms. Mud.
368-35	11	South of Lorenzo Island, near Callao, Peru	12 07 30 S	77 12 32 W	13 fathoms. Rock.
369-35	11	Off Fronton Island, near Callao, Peru	12 07 25 S	77 11 30 W	5 fathoms. Rock.
370-35	11	Off Fronton Island, near Callao, Peru	12 07 S	77 11 40 W	5 fathoms. Rock.

Station	Date	Locality	Bearings		Remarks
	Jan. 1935				
371-35	12	East of Viejas Island, Independencia Bay, Peru	14 15 05 S	76 12 35 W	5 fathoms. Sand, rock.
372-35	12	East of Viejas Island, Independencia Bay, Peru	14 15 05 S	76 12 35 W	5 fathoms. Sand, rock.
373-35	12	Off Viejas Island, Independencia Bay, Peru	14 15 05 S	76 12 W	12 fathoms. Sand.
374-35	12	Off Viejas Island, Independencia Bay, Peru	14 15 05 S	76 12 W	12 fathoms. Sand, mud.
375-35	13	East of Viejas Island, Independencia Bay, Peru	14 14 S	76 12 40 W	Shore. Sand.
375a-35	13	East of Viejas Island, Independencia Bay, Peru	14 14 S	76 12 40 W	Lobster traps. Rock.
376-35	13	East of Viejas Island, Independencia Bay, Peru	14 15 35 S	76 11 35 W	7 fathoms. Rock.
377-35	13	East of Viejas Island, Independencia Bay, Peru	14 15 50 S	76 11 25 W	12 fathoms. Rock.
378-35	13	East of Viejas Island, Independencia Bay, Peru	14 16 S	76 10 40 W	20 fathoms. Rock, mud.
379-35	13	East of Viejas Island, Independencia Bay, Peru	14 16 05 S	76 09 30 W	20 fathoms. Mud.
380-35	14	Independencia Bay, Peru	14 14 08 S	76 08 30 W	Shore. Rock.
380a-35	14	Independencia Bay, Peru	14 14 40 S	76 09 07 W	12 fathoms. Rock, sand.
381-35	14	Independencia Bay, Peru	14 14 S	76 08 45 W	5 fathoms. Rock, sand.
382-35	14	Independencia Bay, Peru	14 13 55 S	76 08 45 W	5 fathoms. Rock, sand.
383-35	14	Independencia Bay, Peru	14 13 S	76 08 45 W	3-5 fathoms. Sand, sea pansies.
384-35	14	Independencia Bay, Peru	14 13 S	76 09 20 W	5 fathoms. Rock, spider crabs.
385-35	14	Independencia Bay, Peru	14 13 S	76 09 20 W	9-10 fathoms. Red algae, gastropods.
386-35	15	Off Middle Chincha Island, Peru	13 39 15 S	76 24 40 W	8 fathoms. Sand.
387-35	15	Off Middle Chincha Island, Peru	13 39 15 S	76 24 40 W	5 fathoms. Sand.
388-35	15	Off Middle Chincha Island, Peru	13 39 15 S	76 24 40 W	3-8 fathoms. Kelp, sand.
389-35	15	Off Middle Chincha Island, Peru	13 39 15 S	76 24 40 W	8-10 fathoms. Sand, kelp.
390-35	15	Between North and Middle Chincha islands, Peru	13 38 30 S	76 22 25 W	24 fathoms. Shell.
391-35	17	Lobos de Afuera Islands, Peru	6 55 40 S	80 43 40 W	Shore. Rock.

Station	*Date*	*Locality*	*Bearings*		*Remarks*
	Jan. 1935				
392-35	17	North Bay, Lobos de Afuera Islands, Peru	6 55 07 S	80 43 53 W	20-22 fathoms. Sand.
393-35	17	North Bay, Lobos de Afuera Islands, Peru	6 55 35 S	80 43 38 W	12 fathoms. Rock.
394-35	17	South Bay, Lobos de Afuera Islands, Peru	6 56 04 S	80 43 W	12 fathoms. Rock.
395-35	17	South Bay, Lobos de Afuera Islands, Peru	6 56 12 S	80 42 50 W	14-16 fathoms. Rock.
			Ecuador		
396-35	18	Salango Island, Ecuador	1 35 10 S	80 51 55 W	12 fathoms. Rock, sand.
397-35	18	Salango Island, Ecuador	1 35 15 S	80 52 52 W	3 fathoms. Sand.
398-35	18	Salango Island, Ecuador	1 35 15 S	80 52 52 W	3 fathoms. Sand.
399-35	18	Salango Island, Ecuador	1 35 12 S	80 35 48 W	8 fathoms. Sand.
400-35	19	Manta Bay, Ecuador	0 56 30 S	80 44 18 W	Shore. Rock, sand.
401-35	19	Manta Bay, Ecuador	0 56 30 S	80 44 W	1 fathom. Sand.
402-35	19	Manta Bay, Ecuador	0 56 17 S	80 44 18 W	1 fathom. Sand.
403-35	20	West of Manta, Ecuador	0 56 43 S	80 44 43 W	Reef with breakers.
			Colombia		
404-35	21	Off Gorgona Island, Colombia	3 01 N	78 11 15 W	3 fathoms. Rock. Tangles.
405-35	22	Gorgona Island, Colombia	2 58 N	78 11 30 W	Shore. Rock, sand.
406-35	22	Off Monkey Point, Gorgona Island, Colombia	2 57 N	78 10 W	22 fathoms. Nullipores.
407-35	22	Off Monkey Point, Gorgona Island, Colombia	2 57 N	78 10 W	20 fathoms. Mud.
408-35	22	Off Monkey Point, Gorgona Island, Colombia	3 01 30 N	78 03 W	65-80 fathoms. Gray mud.
409-35	22	Off North Point, Gorgona Island, Colombia	3 02 N	78 10 30 W	20 fathoms. Nullipores.
410-35	22	Off sandy beach, Gorgona Island	2 58 N	78 11 50 W	1 fathom. Gravel.
411-35	22	Gorgona Island, Colombia	2 58 N	78 11 50 W	Shallow water. Coral (*Pocillopora*).
412-35	22	Gorgona Island, Colombia	2 58 N	78 11 50 W	Shallow water. Coral (*Pavona*).
413-35	23	Port Utria, Colombia	5 59 10 N	77 21 20 W	Shore. Rock.

Station	*Date*	*Locality*	*Bearings*		*Remarks*
	Jan. 1935				
414-35	23	Port Utria, Colombia	5 59 10 N	77 21 20 W	3 fathoms. Coral *(Pocillopora)*.
415-35	24	Off Port Utria, Colombia	5 57 25 N	77 20 50 W	45 fathoms. Mud.
415a-35	24	Off Port Utria, Colombia	5 57 10 N	77 20 55 W	50 fathoms. Mud.
416-35	24	Off Port Utria, Colombia	5 57 10 N	77 20 55 W	50 fathoms. Mud.
417-35	24	Port Utria, Colombia	5 57 40 N	77 20 15 W	10 fathoms. Mud.
418-35	24	Port Utria, Colombia	5 59 55 N	77 20 30 W	Shore. Sand.
419-35	24	Port Utria, Colombia	5 59 10 N	77 21 20 W	Shallow water. Coral.
420-35	25	Off Port Utria, Colombia	5 58 N	77 21 15 W	35 fathoms. Mud, sand.
421-35	25	Off Port Utria, Colombia	5 58 N	77 21 30 W	40 fathoms. Soft mud.
422-35	25	Off Port Utria, Colombia	5 58 35 N	77 22 10 W	35 fathoms. Mud, shell.
423-35	25	Off Port Utria, Colombia	5 59 20 N	77 21 50 W	20 fathoms. Rock, sand, mud.
424-35	25	Port Utria, Colombia	5 59 25 N	77 21 30 W	7 fathoms. Mud.
425-35	25	Port Utria, Colombia	5 59 20 N	77 21 10 W	12 fathoms. Coarse sand.
426-35	25	Port Utria, Colombia	5 59 20 N	77 21 10 W	15 fathoms. Mud.
427-35	26	Cupica Bay, Colombia	6 39 10 N	77 30 40 W	Shore. Rock.
428-35	26	Cupica Bay, Colombia	6 40 10 N	77 33 10 W	Anchorage. Electric Light.
429-35	27	Octavia Bay, Colombia	6 48 40 N	77 40 50 W	30-35 fathoms. Coarse sand, gravel.
430-35	27	Octavia Bay, Colombia	6 47 45 N	77 43 30 W	75 fathoms. Soft mud.
431-35	27	Off Octavia Rocks, Colombia	6 47 20 N	77 41 40 W	45 fathoms. Sand, gravel.
432-35	27	Octavia Bay, Colombia	6 47 45 N	77 42 W	50 fathoms. Soft mud, fine gravel.
433-35	27	Octavia Bay, Colombia	6 49 50 N	77 41 35 W	Shore, on island. Shingle.
434-35	28	Octavia Bay, Colombia	6 50 N	77 41 10 W	2 fathoms.
435-35	28	Octavia Bay, Colombia	6 50 N	77 41 10 W	Shallow water. Coral.

Station	Date	Locality	Bearings		Remarks
	Jan. 1935		Panama		
436-35	28	Piñas Bay, Panama	7 34 08 N	78 12 10 W	Shore. Rock.
437-35	28	Piñas Bay, Panama	7 33 25 N	78 10 35 W	Shallow water. Coral.
438-35	29	Piñas Bay, Panama	7 33 10 N	78 13 20 W	25 fathoms. Coarse sand.
439-35	29	Piñas Bay, Panama	7 33 05 N	78 13 20 W	20 fathoms. Mud, sand.
440-35	29	Piñas Bay, Panama	7 33 50 N	78 12 40 W	15 fathoms. Sticky mud.
441-35	29	Piñas Bay, Panama	7 34 18 N	78 13 40 W	32 fathoms. Soft mud.
442-35	29	Piñas Bay, Panama	7 33 45 N	78 13 40 W	30-35 fathoms. Rock, coarse sand.
443-35	29	Piñas Bay, Panama	7 34 18 N	78 13 40 W	20 fathoms. Mud.
444-35	29	Piñas Bay, Panama	7 32 30 N	78 10 50 W	2-4 fathoms. Coral.
	Feb. 1935				
445-35	2	Panama City, Panama	8 57 15 N	79 31 45 W	Shore. Rock.
446a-35	4	Secas Islands, Panama	7 57 N	82 01 25 W	Shore. Reef, inland.
446b-35	4	Secas Islands, Panama	7 57 N	82 01 25 W	Shore. Rock.
447-35	4	Secas Islands, Panama	7 57 10 N	82 00 45 W	Shallow water. Coral.
448-35	5	Secas Islands, Panama	7 57 45 N	82 00 45 W	12 fathoms. Sand, nullipores.
449-35	5	Secas Islands, Panama	7 57 15 N	82 01 35 W	25 fathoms. Sand, nullipores.
450-35	5	Secas Islands, Panama	7 57 N	82 01 35 W	14 fathoms. Shell, nullipores.
451-35	5	Secas Islands, Panama	7 57 30 N	82 01 50 W	12 fathoms. Sand.
452-35	5	Secas Islands, Panama	7 58 30 N	82 01 55 W	Fresh water stream and pools.
453-35	5	Secas Islands, Panama	7 58 15 N	82 01 W	Anchorage. Electric Light.
454-35	6	Secas Islands, Panama	7 57 10 N	82 00 45 W	Shore. Tide flats. Coral.
455-35	6	Secas Islands, Panama	7 58 30 N	82 01 55 W	Freshwater stream and pools.
456-35	6	Secas Islands, Panama	7 57 50 N	82 01 15 W	12 fathoms. Sand, nullipores.

Station	Date	Locality	Bearings		Remarks
	Feb. 1935				
457-35	6	Secas Islands, Panama	7 57 50 N	82 01 15 W	12 fathoms. Sand, rock.
458-35	6	Secas Islands, Panama	7 57 55 N	82 02 W	5-20 fathoms. Mud, sand.
			Costa Rica		
459-35	8	Playa Blanca, Costa Rica	10 56 45 N	85 53 30 W	2-3 fathoms. Rock, algae.
460-35	8	Playa Blanca, Costa Rica	10 56 N	85 52 50 W	3-5 fathoms. Sand, shells.
461-35	8	Playa Blanca, Costa Rica	10 56 45 N	85 53 50 W	15 fathoms. Mud, sand, algae.
462-35	8	Playa Blanca, Costa Rica	10 56 45 N	85 56 W	40 fathoms. Mud, sand.
463-35	8	Playa Blanca, Costa Rica	10 53 45 N	85 57 45 W	25 fathoms. Shell. Little life.
464-35	8	Playa Blanca, Costa Rica	10 55 30 N	85 53 W	Shore. Coral.
465-35	8	Playa Blanca, Costa Rica	10 56 45 N	85 53 30 W	Shore. Shale.
466-35	9	Port Parker, Costa Rica	10 56 N	85 48 47 W	Shore. Small island at entrance. Rock.
467-35	9	Port Parker, Costa Rica	10 55 55 N	85 49 20 W	2 fathoms. Rock, algae.
468-35	9	Port Parker, Costa Rica	10 57 35 N	85 49 W	5 fathoms. Sand, shell.
469-35	9	Port Parker, Costa Rica	10 56 10 N	85 49 05 W	10 fathoms. Sand, shell.
470-35	9	Port Parker, Costa Rica	10 57 35 N	85 49 W	5 fathoms. Sand, mud.
471-35	9	Port Parker, Costa Rica	10 56 10 N	85 49 05 W	10 fathoms. Mud.
472-35	9	Port Parker, Costa Rica	10 57 50 N	85 48 45 W	30 fathoms. Shell.
473-35	9	Port Parker, Costa Rica	10 54 55 N	85 49 W	Shall water. Coral.
474-35	10	Salinas Bay, Costa Rica	11 02 N	85 42 45 W	Shore. Sandstone.
475-35	11	Salinas Bay, Costa Rica	11 04 25 N	85 44 40 W	20 fathoms. Mud.
476-35	11	Salinas Bay, Costa Rica	11 03 33 N	85 43 47 W	8 fathoms. Mud.
477-35	11	Salinas Bay, Costa Rica	11 03 20 N	85 43 30 W	2 fathoms. Coarse sand.
478-35	11	Salinas Bay, Costa Rica	11 03 13 N	85 43 20 W	1½ fathoms. Coarse sand.

Station	Date	Locality	Bearings		Remarks
	Feb. 1935				
479-35	11	Salinas Bay, Costa Rica	11 02 50 N	85 44 10 W	2 fathoms. Sand.
480-35	11	Salinas Bay, Costa Rica	11 04 10 N	85 44 40 W	12 fathoms. Shells, vegetation.
481-35	11	Salinas Bay, Costa Rica	11 03 33 N	85 44 05 W	6 fathoms. Shells, vegetation.
		Mexico			
482-35	15	Tenacatita Bay, Mexico	19 18 N	104 50 W	10 fathoms. Mud, sand.
483-35	15	Tenacatita Bay, Mexico	19 18 N	104 50 W	6 fathoms. Mud, sand.
484-35	15	Tenacatita Bay, Mexico	19 18 N	104 50 W	8 fathoms. Mud.
485-35	15	Tenacatita Bay, Mexico	19 18 N	104 50 W	5 fathoms. Sand, shell.
486-35	15	Tenacatita Bay, Mexico	19 18 N	104 50 W	10 fathoms. Sand, shell, algae.
487-35	15	Tenacatita Bay, Mexico	19 18 N	104 51 35 W	Lagoon. *Pinnas.*

ALLAN HANCOCK PACIFIC EXPEDITION OF 1936

Mexico

West Coast of Lower California

Station	Date	Locality	Bearings		Remarks
	Feb. 1936				
488-36	15	San Quentin Bay, Lower California	30 22 N	115 57 20 W	3-5 fathoms. Sand, seaweed.
489-36	15	San Quentin Bay, Lower California	30 20 55 N	115 56 35 W	12 fathoms. Sand, seaweed.
490-36	15	San Quentin Bay, Lower California	30 19 35 N	115 56 50 W	25 fathoms. Sand, seaweed.
491-36	15	Rosario Bay, Lower California	29 55 N	115 48 30 W	10-15 fathoms. Rock, kelp.
492-36	16	Off Point Tosco, Lower California	24 18 10 N	111 38 55 W	45 fathoms. Green mud.
493-36	16	Off Point Tosco, Lower California	24 18 20 N	111 41 55 W	15 fathoms. Sand, kelp.
		Gulf of California			
494-36	18	East of Cape San Lucas, Lower California	22 52 35 N	119 52 10 W	25 fathoms. Mud.
495-36	18	North of Cabeza Ballena, Lower California	22 56 30 N	109 47 W	10-15 fathoms. Sand.
496-36	18	Fraile Bay, Lower California	23 21 55 N	109 24 40 W	80 fathoms. Mud.

Station	*Date*	*Locality*	*Bearings*		*Remarks*
	Feb. 1936				
497-36	18	Fraile Bay, Lower California	23 22 30 N	109 24 45 W	8-10 fathoms. Sand.
498-36	19	San Lorenzo Channel, Gulf of California	24 22 35 N	110 19 40 W	5-15 fathoms. Coralline.
499-36	19	San Lorenzo Channel, Gulf of California	24 22 05 N	110 20 55 W	35 fathoms. Sand.
500-36	20	San Gabriel Bay, Espiritu Santo Island, Gulf of California	24 25 25 N	110 20 55 W	Shore. Sand, rock.
501-36	20	San Gabriel Bay, Espiritu Santo Island, Gulf of California	24 25 25 N	110 20 55 W	Shallow water. Coral.
502-36	21	Pichilinque Harbor, Lower California	24 15 N	110 19 55 W	7 fathoms. Sandy mud.
503-36	21	Off Prieta Point Light, La Paz Bay, Lower California	24 13 25 N	110 19 05 W	5 fathoms. Coralline.
504-36	21	Pichilinque Harbor, Lower California	24 14 N	110 18 40 W	3 fathoms. Sand, seaweed.
505-36	21	San Gabriel Bay, Espiritu Santo Island, Gulf of California	24 25 15 N	110 21 45 W	Anchorage. Electric Light.
506-36	22	San Gabriel Bay, Espiritu Santo Island, Gulf of California	24 24 45 N	110 21 10 W	1-4 fathoms. Broken shell.
507-36	22	San Gabriel Bay, Espiritu Santo Island, Gulf of California	24 24 35 N	110 23 W	35 fathoms. Mud, sand.
508-36	22	San Gabriel Bay, Espiritu Santo Island, Gulf of California	24 24 20 N	110 24 55 W	80 fathoms. Thick mud.
509-36	22	West of Espiritu Santo Island, Gulf of California	24 23 55 N	110 22 15 W	24 fathoms. Mud, sand.
510-36	22	Cove south of Ballenas Bay, Espiritu Santo Island, Gulf of California	24 26 35 N	110 22 W	Shore. Sand, rock.
511-36	22	Cove south of Ballenas Bay, Espiritu Santo Island, Gulf of California	24 26 35 N	110 22 W	Shore. Behind mangroves.

Station	Date	Locality	Bearings	Remarks
	Feb. 1936			
512-36	23	Ballenas Bay, Espiritu Santo Island, Gulf of California	24 27 45 N 110 22 W	Shore. Rock.
513-36	24	Off San Francisco Island, Gulf of California	24 48 40 N 110 37 20 W	30 fathoms. Coralline.
514-36	24	South of San Francisco Island, Gulf of California	24 48 30 N 110 35 20 W	15 fathoms. Sand, coralline.
515-36	24	East of San Francisco Island, Gulf of California	24 49 50 N 110 34 W	Shore. Reef.
516-36	25	East of San Francisco Island, Gulf of California	24 49 45 N 110 30 35 W	125-150 fathoms. Sand, mud.
517-36	25	East of San Francisco Island, Gulf of California	24 49 30 N 110 32 35 W	15 fathoms. Sand.
518-36	25	North Bay, San Francisco Island, Gulf of California	24 50 05 N 110 35 W	Shore. Rock, sand.
519-36	26	North Bay, San Francisco Island, Gulf of California	24 50 05 N 110 35 W	Shore. Rock, sand.
520-36	27	Agua Verde Bay, Lower California	25 31 N 111 01 45 W	5-10 fathoms. Mud, sand, broken shell.
521-36	27	Agua Verde Bay, Lower California	25 31 N 111 01 45 W	Mud, sand, broken shell.
522-36	27	Agua Verde Bay, Lower California	25 29 40 N 110 58 45 W	Shore. Reef.
523-36	28	South of Coronados Island, Gulf of California	26 03 45 N 111 17 W	100-120 fathoms. Broken shell.
524-36	28	Southwest of Coronados Island, Gulf of California	26 04 40 N 111 17 55 W	45-50 fathoms. Coarse white sand.
525-36	28	West of Coronados Island, Gulf of California	26 05 40 N 111 19 10 W	3-10 fathoms. Coralline.
526-36	28	South of Mangles Anchorage, Lower California	26 16 55 N 111 23 45 W	3-5 fathoms. Sand, seaweed.
527-36	28	Mangles Anchorage, Lower California	26 16 35 N 111 24 05 W	Shore. Rock.
	Mar. 1936			
528-36	1	Off San Francisquito Bay, Lower California	28 26 15 N 112 54 W	45 fathoms. Sand. *(Stylocidaris).*
529-36	1	Off San Francisquito Bay, Lower California	28 27 10 N 112 49 25 W	165 fathoms. Shale, gray mud.

Station	Date	Locality	Bearings		Remarks
	Mar. 1936				
530-36	1	Off San Francisquito Bay, Lower California	28 25 55 N	112 53 15 W	10-20 fathoms. Coral, nullipores, kelp.
531-36	1	San Francisquito Bay, Lower California	28 25 55 N	112 53 30 W	10 fathoms. Sand, kelp, red, green, and brown algae.
532-36	2	San Francisquito Bay, Lower California	28 25 55 N	112 53 15 W	20 fathoms. Sand, kelp.
533-36	2	San Francisquito Bay, Lower California	28 26 40 N	112 52 40 W	40 fathoms. Sand, broken shell.
534-36	2	Off San Francisquito Bay, Lower California	28 26 50 N	112 50 45 W	125 fathoms. Shale, rock, mud.
535-36	2	Entrance to Angeles Bay, Lower California	20 57 N	113 30 45 W	25-40 fathoms. Sand.
536-36	2	Angeles Bay, Lower California	28 55 40 N	113 32 25 W	20 fathoms. Mud.
537-36	2	Angeles Bay, Lower California	28 53 40 N	113 32 45 W	Shore. Sand.
538-36	3	Entrance to Angeles Bay, Lower California	28 57 N	113 30 45 W	25 fathoms. Sand.
539-36	3	Spit, Angeles Bay, Lower California	28 53 40 N	113 32 45 W	1 fathom. Sand. *(Encope)*
540-36	3	Puerto Refugio, Angel de la Guardia Island, Gulf of California	29 31 58 N	113 33 34 W	Shore. Sand, rock.
541-36	4	Puerto Refugio, Angel de la Guardia Island, Gulf of California	29 34 25 N	113 32 35 W	60 fathoms. Broken shell.
542-36	4	Puerto Refugio, Angel de la Guardia Island, Gulf of California	29 32 40 N	113 32 22 W	15-30 fathoms. Oysters, etc.
543-36	4	Puerto Refugio, Angel de la Guardia Island, Gulf of California	29 33 43 N	113 32 54 W	15 fathoms. Sand, kelp.
544-36	4	Puerto Refugio, Angel de la Guardia Island, Gulf of California	29 34 25 N	113 32 35 W	65 fathoms. Sand.
545-36	4	Puerto Refugio, Angel de la Guardia Island, Gulf of California	29 32 07 N	113 34 12 W	Shore. Rock.
546-36	5	North of Angel de la Guardia Island, Gulf of California	29 34 25 N	113 32 35 W	40-70 fathoms. Sand.

Station	Date	Locality	Bearings	Remarks
	Mar. 1936			
547-36	5	Angel de la Guardia Island, Gulf of California	29 32 22 N 113 33 08 W	1-8 feet. Netting from skiff.
548-36	5	North of Angel de la Guardia Island, Gulf of California	29 35 30 N 113 33 25 W	80 fathoms. Sand.
549-36	6	East of Angel de la Guardia Island, Gulf of California	29 32 30 N 113 29 50 W	40 fathoms. Sand.
550-36	6	East of Angel de la Guardia Island, Gulf of California	29 32 N 113 27 W	90 fathoms. Mud.
551-36	6	East of Angel de la Guardia Island, Gulf of California	29 30 35 N 113 27 20 W	8-10 fathoms. Rock, sand.
552-36	6	Angel de la Guardia Island, Gulf of California	29 29 20 N 113 27 10 W	Shore. Potholes, beach.
553-36	8	Pond Isle, east of Angel de la Guardia Island, Gulf of California	29 02 35 N 113 07 40 W	Shore. Lagoon and beach.
554-36	8	East of Angel de la Guardia Island, Gulf of California	29 01 N 113 12 15 W	10 fathoms. Sand, red algae, scallops.
555-36	8	Between Isla Partida and Angel de la Guardia Island, Gulf of California	28 56 50 N 113 07 W	20 fathoms. Nullipores.
556-36	8	North of Isla Partida, Gulf of California	28 54 40 N 113 03 45 W	10 fathoms. Sand, gravel, sponge.
557-36	8	Off White Rock, Isla Partida, Gulf of California	28 55 30 N 113 05 35 W	45 fathoms. Sand, gravel, sponge.
558-36	9	South of Isla Partida, Gulf of California	28 52 15 N 113 04 W	20 fathoms. Gravel, sand.
559-36	9	South of Isla Partida, Gulf of California	28 51 20 N 113 03 45 W	45 fathoms. Sand.
560-36	9	West of Isla Partida, Gulf of California	28 53 10 N 113 05 35 W	40 fathoms. Rock.
561-36	9	South of Isla Partida, Gulf of California	28 51 20 N 113 03 45 W	70 fathoms. Coral, sand.
562-36	10	East of San Esteban Island, Gulf of California	28 41 25 N 112 32 15 W	20-70 fathoms. Sand, rock.
563-36	10	Off south end of Tiburon Island, Gulf of California	28 40 55 N 112 18 W	40-55 fathoms. Muddy sand.

Station	*Date*	*Locality*	*Bearings*	*Remarks*
	Mar. 1936			
564-36	10	Off south end of Tiburon Island, Gulf of California	28 44 45 N 112 18 20 W	8-10 fathoms. Kelp, coralline.
565-36	10	Off south end of Tiburon Island, Gulf of California	28 40 55 N 112 18 W	40 fathoms. Sand, mud.
566-36	11	South of Tiburon Island, Gulf of California	28 43 45 N 112 17 50 W	20 fathoms. Sand, shell.
567-36	11	South end of Tiburon Island, Gulf of California	28 44 45 N 112 18 20 W	4 fathoms. Sand, Ulva.
568-36	11	East of Tiburon Island, Gulf of California	28 47 25 N 112 16 20 W	10 fathoms. Rock.
569-36	11	East of Tiburon Island, Gulf of California	28 47 15 N 112 13 45 W	12 fathoms. Shell.
570-36	11	East of Tiburon Island, Gulf of California	28 47 45 N 112 12 25 W	12 fathoms. Mud.
571-36	11	East of Tiburon Island, Gulf of California	28 46 50 N 112 17 50 W	5 fathoms. Sand, kelp.
572-36	12	North of San Pedro Nolasco Island, Gulf of California	27 58 40 N 111 24 10 W	60 fathoms. Rock, sand.
573-36	12	North of San Pedro Nolasco Island, Gulf of California	27 58 40 N 111 24 10 W	60 fathoms. Rock, sand.
574-36	12	North of San Pedro Nolasco Island, Gulf of California	27 59 30 N 111 24 25 W	80 fathoms. Sand.
575-36	12	North of San Pedro Nolasco Island, Gulf of California	28 00 20 N 111 24 40 W	100 fathoms. Sand.
576-36	13	South of Tortuga Island, Gulf of California	27 25 30 N 111 53 25 W	21 fathoms. Volcanic sand.
577-36	13	South of Tortuga Island, Gulf of California	27 24 N 111 53 05 W	40 fathoms. Sand.
578-36	13	South of Tortuga Island, Gulf of California	27 22 45 N 111 53 25 W	83 fathoms. Rock.
579-36	14	East of San Marcos Island, Gulf of California	27 14 50 N 112 04 20 W	18 fathoms. Mud.
580-36	14	Southeast of San Marcos Island, Gulf of California	27 10 45 N 112 02 W	20 fathoms. Nullipores.
581-36	14	East of San Marcos Island, Gulf of California	27 10 15 N 112 02 45 W	12 fathoms. Sand, sponges.

Station	Date	Locality	Bearings	Remarks
	Mar. 1936			
582-36	14	South of San Marcos Island, Gulf of California	27 09 05 N 112 04 25 W	20 fathoms. Coral, sand.
583-36	14	Southeast of San Marcos Island, Gulf of California	27 10 N 112 02 15 W	25 fathoms. Mud.
584-36	14	Concepción Bay, Lower California	26 44 40 N 111 54 W	West beach. Sponge, sand.
585-36	14	Coyote Bay, Concepción Bay, Lower California	26 43 25 N 111 54 05 W	2-3 fathoms. Sand, kelp.
586-36	14	Coyote Bay, Concepción Bay, Lower California	26 43 15 N 111 52 25 W	10 fathoms. Broken shell.
587-36	14	Concepción Bay, Lower California	26 43 25 N 111 52 05 W	Anchorage. Electric Light.
588-36	15	Coyote Bay, Concepción Bay, Lower California	26 43 10 N 111 52 25 W	14 fathoms. Mud.
589-36	15	Concepción Bay, Lower California	26 41 40 N 111 51 05 W	10 fathoms. Sand.
590-36	15	Concepción Bay, Lower California	26 42 55 N 111 50 40 W	15 fathoms. Shell.
591-36	16	Puerto Escondido, Lower California	25 50 05 N 111 19 W	Shore. Shingle.
592-36	16	Puerto Escondido, Lower California	25 48 50 N 111 18 W	24 fathoms. Mud, shell.
593-36	16	Puerto Escondido, Lower California	25 49 25 N 111 18 35 W	5 fathoms. Mud, shell.
594-36	16	Puerto Escondido, Lower California	25 49 15 N 111 19 W	10-15 fathoms. Sand, seaweed.
595-36	16	Puerto Escondido, Lower California	24 49 N 111 16 35 W	26 fathoms. Sand.
596-36	16	Puerto Escondido, Lower California	25 48 10 N 111 17 55 W	20 fathoms. Sand.
597-36	16	Puerto Escondido, Lower California	25 48 05 N 111 16 25 W	10 fathoms. Sand.
598-36	17	Puerto Escondido, Lower California	25 50 05 N 111 19 W	Dipnet and beach.
599-36	18	Agua Verde Bay, Lower California	25 31 40 N 110 59 35 W	30 fathoms. Mud.
600-36	18	Agua Verde Bay, Lower California	25 32 05 N 110 56 55 W	80 fathoms. Mud.
601-36	18	Agua Verde Bay, Lower California	25 31 40 N 110 59 35 W	20 fathoms. Mud.
602-36	18	Agua Verde Bay, Lower California	25 31 05 N 111 02 30 W	South shore. Diving and netting.
603-36	19	Agua Verde Bay, Lower California	25 31 05 N 111 02 30 W	South shore. Diving and netting.
604-36	20	San Gabriel Bay, Espiritu Santo Island, Gulf of California	24 25 25 N 110 20 55 W	Shallow water. Coral.

Station	Date	Locality	Bearings	Remarks
	Mar. 1936			
605-36	20	San Gabriel Bay, Espiritu Santo Island, Gulf of California	24 25 25 N 110 20 55 W	Shore in lagoon.
606-36	21	San Lorenzo Channel, Gulf of California	24 22 N 110 19 30 W	14 fathoms. Sand.
607-36	21	San Lorenzo Channel, Gulf of California	24 21 35 N 110 20 10 W	24 fathoms. Coralline.
608-36	21	Ballenas Bay, Espiritu Santo Island, Gulf of California	24 27 45 N 110 22 W	Shore. Sand, rock, *pinnas*.
		West Coast of Lower California		
609-36	24	Middle San Benito Island	28 18 45 N 115 34 05 W	Shore. Rock.
		ALLAN HANCOCK PACIFIC EXPEDITION OF 1937		
		Mexico		
	Feb. 1937	**West Coast of Lower California**		
610-37	28	Rosario Bay, Lower California	29 54 20 N 115 48 20 W	15 fathoms. Sand, kelp.
611-37	28	Off Rosario Bay, Lower California	29 53 45 N 115 49 30 W	25 fathoms. Rock.
	Mar. 1937			
612-37	1	Lagoon Head Anchorage, Lower California	28 12 25 N 114 06 30 W	7 fathoms. Sand.
613-37	1	Lagoon Head Anchorage, Lower California	28 10 55 N 114 13 W	17 fathoms. Sand.
614-37	1	Manuela Lagoon, near Lagoon Head Anchorage, Lower California	28 12 15 N 114 03 30 W	Shore. Sand.
615-37	2	San Juanico Bay, Lower California	26 14 30 N 112 28 20 W	Shore. Kelp, rock.
616-37	2	San Juanico Bay, Lower California	26 12 50 N 112 28 05 W	16 fathoms. Sand, kelp.
617-37	2	San Juanico Bay, Lower California	26 11 50 N 112 29 05 W	24 fathoms. Sand, kelp.
618-37	3	San Jaime Bank, off Cape San Lucas, Lower California	22 50 30 N 110 15 W	75 fathoms. Rock, coralline, sponge.
619-37	3	San Jaime Bank, off Cape San Lucas, Lower California	22 50 30 N 110 15 W	120 fathoms. Granite rock, coralline, sponge.

Station	Date	Locality	Bearings	Remarks
	Mar. 1937	Gulf of California—West Coast		
620-37	3	East of Cabeza Ballena, Lower California	22 53 50 N 109 49 45 W	25 fathoms. Fine gray sand.
621-37	3	Cabeza Ballena, Lower California	22 53 20 N 109 50 20 W	Shore. Rock, tide pools.
622-37	3	Cabeza Ballena, Lower California	22 53 20 N 109 50 20 W	Anchorage. Electric Light.
623-37	4	Cabeza Ballena, Lower California	22 53 20 N 109 50 20 W	Shore. Rock, tide pools.
624-37	4	Inner Gorda Bank, Gulf of California	23 01 N 109 30 50 W	120 fathoms. Sand.
625-37	4	Ensenada de los Muertos, Lower California	23 59 N 109 48 35 W	Anchorage. Electric Light.
626-37	5	Ensenada de los Muertos, Lower California	23 59 30 N 109 49 10 W	Shore. Rock, sand.
627-37	5	Ensenada de los Muertos, Lower California	23 58 55 N 109 49 25 W	5 fathoms. Sand.
628-37	5	Ensenada de los Muertos, Lower California	23 48 20 N 109 49 05 W	10-12 fathoms. Coralline.
629-37	5	Ensenada de los Muertos, Lower California	23 48 50 N 109 48 35 W	40 fathoms. Broken shell.
630-37	5	Off Prieta Point Light, La Paz Bay, Lower California	24 12 40 N 110 19 W	Anchorage. Electric Light.
631 37	6	Off Prieta Point Light, La Paz Bay, Lower California	24 12 50 N 110 18 10 W	Shore. Sand.
632-37	6	San Gabriel Bay, Espiritu Santo Island, Gulf of California	24 24 35 N 110 23 W	24 fathoms. Sandy mud.
633-37	6	San Gabriel Bay, Espiritu Santo Island, Gulf of California	24 24 10 N 110 21 55 W	18 fathoms. Coralline.
634-37	6	San Gabriel Bay, Espiritu Santo Island, Gulf of California	24 25 25 N 110 20 55 W	Shallow water. Coral.
635-37	6	San Gabriel Bay, Espiritu Santo Island, Gulf of California	24 25 25 N 110 20 55 W	Shore. Lagoon.
635a-37	6	San Gabriel Bay, Espiritu Santo Island, Gulf of California	24 25 25 N 110 20 55 W	Shore. Mollusks.
636-37	6	San Gabriel Bay, Espiritu Santo Island, Gulf of California	24 24 10 N 110 21 55 W	Anchorage. Electric Light.

Station	Date	Locality	Bearings	Remarks
	Mar. 1937			
637-37	7	San Gabriel Bay, Espiritu Santo Island, Gulf of California	24 25 25 N 110 20 55 W	Lagoon. *Callinectes.*
638-37	7	San Gabriel Bay, Espiritu Santo Island, Gulf of California	24 25 25 N 110 20 55 W	Shallow water. Coral.
639-37	7	San Lorenzo Channel, Gulf of California	24 21 55 N 110 18 40 W	3-5 fathoms. Sand, coralline, algae.
640-37	7	Off San Lorenzo Channel, Gulf of California	24 21 20 N 110 21 W	30 fathoms. Sandy mud.
641-37	7	San Gabriel Bay, Espiritu Santo Island, Gulf of California	24 25 55 N 110 20 55 W	Land plants.
642-37	8	Off Ballenas Bay, Espiritu Santo Island, Gulf of California	24 27 N 110 23 05 W	25 fathoms. Coralline.
643-37	8	Off Ballenas Bay, Espiritu Santo Island, Gulf of California	24 27 15 N 110 22 20 W	8 fathoms. Coralline.
644-37	8	Off Ballenas Bay, Espiritu Santo Island, Gulf of California	24 26 45 N 110 24 40 W	48 fathoms. Mud, shell.
645-37	8	San Gabriel Bay, Espiritu Santo Island, Gulf of California	24 25 25 N 110 20 55 W	Shore. Lagoon.
646-37	8	San Francisco Island, Gulf of California	24 49 50 N 110 34 W	Shore. Shingle.
647-37	8	North of San Francisco Island, Gulf of California	24 51 10 N 110 33 45 W	22 fathoms. Coral.
648-37	8	North of San Francisco Island, Gulf of California	24 50 50 N 110 31 40 W	60 fathoms. Sand.
649-37	8	San Francisco Island, Gulf of California	24 48 N 110 35 55 W	Anchorage. Electric Light.
650-37	9	East of San Francisco Island, Gulf of California	24 47 35 N 110 32 20 W	47 fathoms. Coarse sand.
651-37	9	East of San Francisco Island, Gulf of California	24 47 25 N 110 31 20 W	60 fathoms. Sandy mud.
652-37	9	San Francisco Island, Gulf of California	24 49 50 N 110 34 W	Shore. Shingle.

Station	Date	Locality	Bearings	Remarks
	Mar. 1937			
653-37	9	San Francisco Island, Gulf of California	24 49 50 N 110 34 W	Shallow water. Coral.
654-37	10	Agua Verde Bay, Lower California	25 31 05 N 111 02 30 W	Shore. Dipping for sea stars.
655-37	10	Agua Verde Bay, Lower California	25 31 N 111 01 45 W	10 fathoms. Sand.
656-37	10	Agua Verde Bay, Lower California	25 31 40 N 110 59 35 W	25 fathoms. Mud.
657-37	10	Agua Verde Bay, Lower California	25 31 45 N 110 58 20 W	70 fathoms. Mud.
658-37	10	Agua Verde Bay, Lower California	25 32 05 N 110 56 55 W	80 fathoms. Mud.
659-37	10	Agua Verde Bay, Lower California	25 29 40 N 110 58 45 W	San Marcial Reef. Low tide.
660-37	10	Agua Verde Bay, Lower California	25 31 05 N 111 02 30 W	Shore, north cove. Rock.
661-37	10	Agua Verde Bay, Lower California	25 31 N 111 01 45 W	Anchorage. Electric Light.
662-37	11	Agua Verde Bay, Lower California	25 31 35 N 111 01 45 W	Off San Marcial Reef. 8 fathoms. Rock.
663-37	11	Agua Verde Bay, Lower California	25 29 10 N 110 57 45 W	15 fathoms. Rock, mud.
664-37	11	Agua Verde Bay, Lower California	25 29 40 N 110 58 45 W	San Marcial Reef. Low tide.
665-37	11	Agua Verde Bay, Lower California	25 31 05 N 111 02 30 W	Shore, north of salt beds.
666-37	12	Puerto Escondido, Lower California	25 53 55 N 111 16 30 W	Off Carmen Island. 180 fathoms. Mud.
667-37	12	Puerto Escondido, off Carmen Island, Lower California	25 51 50 N 111 15 40 W	60 fathoms. Mud.
668-37	12	Puerto Escondido, Lower California	25 48 50 N 111 18 W	20 fathoms. Mud, sand.
669-37	12	Off Puerto Escondido, Lower California	25 47 05 N 111 16 15 W	34 fathoms. Sand.
670-37	12	Puerto Escondido, Lower California	25 50 05 N 111 19 W	Shore. Lagoon entrance.
671-37	13	Puerto Escondido, Lower California	25 50 05 N 111 19 W	1-2 fathoms. Netting from skiff.
672-37	13	Puerto Escondido, Lower California	25 50 05 N 111 19 W	Fresh water stream, inland.
673-37	14	Salinas Bay, Carmen Island, Gulf of California	25 57 55 N 111 07 45 W	20 fathoms. Shell.
674-37	14	Off Pulpito Point, Lower California	26 30 N 111 27 10 W	14 fathoms. Sand.

Station	Date	Locality	Bearings	Remarks
	Mar. 1937			
675-37	15	Off Pulpito Point, Lower California	26 28 45 N 111 26 45 W	55 fathoms. Sand, small rock.
676-37	15	Ildefonso Island, Gulf of California	26 37 55 N 111 26 35 W	South shore. Rock.
677-37	15	Off Ildefonso Island, Gulf of California	26 37 20 N 111 29 10 W	50 fathoms. Sand, shell.
678-37	15	Off Ildefonso Island, Gulf of California	26 38 55 N 111 30 25 W	190 fathoms. Mud.
679-37	15	Outside of Concepción Bay, Lower California	26 54 30 N 111 52 W	30 fathoms. Mud, shell.
680-37	15	Off Concepción Bay, Lower California	26 54 15 N 111 51 10 W	20 fathoms. Shell, oyster spat.
681-37	15	Off Concepción Bay, Lower California	26 52 50 N 111 51 30 W	3 fathoms. Shells, hermit crabs.
682-37	15	Off Concepción Bay, Lower California	26 53 30 N 111 52 25 W	12 fathoms. *Strombus* shells.
683-37	15	Off Concepción Bay, Lower California	26 53 50 N 111 52 25 W	12 fathoms. Coralline.
684-37	15	West Cove, Concepción Bay, Lower California	26 44 40 N 111 54 W	Shore. Heliasters.
685-37	15	Concepción Bay, Lower California	26 43 25 N 111 52 05 W	Anchorage. Electric Light.
686-37	16	Concepción Bay, Lower California	26 41 40 N 111 51 05 W	12 fathoms. Mud, sand.
687-37	16	Concepción Bay, Lower California	26 43 25 N 111 54 05 W	5 fathoms. Sand.
688-37	16	Concepción Bay, Lower California	26 41 40 N 111 51 05 W	12 fathoms. Mud, sand.
689-37	16	Coyote Bay, Concepción Bay, Lower California	26 44 40 N 111 54 W	Shore. Sand, rock.
690-37	16	Island in Concepción Bay, Lower California	26 44 40 N 111 54 W	Shore. Land plants.
691-37	16	Concepción Bay, Lower California	26 44 40 N 111 54 W	2 fathoms. Dipnetting.
691a-37	16	Concepción Bay, Lower California	26 44 40 N 111 54 W	3-4 fathoms. Lobster pots.
692-37	17	South of Tortuga Island, Gulf of California	27 25 30 N 111 53 25 W	18 fathoms. Sand.
693-37	17	South of Tortuga Island, Gulf of California	27 23 15 N 111 53 W	55 fathoms. Sand.
694-37	17	Tortuga Island, Gulf of California	27 26 N 111 53 40 W	Inland. Land plants.
695-37	17	South of Tortuga Island, Gulf of California	27 24 50 N 111 53 35 W	Anchorage. Electric Light.
696-37	18	South of Tortuga Island, Gulf of California	27 24 N 111 53 25 W	45 fathoms. Sand.
697-37	18	South of Tortuga Island, Gulf of California	27 22 45 N 111 53 25 W	75 fathoms. Sand.

Station	Date	Locality	Bearings	Remarks
	Mar. 1937			
698-37	18	Tortuga Island, Gulf of California	27 26 N 111 53 40 W	Shore, inland. Land plants.
699-37	19	Angeles Channel, Lower California	28 57 35 N 113 29 30 W	30 fathoms. Sand.
700-37	19	Angeles Bay, Lower California	28 53 40 N 113 32 45 W	Shore. Shingle.
701-37	20	Angeles Bay, Lower California	28 37 N 113 30 45 W	32 fathoms. Sand, shell.
702-37	20	Angeles Bay, Lower California	28 55 40 N 113 32 25 W	18 fathoms. Coarse sand.
703-37	20	Angeles Bay, Lower California	28 56 45 N 113 34 W	North shore. Rock.
704-37	20	Puerto Refugio, Angel de la Guardia Island, Gulf of California	29 33 04 N 113 33 25 W	20 fathoms. Coralline.
705-37	20	Puerto Refugio, Angel de la Guardia Island, Gulf of California	29 32 48 N 113 33 35 W	15 fathoms. Coarse sand.
706-37	20	Puerto Refugio, Angel de la Guardia Island, Gulf of California	29 33 06 N 113 33 42 W	8-10 fathoms. Ulva.
707-37	20	Puerto Refugio, Angel de la Guardia Island, Gulf of California	29 32 47 N 113 34 35 W	Shore. Rock.
708-37	21	Puerto Refugio, Angel de la Guardia Island, Gulf of California	29 34 25 N 113 32 35 W	60 fathoms. Sand.
709-37	21	Puerto Refugio, Angel de la Guardia Island, Gulf of California	29 36 25 N 113 29 30 W	90 fathoms. Mud.
710-37	21	Puerto Refugio, Angel de la Guardia Island, Gulf of California	29 39 N 113 28 25 W	110 fathoms. Mud.
711-37	21	Puerto Refugio, Angel de la Guardia Island, Gulf of California	29 33 45 N 113 32 24 W	40 fathoms. Sand.
712-37	21	Puerto Refugio, Angel de la Guardia Island, Gulf of California	29 34 35 N 113 29 30 W	50-75 fathoms. Sand.
713-37	21	Puerto Refugio, Angel de la Guardia Island, California	29 32 47 N 113 34 35 W	Shore. Rock.

Station	*Date*	*Locality*	*Bearings*	*Remarks*
	Mar. 1937			
714-37	23	Off Willard Point, Gonzaga Bay, Lower California	29 49 25 N 114 20 40 W	16-30 fathoms. Rock, mud.
715-37	23	Willard Point, Gonzaga Bay, Lower California	29 48 25 N 114 23 30 W	Shore. Land plants.
716-37	23	Off Willard Point, Gonzaga Bay, Lower California	29 48 N 114 23 05 W	2-3 fathoms. Sand. *Encope.*
717-37	23	Off San Luis Island, Gulf of California	29 56 30 N 114 25 35 W	10 fathoms. Sand, *Pectens.*
718-37	24	Consag Rock, Gulf of California	31 07 N 114 27 35 W	Shore. Rock.
719-37	24	Off Consag Rock, Gulf of California	30 53 N 114 28 45 W	10-25 fathoms. Basket stars.
		Gulf of California—East Coast		
720-37	24	Rocky Point, Sonora, Mexico	31 19 25 N 113 41 40 W	6 fathoms. Rock, basket stars.
721-37	24	Rocky Point, Sonora, Mexico	31 19 25 N 113 41 40 W	8-12 fathoms. Sand.
722-37	25	Off Georges Island, Gulf of California	30 59 50 N 113 16 W	10 fathoms. Sand, rock.
723-37	25	Georges Island, Gulf of California	31 00 40 N 113 16 05 W	Shore. Rock.
724-37	26	North of Lobos Point, Sonora, Mexico	29 54 25 N 112 41 W	Shore. Rock.
725-37	26	North of Lobos Point, Sonora, Mexico	29 55 N 112 46 50 W	10 fathoms. Sand.
726-37	26	North of Lobos Point, Sonora, Mexico	29 55 45 N 112 47 40 W	25 fathoms. Sand.
727-37	26	Patos Island, Gulf of California	29 16 N 112 28 30 W	Shore. Plants, insects.
728-37	27	South end of San Esteban Island, Gulf of California	28 39 40 N 112 35 35 W	Shore. Rock.
729-37	27	South of San Esteban Island, Gulf of California	28 48 25 N 112 34 10 W	35 fathoms. Shell.
730-37	27	South end of Tiburon Island, Gulf of California	28 45 35 N 112 17 45 W	Inland.
731-37	28	South of Tiburon Island, Gulf of California	28 44 45 N 112 18 20 W	7 fathoms. Sand.
732-37	28	South of Tiburon Island, Gulf of California	28 44 45 N 112 18 20 W	12 fathoms. Sand, coralline.
733-37	29	Off San Pedro Nolasco Island, Gulf of California	27 58 25 N 111 23 25 W	45 fathoms. Rock, sand.

Station	Date	Locality	Bearings	Remarks
	Mar. 1937			
734-37	29	Off San Pedro Nolasco Island, Gulf of California	27 59 30 N 111 24 25 W	75 fathoms. Sand.
735-37	29	Off San Pedro Nolasco Island, Gulf of California	28 00 20 N 111 24 40 W	110 fathoms. Sand.
736-37	29	San Pedro Nolasco Island, Gulf of California	27 58 N 111 24 20 W	Shore. Land plants.
737-37	30	Ensenada de San Francisco, Sonora, Mexico	27 55 45 N 111 03 W	15 fathoms. Sand.
738-37	30	Ensenada de San Francisco, Sonora, Mexico	27 53 20 N 111 02 30 W	30 fathoms. Shell.
739-37	30	Ensenada de San Francisco, Sonora, Mexico	27 57 05 N 111 03 20 W	Shore. Shingle.
740-37	31	San Ignacio Bay, Sinaloa, Mexico	25 34 10 N 109 14 40 W	3-5 fathoms. Sand. *Luidia*.
741-37	31	Farallon, San Ignacio Bay, Sinaloa, Mexico	25 25 50 N 109 24 20 W	Shore. Rock.
742-37	31	San Ignacio Bay, Sinaloa, Mexico	25 23 N 109 15 10 W	30-50 fathoms. Shell.
743-37	31	San Ignacio Bay, Sinaloa, Mexico	25 16 20 N 109 18 W	90 fathoms. Mud.
	Apr. 1937			
744-37	1	Near Point Piaxtla, Sinaloa, Mexico	28 39 05 N 106 50 55 W	6-8 fathoms. Sand, rock, mud.
745-37	2	Isabel Island, Mexico	21 54 10 N 105 53 05 W	10-18 fathoms. Coralline, nullipores.
746-37	2	Isabel Island, Mexico	21 50 30 N 105 53 35 W	Shore. Rock.
747-37	2	Isabel Island, Mexico	21 54 10 N 105 53 15 W	10-18 fathoms. Coralline.
748-37	2	Isabel Island, Mexico	21 52 20 N 105 51 30 W	Anchorage. Electric Light.
749-37	3	Isabel Island, Mexico	21 51 30 N 105 33 35 W	Rocky reef. Low tide.
		Gulf of California—West Coast		
750-37	4	Outer Gorda Bank, Gulf of California	23 00 25 N 109 28 35 W	60 fathoms. Fine gray sand.
751-37	4	Off Los Frailes, Lower California	23 22 45 N 109 24 15 W	5-15 fathoms. Sand, algae.
752-37	4	Fraile Bay, Lower California	23 23 N 109 24 30 W	Shore. Land plants.

Station	*Date*	*Locality*	*Bearings*	*Remarks*
		ALLAN HANCOCK SUMMER CRUISE OF 1937		
		Mexico		
	July 1937	**West Coast of Lower California**		
753-37	10	East side of Cedros Island, Lower California	28 07 N 115 11 25 W	Shore. Rock, sand.
754-37	11	Abreojos Point, Lower California	26 44 30 N 113 36 20 W	Pond Lagoon, islands in lagoon.
755-37	12	East side of Cedros Island, Lower California	28 07 N 115 11 25 W	Sand spit and mainland shore.
756-37	14	Middle San Benito Island, off Lower California	28 19 15 N 115 34 W	Shore. Rock, beach.
757-37	15	West San Benito Island, off Lower California	28 18 20 N 115 34 20 W	Shore. Rock.
757a-37	15	East San Benito Island, off Lower California	28 18 05 N 115 32 15 W	Shore. Beach, rock.
758-37	18	Guadalupe Island, off Lower California	27 06 N 118 15 W	Shore. Elephant seal beach.
759-37	19	Guadalupe Island, Outer Island, off Lower California	28 43 N 118 15 W	Shore. Rock, beach.
		ALLAN HANCOCK PACIFIC EXPEDITION OF 1938		
	Jan. 1938	Mexico		
760-38	5	Santa Maria Bay, Lower California	24 42 20 N 112 14 10 W	32 fathoms. Rock, shell.
761-38	6	Southwest of Inner Gorda Bank, Gulf of California	23 01 N 109 33 15 W	345 fathoms. Mud.
762-38	6	Inner Gorda Bank, Gulf of California	23 02 10 N 109 30 50 W	60 fathoms. Fine gray sand.
763-38	7	Off Black Rock, Cape Corrientes, Mexico	19 57 N 105 32 W	5-10 fathoms. Broken shell.
764-38	8	North of White Friars, Mexico	17 31 20 N 101 29 W	15-20 fathoms. Fine sand.
765-38	9	Chacahua Bay, Mexico	15 57 05 N 97 38 W	5-10 fathoms. Nullipores.
766-38	9	Chacahua Bay, Mexico	15 57 45 N 97 41 30 W	Shore. Rock, *Heliasters*.
767-38	9	Chacahua Bay, Mexico	15 55 N 97 41 W	40-50 fathoms. Mud.
768-38	10	Off Chiapas, Mexico, Gulf of Tehuantepec	15 41 N 94 08 W	35 fathoms. Mud, shrimp.

Station	*Date*	*Locality*	*Bearings*	*Remarks*
	Jan. 1938		**Guatemala**	
769-38	11	Off San Jose Point, Guatemala	13 46 N 91 14 W	20 fathoms. Mud.
770a-38	11	Off San Jose Point, Guatemala	13 52 30 N 91 10 30 W	11 fathoms. Black sand.
770b-38	11	Off San Jose Point, Guatemala	13 53 40 N 91 10 30 W	7½ fathoms. Black sand.
770c-38	11	Off San Jose Point, Guatemala	13 53 40 N 91 11 20 W	7 fathoms. Black sand, shell.
770d-38	11	Off San Jose Point, Guatemala	13 53 40 N 91 09 40 W	7 fathoms. Black sand, mud.
771-38	11	Off San Jose Point, Guatemala	13 26 N 90 57 W	56 fathoms. Shell, shrimp.
			Costa Rica	
772-38	13	Off Nuez Island, Cocos Island, Costa Rica	5 34 N 86 59 20 W	31-50 fathoms. Coralline.
773-38	13	Off Nuez Island, Cocos Island, Costa Rica	5 34 N 86 59 20 W	31-50 fathoms. Coralline.
774-38	13	Chatham Bay, Cocos Island, Costa Rica	5 32 56 N 86 59 18 W	Shore. Rock.
775-38	13	Wafer Bay, Cocos Island, Costa Rica	5 32 40 N 86 59 50 W	Freshwater stream.
776-38	13	Wafer Bay, Cocos Island, Costa Rica	5 32 45 N 87 00 10 W	Tide pools.
777-38	13	Wafer Bay, Cocos Island, Costa Rica	5 32 40 N 86 59 50 W	Brackish water.
778-38	14	Chatham Bay, Cocos Island, Costa Rica	5 32 56 N 86 59 18 W	Shore. Rock.
779-38	14	Off Nuez Island, Cocos Island, Costa Rica	5 34 N 86 59 20 W	30-50 fathoms. Rock, coral, coralline.
780a-38	14	Chatham Bay, Cocos Island, Costa Rica	5 33 50 N 86 59 05 W	40-46 fathoms. Coarse white sand.
780b-38	14	Chatham Bay, Cocos Island, Costa Rica	5 33 50 N 86 58 45 W	47 fathoms. Coarse white sand.
781-38	14	Wafer Bay, Cocos Island, Costa Rica	5 32 45 N 87 00 10 W	Shore. Shingle.
			Galapagos Islands	
782-38	16	Darwin Bay, Tower Island	0 19 18 N 89 57 14 W	Shore. Rock.
783-38	16	Darwin Bay, Tower Island	0 19 10 N 89 56 44 W	40-70 fathoms. White sand, rock.
784-38	17	Darwin Bay, Tower Island	0 19 22 N 89 57 02 W	Shore. Rock.
785-38	17	Darwin Bay, Tower Island	0 19 17 N 89 56 52 W	20-40 fathoms. Sand, coral.

Station	*Date*	*Locality*	*Bearings*		*Remarks*
	Jan. 1938				
786-38	18	Northeast of Indefatigable Island	0 30 S	89 55 30 W	392 fathoms. Sand.
787-38	18	Stephens Bay, Chatham Island	0 51 35 S	90 02 W	Anchorage. Electric Light.
788-38	19	Southeast of Daphne Major Island	0 27 S	90 21 50 W	55 fathoms. Coral, shell.
789-38	19	South Seymour Island	0 24 20 S	90 20 W	West shore. Rock, sand.
790-38	19	Velero Bay, South Seymour Island	0 24 15 S	90 20 10 W	10-20 fathoms. Sand, rock.
791-38	19	Off South Seymour Island	0 24 20 S	90 20 W	Anchorage. Electric Light.
792-38	20	Off Daphne Minor Island	0 24 30 S	90 22 40 W	70-80 fathoms. Mud.
793-38	20	South Seymour Island	0 24 20 S	90 20 W	Shore. Rock, sand.
793a-38	20	North Seymour Island	0 24 20 S	90 19 25 W	Shore. Rock.
794-38	20	Sulivan Bay, James Island	0 16 48 S	90 34 58 W	Anchorage. Electric Light.
795-38	21	Sulivan Bay, James Island	0 16 12 S	90 34 50 W	36-40 fathoms. Rock, sand.
795a-38	21	Sulivan Bay, James Island.	0 16 08 S	90 34 35 W	50-60 fathoms. Volcanic sand.
796-38	21	Sulivan Bay, James Island.	0 17 S	90 35 13 W	Shore. Rock.
797-38	21	Off Jervis Island	0 26 S	90 40 W	145 fathoms. Water haul.
798-38	21	Cartago Bay, Albemarle Island	0 35 58 S	90 55 34 W	Anchorage. Electric Light.
799-38	22	Cartago Bay, Albemarle Island	0 35 42 S	90 58 38 W	15-18 fathoms. Sand.
800-38	22	Cartago Bay, Albemarle Island	0 34 10 S	90 57 55 W	North shore. Rock.
801-38	22	Cartago Bay, Albemarle Island	0 35 58 S	90 55 24 W	Anchorage. Electric Light.
802-38	23	Northwest of Charles Island	1 09 S	90 35 W	250 fathoms. Sand, shell.
803-38	23	Black Beach, Charles Island	1 16 36 S	90 29 42 W	Shore. Rock.
804-38	23	Onslow Island, north of Charles Island	1 14 20 S	90 26 07 W	Crater. *Pavona* coral.
805-38	23	Black Beach, Charles Island	1 16 46 S	90 29 56 W	Anchorage. Electric Light.
806-38	24	Black Beach, Charles Island	1 16 26 S	90 29 42 W	Shore. Rock.
807-38	24	Academy Bay, Indefatigable Island	0 46 16 S	90 19 38 W	10-25 fathoms. Sand.

Station	Date	Locality	Bearings		Remarks
	Jan. 1938				
808-38	25	Academy Bay, Indefatigable Island	0 45 14 S	90 20 11 W	Shore. Rock.
809-38	25	Academy Bay, Indefatigable Island	0 45 55 S	90 20 45 W	Anchorage. Electric Light.
810a-38	26	Off Barrington Island	0 47 S	90 02 W	48 fathoms. Rock.
810b-38	26	Off Barrington Island	0 43 S	90 01 W	73 fathoms. Sand.
810c-38	26	Off Barrington Island	0 43 S	89 59 30 W	73 fathoms. Sand.
811-38	26	Barrington Island.	0 51 35 S	90 02 W	Shore. *Pocillopora* coral.
811a-38	26	Barrington Island	0 51 35 S	90 02 W	Shore. Coral (Pavonia?).
812-38	27	Freshwater Bay, Chatham Island	0 56 20 S	89 29 25 W	Inland.
812a-38	27	Off Freshwater Bay, Chatham Island	1 01 S	89 30 W	400 fathoms. Coarse sand.
813-38	27	Gardner Bay, Hood Island	1 22 15 S	89 39 40 W	Anchorage. Electric Light.
814-38	28	North of Hood Island	1 21 55 S	90 40 05 W	20-40 fathoms. Shell.
815-38	28	East side, Hood Island	1 22 20 S	89 39 37 W	Shore. Rock. *Grapsus.*
816-38	29	North of Hood Island	1 19 15 S	89 39 45 W	50-100 fathoms. Rock, sand.
817-38	29	North of Hood Island	1 20 S	89 40 W	140-160 fathoms. Sand.
818-38	30	South of Hood Island	1 33 S	89 34 30 W	300 fathoms. Sand, rock.
	Feb. 1938		**Peru**		
819-38	4	Callao, Peru	12 03 50 S	77 10 W	Breakwater. Rock.
820-38	6	San Nicolas Bay, Peru	15 14 05 S	75 14 45 W	10-25 fathoms. Mud.
821-38	6	San Nicolas Bay, Peru	15 14 13 S	75 15 30 W	Shore. Rock.
822-38	6	San Juan Bay, Peru	15 20 06 S	75 09 34 W	Anchorage. Electric Light.
823-38	7	San Juan Bay, Peru	15 20 55 S	75 11 30 W	30-40 fathoms. Mud.
824-38	7	San Juan Bay, Peru	15 20 30 S	75 10 07 W	15-20 fathoms. Sand, shell.
825-38	7	San Juan Bay, Peru	15 20 40 S	75 10 18 W	Shore. Rock.
826-38	7	San Juan Bay, Peru	15 20 12 S	75 10 52 W	20-30 fathoms. Sand, shell.

Station	Date	Locality	Bearings		Remarks
	Feb. 1938				
827-38	7	San Juan Bay, Peru	15 20 06 S	75 09 34 W	Anchorage. Electric Light.
828-38	8	San Juan Bay, Peru	15 20 43 S	75 09 20 W	Shore. Rock.
829-38	9	Independencia Bay, Peru	14 14 40 S	76 09 07 W	10 fathoms. Shell, sand, algae.
830-38	9	Independencia Bay, Peru	14 14 08 S	76 08 30 W	Shore. Rock.
831-38	9	Independencia Bay, Peru	14 14 08 S	76 08 30 W	Shore. Rock.
832-38	10	Independencia Bay, Peru	14 14 S	76 08 W	10 fathoms. Sand, shell, algae.
833-38	10	Off Independencia Bay, Peru	14 13 S	76 13 W	8 fathoms. Sand, shell.
834-38	10	Off Independencia Bay, Peru	14 16 S	76 10 W	21 fathoms. Mud, worms.
835-38	10	Independencia Bay, Peru	14 17 30 S	76 09 W	18 fathoms. Rock, sand, shell.
835a-38	10	Trujillana Channel, Independencia Bay, Peru	14 13 S	76 16 W	15 fathoms. Mud.
836-38	10	North Chincha Island, Peru	13 37 40 S	76 24 15 W	Anchorage. Electric Light.
837-38	11	North Chincha Island, Peru	13 37 40 S	76 24 15 W	Shore. Rock.
838-38	11	North Chincha Island, Peru	13 37 40 S	76 24 15 W	10 fathoms. Mud. Nematodes.
839-38	11	West of Chincha Islands, Peru	13 37 30 S	76 41 30 W	100 fathoms. Mud.
840-38	11	West of Chincha Islands, Peru	13 35 S	76 50 W	Surface (drifting). Electric Light.
841a-38	12	Off Hormigas de Afuera Islands, Peru	11 57 S	77 47 W	45 fathoms. Mud, shell.
841b-38	12	Off Hormigas de Afuera Islands, Peru	11 58 S	77 47 W	45 fathoms. Mud, shell.
842-38	13	Huañape (Guañape) Island, Peru.	8 34 S	78 57 45 W	Shore. Rock (from skiff).
843-38	14	Off Lobos de Afuera Islands, Peru	6 53 50 S	80 43 30 W	25-30 fathoms. Sand.
844-38	14	Lobos de Afuera Islands, Peru	6 55 40 S	80 43 50 W	Shore. Rock.
845-38	15	Sechura Bay, Peru	5 39 30 S	81 01 W	9½ fathoms. Coarse sand, worm tubes, red algae.
846-38	15	Sechura Bay, Peru	5 27 30 S	81 01 W	6 fathoms. Sand and finely broken shell.
847-38	16	9½ miles southwest of Zorritos Light, Peru	3 45 50 S	79 47 W	Shore. Rock.

Station	*Date*	*Locality*	*Bearings*		*Remarks*
	Feb. 1938		**Ecuador**		
848-38	23	Cape San Francisco, Ecuador	0 39 30 N	80 06 30 W	Shore. Rock.
849-38	23	San Francisco Bay, Ecuador	0 40 20 N	80 06 35 W	Freshwater stream.
850-38	23	Off Cape San Francisco, Ecuador	0 37 10 N	80 00 30 W	15 fathoms. Mud, rock.
			Colombia		
851-38	24	North of Gorgona Island, Colombia	3 01 25 N	78 10 W	10-20 fathoms. Mud, rock.
852-38	24	Watering Bay, Gorgona Island, Colombia	2 56 10 N	78 12 W	Freshwater stream.
853-38	24	Gorgona Island, Colombia	3 00 30 N	78 11 45 W	Shore. Rock.
854-38	24	North of Gorgona Island, Colombia	3 01 N	78 10 55 W	40-60 fathoms. Mud, rock.
855-38	24	Off north end of Gorgona Island, Colombia	3 01 25 N	78 10 W	10-20 fathoms. Rock, shell.
856-38	25	Port Utria, Colombia	5 59 10 N	77 21 W	15-30 fathoms. Mud, sand.
857-38	25	Port Utria, Colombia	6 00 27 N	77 20 30 W	Freshwater stream.
858-38	25	Port Utria, Colombia	5 59 10 N	77 21 20 W	Shore. Rock.
859-38	25	Port Utria, Colombia	5 59 10 N	77 21 20 W	Shallow water. Coral.
			Panama		
860-38	28	San Francisco Bay, 8 miles east of Panama City, Panama	8 59 25 N	79 31 45 W	Shore. Rock.
	Mar. 1938				
861-38	1	Bahia Honda, Panama	7 44 25 N	81 32 45 W	Shore. Rock.
862-38	1	Off Bahia Honda, Panama	7 43 30 N	81 34 15 W	30 fathoms. Mud.
863-38	1	Off Bahia Honda, Panama	7 45 35 N	81 35 35 W	30-50 fathoms. Rock, sand, mud.
864-38	1	Bahia Honda, Panama	7 44 35 N	81 31 40 W	Anchorage. Electric Light.
865-38	2	Secas Islands, Panama	7 57 55 N	82 02 W	3 fathoms. Mud, sand.
866-38	2	Secas Islands, Panama	7 57 10 N	82 00 45 W	Shore. Rock.
867-38	2	Secas Islands, Panama	7 57 10 N	82 00 45 W	Shallow water. Coral.

Station	Date	Locality	Bearings	Remarks
	Mar. 1938		**Mexico**	
868-38	6	Off Acapulco, Mexico	16 39 45 N 99 42 W	11 fathoms. Fine sand.
869-38	8	Isabel Island, Mexico	21 51 30 N 105 53 35 W	Shore. Rock.
870-38	8	Isabel Island, Mexico	21 54 10 N 105 58 15 W	10-15 fathoms. Coralline, Gorgonids.
871-38	11	4¾ miles east of South Coronado Island, Mexico	32 24 N 117 09 15 W	14 fathoms. Sand, kelp.
			ALLAN HANCOCK SUMMER CRUISES OF 1938	
	July 1938		**California**	
872-38	23	Off Long Point, Santa Catalina Island	33 24 35 N 118 21 15 W	Rock, brachiopods. 50 fathoms.
	Aug. 1938			
873-38	1	East of Anacapa Island, California	34 01 N 119 19 W	50 fathoms. Broken shell.
874-38	1	Northeast of Anacapa Island	34 01 30 N 119 21 W	45 fathoms. Shell.
875-38	1	Northeast of Anacapa Island	34 02 30 N 119 20 W	50 fathoms. Rock, sponges.
876-38	1	Northeast of Anacapa Island	34 03 N 119 21 W	45 fathoms. Rock, sea urchins.
877-38	1	Anacapa Island	34 00 20 N 119 24 25 W	North shore. Rock.
878-38	1	North of Anacapa Island	34 00 45 N 119 24 30 W	15 fathoms. Sand.
879-38	2	Off Prisoners Harbor, Santa Cruz Island	34 03 N 119 40 05 W	50 fathoms. Gray sand.
880-38	2	Off Bechers Bay, Santa Rosa Island	34 02 N 120 01 W	16 fathoms. Sand, shell.
881-38	2	Bechers Bay, Santa Rosa Island	34 01 N 120 02 W	10 fathoms. Sand.
882-38	3	Off Tyler Bight, San Miguel Island	34 01 20 N 120 24 25 W	15 fathoms. Sand, shell.
883-38	3	Tyler Bight, San Miguel Island	34 01 55 N 120 25 05 W	Shore. Rock.
884-38	4	Point San Luis, California	35 09 30 N 120 45 40 W	Lobster traps *(Cancers)*.
885-38	4	San Luis Obispo Bay, California	35 09 15 N 120 44 15 W	8-14 fathoms. Rock.
886-38	5	South of Pillar Point, Halfmoon Bay, California	37 28 30 N 122 29 15 W	16 fathoms. Coarse gravel.
887-38	7	Northeast of Middle Farallon Island	37 48 N 122 59 W	37 fathoms. Sand.

Station	Date	Locality	Bearings	Remarks
	Aug. 1938			
888-38	8	Near the mouth of Salinas River, Monterey Bay, California	36 44 30 N 121 49 30 W	10-13 fathoms. Sand.
889-38	8	Off Point Pinos, Monterey Bay, California	36 38 45 N 121 56 W	36 fathoms. Broken shell.
890-38	8	Off Point Pinos, Monterey Bay, California	36 39 50 N 121 58 W	49-54 fathoms. Rock, crinoids, brittle stars.
891-38	8	Southwest of Point Pinos, California	36 37 25 N 121 58 25 W	26 fathoms. Rock, sponges.
892-38	9	In and around Carmel Bay, California	36 33 N 121 57 40 W	10-40 fathoms. Rock, mud.
893-38	10	Off Point Arguello, California	34 34 20 N 120 40 W	15-30 fathoms. Sand, algae.
894-38	10	South of San Miguel Island	34 01 N 120 24 W	5-15 fathoms. Rock with kelp.
895-38	12	East of Santa Barbara Island	33 29 N 119 01 W	Shoal to 40 fathoms. Sand.
	Sept. 1938			
896a-38	12	South of San Miguel Island, off Point Bennett	34 00 50 N 120 26 35 W	34 fathoms. Sand, shell.
896b-38	12	South of San Miguel Island	34 00 45 N 120 20 W	12-19 fathoms. Gray sand.
897-38	13	Off Point Santa Barbara, California	34 22 30 N 119 42 30 W	33 fathoms. Mud.
898-38	14	North of Santa Cruz Island	34 06 30 N 119 53 W	53 fathoms. Green sand.

ALLAN HANCOCK WINTER CRUISES OF 1938-39

California

Station	Date	Locality	Bearings	Remarks
	Nov. 1938			
899-38	17	Off Long Point, Santa Catalina Island	33 24 15 N 118 20 45 W	90-110 fathoms. Sand, gravel.
900-38	18	Off Long Point, Santa Catalina Island	33 24 35 N 118 21 15 W	40 fathoms. Rock, brachiopods, sponges.
901-38	20	Point Fermin, California	33 42 30 N 118 17 10 W	Shore. Rock and rocks in sand.
902-38	21	Portuguese Bend, California	33 44 20 N 118 22 20 W	Shore. Rock, sand, tide pools.

Station	*Date*	*Locality*	*Bearings*	*Remarks*
	Dec. 1938			
903-38	5	Anaheim Slough, near Long Beach, California	33 43 15 N 118 03 45 W	Shore. Sand, mud, *Zostera*
904-38	6	Laguna Beach and Pier, California	33 32 N 117 46 50 W	Shore. Rock, sand, pier.
905-38	7	Anaheim Slough, near Long Beach, California	33 43 15 N 118 03 45 W	Shore. Sand, mud, *Zostera*
906-38	8	Portuguese Bend, California	33 44 20 N 118 22 20 W	Shore. Rock, reefs.
907-38	9	Bluff Cove, south of Redondo, California	33 47 45 N 118 24 25 W	Shore. Rock.
	Jan. 1939			
908-39	28	Off White Cove, Santa Catalina Island	33 23 45 N 118 20 15 W	40-80 fathoms. Rock, brachiopods.
909-39	29	Off Emerald Bay, Santa Catalina Island	33 28 55 N 118 30 05 W	65-90 fathoms. Mud.
	Feb. 1939			
910-39	12	Portuguese Bend, California	33 44 20 N 118 22 20 W	Shore. Rock, reefs.
911-39	18	Off Wilson Cove, San Clemente Island	33 00 20 N 118 33 10 W	60-85 fathoms. Sand, broken shell.
912-39	18	Pyramid Cove, San Clemente Island	32 49 18 N 118 23 42 W	Shore. Rock, sand.
913-39	18	Off Pyramid Cove, San Clemente Island	32 48 30 N 118 23 42 W	35-46 fathoms. Fine gray sand.
914a-39	19	Off Pyramid Cove, San Clemente Island	32 47 10 N 118 22 10 W	78-110 fathoms. Sand, mud.
914b-39	19	Off Pyramid Cove, San Clemente Island	32 46 30 N 118 21 15 W	214 fathoms. Mud.
914c-39	19	Pyramid Cove, San Clemente Island	32 48 30 N 118 23 42 W	Shore. Rock, sand.
		ALLAN HANCOCK PACIFIC EXPEDITION OF 1939		
	Mar. 1939	Mexico		
915-39	16	Sulphur Bay, Clarion Island	18 20 45 N 114 44 15 W	5 fathoms. Coralline.
916-39	16	Sulphur Bay, Clarion Island	18 20 50 N 114 44 10 W	Shore. Shingle.
917a-39	16	Sulphur Bay, Clarion Island	18 20 05 N 114 44 50 W	28-35 fathoms. Gray sand, coralline.
917b-39	16	Off Sulphur Bay, Clarion Island	18 19 50 N 114 43 55 W	30-45 fathoms. Gray sand, coralline.
918a-39	16	Off Sulphur Bay, Clarion Island	18 19 25 N 114 44 50 W	50-60 fathoms. Shell, coralline.
918b-39	16	Off Sulphur Bay, Clarion Island	18 19 45 N 114 44 35 W	45-50 fathoms. Shell, coralline.

Station	Date	Locality	Bearings		Remarks
	Mar. 1939				
919-39	17	Off Sulphur Bay, Clarion Island	18 20 13 N	114 44 51 W	25-26 fathoms. Sand, coralline.
920-39	17	Sulphur Bay, Clarion Island	18 20 50 N	114 44 30 W	Shore. Tide pools.
921a-39	17	North of Clarion Island	18 23 30 N	114 45 55 W	30-35 fathoms. Nullipores.
921b-39	17	North of Clarion Island	18 24 N	114 44 15 W	40-50 fathoms. Nullipores.
921c-39	17	North of Clarion Island	18 23 45 N	114 44 50 W	35-40 fathoms. Nullipores.
921d-39	17	North of Clarion Island	18 24 30 N	114 43 45 W	50-56 fathoms. Nullipores.
922-39	18	Braithwaite Bay, Socorro Island	18 42 20 N	110 56 15 W	10-20 fathoms. Sand, red mud.
923-39	18	Braithwaite Bay, Socorro Island	18 42 45 N	110 56 50 W	Shore. Rock, large shingle.
924-39	18	Off Braithwaite Bay, Socorro Island	18 41 52 N	110 55 20 W	17-46 fathoms. Sand, coralline, sea pens.
925-39	18	Off Braithwaite Bay, Socorro Island	18 40 42 N	110 55 58 W	70-75 fathoms. Rock, shell.
926-39	18	West of Cape Rule, Socorro Island	18 42 10 N	110 58 37 W	41-45 fathoms. Shell, sea pens.
927-39	20	Chacahua Bay, Mexico	15 57 20 N	97 39 45 W	10-15 fathoms. Mud.
928-39	20	Chacahua Bay, Mexico	15 58 N	97 41 40 W	Lagoon. Mud.
			Guatemala		
929-39	23	Near San Jose Light, Guatemala	13 54 35 N	91 03 40 W	2-5 fathoms. Fine sand.
930-39	23	Off San Jose Light, Guatemala	13 52 35 N	91 01 02 W	12-13 fathoms. Fine black sand, mollusks.
931-39	23	Off San Jose Light, Guatemala	13 45 25 N	90 54 20 W	23 fathoms. Gray sand, mollusks.
932-39	23	Off San Jose Light, Guatemala	13 45 25 N	90 49 25 W	53-55 fathoms. Green mud, shell.
			Costa Rica		
933-39	24	Port Parker, Costa Rica	10 55 10 N	85 49 40 W	Shore. Sand beach and estuary.
934-39	24	Port Parker, Costa Rica	10 57 35 N	85 49 W	3-8 fathoms. Sandy mud.
935-39	24	Port Parker, Costa Rica	10 56 30 N	85 45 45 W	Anchorage. Electric Light.

Station	Date	Locality	Bearings		Remarks
	Mar. 1939				
936-39	25	Port Parker, Costa Rica	10 57 35 N	85 49 W	5-10 fathoms. Sandy mud.
937-39	25	Port Parker, Costa Rica	10 56 N	85 48 35 W	Shore. Rocky point of island.
938-39	25	Port Parker, Costa Rica	10 55 10 N	85 49 40 W	Shore. Sandy beach.
939-39	26	Gulf of Dulce, Costa Rica	8 23 10 N	83 16 40 W	10-22 fathoms. Coarse sand.
940-39	26	Gulf of Dulce, Costa Rica	8 24 30 N	83 17 05 W	Shore. Loose basaltic boulders.
941-39	26	Gulf of Dulce, Costa Rica	8 24 20 N	83 13 40 W	19-48 fathoms. Mud and fine sand.
942-39	26	Gulf of Dulce, Costa Rica	8 24 N	83 15 35 W	Anchorage. Electric Light.
		Panama			
943-39	27	3 miles south of Isla Ladrones, Panama	7 49 N	82 23 30 W	54 fathoms. Green mud.
944-39	27	10 miles southwest of Secas Islands, Panama	7 51 10 N	82 12 05 W	30 fathoms. Gray sand.
945-39	27	Secas Islands, Panama	7 58 02 N	82 00 30 W	25-26 fathoms. Gray, sandy mud.
946-39	27	Bahia Honda, Panama	7 44 35 N	81 31 40 W	Anchorage. Electric Light.
947-39	28	Bahia Honda, Panama	7 45 N	81 31 40 W	Shore. Sand, rock.
948-39	28	Off Medidor Island, Bahia Honda, Panama	7 43 55 N	81 35 48 W	30-35 fathoms. Rock, mud, coralline.
949-39	28	Bahia Honda, Panama	7 43 30 N	81 32 40 W	Shore. Rock.
950-39	28	Bahia Honda, Panama	7 46 10 N	81 32 35 W	Shore. Mangroves.
951-39	28	Bahia Honda, Panama	7 46 N	81 31 45 W	Beach seine.
952-39	31	Panama City, Panama	8 57 15 N	79 30 W	Fish market. Fish.
	Apr. 1939				
953-39	1	San Francisco Bay, east of Panama City, Panama	8 59 25 N	79 31 45 W	Shore. Rock.
954-39	1	Panama City, Panama	8 57 15 N	79 30 W	Fish market. Fish and squid.
955-39	1	Madden Dam Road, Canal Zone	9 07 N	79 31 45 W	Freshwater stream in Bat Cave.
956-39	1	Balboa, Canal Zone	8 57 N	79 34 W	Shore. Piling.

At this point the *Velero III* digressed from Pacific exploration to spend one month in Caribbean waters. Since a new set of station numbers, beginning with A1-39, was applied to Atlantic stations, the Pacific station numbers continue without interruption.

Station	Date	Locality	Bearings		Remarks
	May 1939				
957-39	2	Taboga Island, Panama	8 47 35 N	79 33 15 W	Shore. Rock, tide pools.
958-39	2	Taboga Island, Panama	8 47 35 N	79 33 15 W	Shallow water. *Pocillopora* coral.
959-39	2	Taboga Island, Panama	8 48 N	79 30 W	2-5 fathoms. Mud, sand.
960-39	2	Taboga Island, Panama	8 46 40 N	79 32 10 W	2-5 fathoms. Sand, coralline.
961-39	2	Taboga Island, Panama	8 46 40 N	79 33 15 W	Shore. Lava rock.
		Nicaragua			
962-39	4	11 miles northwest of Corinto, Nicaragua	12 35 10 N	87 20 30 W	1-3 fathoms. Sand, dead leaves.
		Mexico			
963-39	7	North of White Friars, Mexico	17 31 30 N	101 29 25 W	20-25 fathoms. Hard sand.
963a-39	7	White Friars, Mexico	17 31 25 N	101 29 25 W	Shore. Algae.
964-39	8	Tenacatita Bay, Mexico	19 18 N	104 50 W	2-8 fathoms. Mud.
965-39	8	Tenacatita Bay, Mexico	19 17 17 N	104 48 40 W	8-15 fathoms. Shell, sand.
966-39	8	Tenacatita Bay, Mexico	19 18 N	104 51 35 W	Lagoon. Seine.
967-39	8	Tenacatita Bay, Mexico	19 16 50 N	104 48 27 W	Shore at village. Rock, coarse sand.
968-39	8	Tenacatita Bay, Mexico	19 16 50 N	104 48 27 W	Shore. Brackish water (Shrimps).
969-39	8	Tenacatita Bay, Mexico	19 18 N	104 51 35 W	Shore. Estuary, mangrove roots.
970-39	9	Magdalena Island, Tres Marias Islands, Mexico	21 25 40 N	106 21 10 W	13 fathoms. Coralline, algae.
971-39	9	Magdalena Island, Tres Marias Islands, Mexico	21 27 N	106 22 30 W	3-5 fathoms. Ulva.
972-39	9	Magdalena Island, Tres Marias Islands, Mexico	21 26 N	106 23 20 W	Shore. Rock.
973-39	9	Isabel Island, Mexico	21 51 30 N	105 53 35 W	Shore. Rock.
974-39	9	Off Isabel Island, Mexico	21 54 10 N	105 53 15 W	15-25 fathoms. Sand, shell.

ALLAN HANCOCK SUMMER CRUISES OF 1939

Station	Date	General Locality	Dredge Down Position	Dredge Down Time	Dredge Down Fms.	Dir.	Dredge Up Position	Dredge Up Time	Dredge Up Fms.	Remarks
	May 1939			California						
975-39	27	East of Santa Barbara Island	33 28 15 N				119 00 40 W			25-27 fms. White sand.
976-39	28	North of Santa Barbara Island	33 31 N				119 01 50 W			15-20 fms. White sand.
977-39	28	North Point of Santa Barbara Island	33 29 05 N				119 02 15 W			Shore. Rock.
978-39	28	East of Gull (Sutil) Island	33 27 35 N				119 02 35 W			21-28 fms. Rock.
979-39	28	West of Gull (Sutil) Island	33 27 55 N				119 03 30 W			38-41 fms. Black sand.
980-39	28	Northwest of Santa Barbara Island	33 29 20 N				119 02 15 W			10-30 fms. Black sand.
981-39 D-1	29	5½ mi. N. of Santa Barbara Island	33 34 40 N 119 00 30 W	12:28 PM	76	215	33 34 30 N 119 00 50 W	12:48 PM	78	Gray sand, sponges
981-39 D-2	29	5½ mi. N. of Santa Barbara Island	33 34 40 N 119 00 15 W	1:24 PM	76	44	33 35 08 N 119 00 50 W	1:51 PM	87	Gray sand, sponges
982-39	29	10 mi. NNW. of Santa Barbara Island	33 37 45 N 119 08 02 W	2:35 PM	81	280	33 37 53 N 119 08 13 W	2:53 PM	80	Sponges, boulders
983-39	29	15½ mi. NNW. of Santa Barbara Island	33 43 30 N 119 09 20 W	3:32 PM	70	285	33 43 30 N 119 09 45 W	3:50 PM	70	Sponges, boulders
984-39 D-1	30	5½ mi. S. of Santa Barbara Island	33 22 15 N 119 03 00 W	8:52 AM	39	155	33 22 02 N 119 02 48 W	9:03 AM	42	Boulders
984-39 D-2	30	5½ mi. S. of Santa Barbara Island	33 22 30 N 119 03 45 W	9:33 AM	42	155	33 22 28 N 119 02 50 W	9:55 AM	48	Boulders
985-39	30	3½ mi. S. of Santa Barbara Island	33 24 58 N 119 04 27 W	10:22 AM	240	114	33 24 45 N 119 03 30 W	11:32 AM	275	Boulders

Station	Date	General Locality	Dredge Down Position	Dredge Down Time	Dredge Down Fms.	Dir.	Dredge Up Position	Dredge Up Time	Dredge Up Fms.	Remarks
	Aug. 1939									
986-39	3	S. of San Miguel Island	33 58 00 N 120 28 00 W	3:40 PM	138	36	33 58 08 N 120 29 00 W	4:05 PM	130	Coarse, gray sand
987-39	3	S. of San Miguel Island	33 59 00 N 120 28 30 W	4:32 PM	170	67	33 59 45 N 120 27 45 W	5:10 PM	155	Rock, clay, shale
988-39	3	N. of Cape Bennett, San Miguel Island	34 02 00 N 120 26 50 W		Shore					Rock
989-39	3	S. of E. end of San Miguel Island	34 00 40 N 120 19 20 W		17					Fishing for sand dabs with copepod parasites
990-39	4	San Miguel Passage	33 59 15 N 120 17 30 W	10:06 AM	39	360	33 53 45 N 120 18 00 W	10:25 AM	37	Shale, gray sand, mud
991-39	4	San Miguel Passage	34 01 00 N 120 16 10 W	10:50 AM	18	360	34 01 15 N 120 16 45 W	11:06 AM	19	Shells, brittle stars
992-39	10	Off Santa Rosa Island	33 56 00 N 119 42 00 W	1:31 PM	230	315	33 56 30 N 119 40 30 W	2:00 PM	130	Gravel, mud
993-39	10	Off Santa Rosa Island	33 56 30 N 119 43 30 W	2:35 PM	130	270	33 56 00 N 119 43 30 W	3:21 PM	125	Gravel, mud
994-39	10	Off Santa Cruz Island	33 58 30 N 119 54 45 W	4:17 PM	127	180	33 58 30 N 119 55 15 W	4:41 PM	114	Broken shell, gray mud
995-39	10	Bechers Bay, Santa Rosa Island	33 59 40 N 119 59 30 W		10					Sand, coralline
996-39	12	Prisoners Harbor, Santa Cruz Island	34 02 15 N 119 40 50 W		35				45	Mud, sea pens
997-39	12	White Cove, Santa Catalina Island	33 23 25 N 118 22 00 W							Mud. Beach seine
998-39	12	White Cove, Santa Catalina Island	33 23 05 N 118 21 00 W		36				41	Mud and sand
999-39	12	Off Willow Cove, Santa Catalina Island	33 22 35 N 118 20 30 W		37				44	Sand, brachiopods

Station	Date	General Locality	Dredge Down Position	Dredge Down Time	Dredge Down Fms.	Dir.	Dredge Up Position	Dredge Up Time	Dredge Up Fms.	Remarks
	Aug. 1939									
1000-39	12	Off Long Point, Santa Catalina Island	33 24 30 N 118 21 10 W		90				101	Mud
1001-39	12	White Cove, Santa Catalina Island	33 23 45 N 118 21 50 W		18					Hand line fishing
1002-39	13	Off Long Point, Santa Catalina Island	33 24 10 N 118 21 30 W		50					Mud, sand
1003-39	18	Bechers Bay, Santa Rosa Island	34 01 15 N 120 00 30 W	2:16 PM	14	90	34 01 45 N 120 00 14 W	2:33 PM	14	Sand, shell
1004-39	18	Bechers Bay, Santa Rosa Island	34 02 15 N 120 01 00 W	3:40 PM	16	135	34 01 45 N 120 00 30 W	3:51 PM	13	Rock, coralline
1005-39	18	Santa Cruz Channel	34 01 45 N 120 00 30 W	4:21 PM	34	180	34 05 10 N 119 57 30 W	4:30 PM	32	Sand, shell, crabs
1006-39	19	Prisoners Harbor, Santa Cruz Island	34 01 15 N 119 40 50 W		Shore					Collecting from skiff
1007-39	20	Off County Quarry, Santa Catalina Island	33 26 40 N 118 27 50 W		56					Brachiopods
	Sept. 1939			Mexico						
1008-39	19	Off San Benito Islands	28 16 17 N 115 32 54 W	4:30 PM	52	300	28 16 48 N 115 33 54 W	4:54 PM	51	Fine green sand, pebbles
1009-39	19	Between S. ends of E. and W. San Benito Islands	28 18 40 N 115 33 50 W		35					Rock, sand, kelp
1010-39 D-1	20	Off San Benito Islands	28 12 05 N 115 33 20 W	3:45 PM	92	310	28 12 45 N 115 34 05 W	4:18 PM	95	Fine green sand
1010-39 D-2	20	Off San Benito Islands	28 12 40 N 115 33 45 W	4:38 PM	86	272	28 12 45 N 115 35 15 W	5:12 PM	71	Fine green sand
1011-39	22	N. end of Ranger Bank, W. of Cedros Island	28 34 22 N 115 31 05 W	1:44 PM	85	170	28 33 58 N 115 31 00 W	3:08 PM	80	Rock

ALLAN HANCOCK WINTER CRUISES OF 1939

Station	Date	General Locality	Dredge Down Position	Dredge Down Time	Dredge Down Fms.	Dir.	Dredge Up Position	Dredge Up Time	Dredge Up Fms.	Remarks
	Nov. 1939			California						
1012-39	9	S. of Pyramid Cove, San Clemente Island	32 45 55 N 118 26 10 W		55				69	Sand, shell
1013-39	10	Portuguese Bend	33 44 20 N 118 22 20 W		Shore					Rock, reefs
1014-39	11	S. of Breakwater, Corona del Mar	33 35 50 N 117 52 40 W		Shore					Rock, sand
1015-39	10	Craig's Shipyard, Terminal Island	33 46 10 N 118 13 00 W							Scrapings from hull of *Velero III* in dry dock
1016-39	23	Off Wilsons Cove, San Clemente Island	33 01 10 N 118 32 10 W		60				135	Sponges
1017-39	23	Off Wilsons Cove, San Clemente Island	33 01 05 N 118 32 10 W		105				180	Rock. Steep bottom
1018-39	23	Off Wilsons Cove, San Clemente Island	33 00 45 N 118 42 00 W		50				150	Sand, broken shell
1019-39	24	N. of San Clemente Island	33 04 40 N 118 42 00 W		250				300	Sand, mud
1020-39	24	N. of San Clemente Island	33 03 10 N 118 40 30 W		135				150	Gray sand
1021-39	24	Northwest Harbor, San Clemente Island	33 02 00 N 118 35 25 W		Shore					Rock, sand
1022-39	25	Off Pyramid Cove, San Clemente Island	32 46 35 N 118 21 50 W		150				170	Green mud
1023-39	25	Off Pyramid Cove, San Clemente Island	32 47 00 N 118 23 00 W		55				110	Fine gray sand
1024-39	25	Pyramid Cove, San Clemente Island	32 48 55 N 118 23 20 W		10					Eel grass, rock with kelp

			Dredge Down				*Dredge Up*			
Station	*Date*	*General Locality*	*Position*	*Time*	*Fms.*	*Dir.*	*Position*	*Time*	*Fms.*	*Remarks*
	Nov. 1939									
1025-39	25	Horse Cove, nr. Pyramid Cove, San Clemente Isl.	32 48 30 N 118 24 55 W		Shore					Rock, tide pools
	Dec. 1939									
1026-39	9	NW. of San Clemente Island	32 59 30 N 118 38 25 W		118				210	Sponges, mud
1027-39	10	5 mi. SE. of Santa Catalina Island	33 15 15 N 118 14 00 W		140				150	Green mud
1028-39	10	E. of SE. end of Santa Catalina Island	33 18 25 N 118 15 30 W		83				125	Mud, rock
1029-39	10	E. of White Cove, Santa Catalina Island	33 23 30 N 118 19 20 W		121				260	Mud

ALLAN HANCOCK PACIFIC EXPEDITION OF 1940

Mexico

West Coast of Lower California

			Dredge Down				*Dredge Up*			
Station	*Date*	*General Locality*	*Position*	*Time*	*Fms.*	*Dir.*	*Position*	*Time*	*Fms.*	*Remarks*
	Jan. 1940									
1030-40	18	Off Turtle Bay	27 39 05 N 114 54 47 W	2:17 PM	31	81	27 39 12 N 114 54 12 W	2:47 PM	26	Gray sand, mud
1031-40 D-1	19	Off Santa Maria Bay	24 43 12 N 112 14 30 W	9:30 AM	25	343	24 44 00 N 112 14 48 W	9:47 AM	22	Worm tubes
1031-40 D-2	19	Off Santa Maria Bay	24 44 00 N 112 14 48 W	9:54 AM	22	19	24 44 26 N 112 14 38 W	10:13 AM	18	Gray sand, worm tubes
1031-40 D-3	19	Off Santa Maria Bay	24 44 26 N 112 14 38 W	10:20 AM	18	166	24 43 42 N 112 14 26 W	10:45 AM	22	Gray sand, worm tubes
1031-40 D-4	19	Off Santa Maria Bay	24 43 42 N 112 14 36 W	10:50 AM	22	151	24 42 46 N 112 13 52 W	11:17 AM	23	Gray sand
1031-40 D-5	19	Off Santa Maria Bay	24 42 46 N 112 13 52 W	11:28 AM	23	130	24 42 33 N 112 13 21 W	11:57 AM	23	Gray sand
1032-40	19	Off Magdalena Bay	24 27 14 N 112 10 06 W	2:24 PM	82	107	24 26 54 N 112 09 46 W	2:54 PM	81	Green mud

Station	Date	General Locality	Dredge Down Position	Dredge Down Time	Fms.	Dir.	Dredge Up Position	Dredge Up Time	Fms.	Remarks
	Jan. 1940									
1033-40	19	Off Magdalena Bay	24 18 00 N 112 12 00 W		Sur- face					Shrimps
			Gulf of California—West Coast							
1034-40 D-1	20	Outer Gorda Bank	23 00 54 N 109 28 55 W	1:12 PM	59	65	23 01 10 N 109 28 55 W	1:32 PM	64	Coralline, sand
1034-40 D-2	20	Outer Gorda Bank	23 01 05 N 109 29 22 W	1:47 PM	67	79	23 01 30 N 109 27 45 W	2:21 PM	95	Coralline, brittle stars
1035-40	20	Inner Gorda Bank	23 02 00 N 109 30 15 W	2:45 PM	70	208	23 01 15 N 109 30 35 W	3:12 PM	78	Coralline, sand
1036-40	20	Arroyo de San Luis	23 10 45 N 109 25 45 W		Sur- face					Electric Light at Anchorage
1037-40 D-1	21	Boca de la Trinidad	23 38 12 N 109 30 00 W	10:20 AM	54	99	23 38 00 N 109 28 22 W	10:35 AM	150	Sand, coralline
1037-40 D-2	21	Boca de la Trinidad	23 37 55 N 109 29 15 W	11:06 AM	53	162	23 37 40 N 109 29 03 W	11:21 AM	53	Sand, coralline
1037-40 D-3	21	Boca de la Trinidad	23 37 40 N 109 29 03 W	11:28 AM	53	179	23 36 50 N 109 29 00 W	11:54 AM	51	Sand, coralline
			Gulf of California—East Coast							
1038-40	22	Guaymas Bay, Sonora	27 54 40 N 110 53 37 W		2				3	Mud, algae
1039-40	23	Outside Guaymas Bay, Sonora	27 52 10 N 110 52 15 W		6				10	Shell, mud
1040-40	23	Guaymas Bay, Sonora	27 56 00 N 110 54 45 W		Shore					Rock
1041-40	23	Guaymas Bay, Sonora	27 54 28 N 110 54 18 W		Shore					Shingle
1042-40	24	Turner's Island, S. of Tiburon Island	28 43 30 N 112 19 05 W		Shore					Rocky reef

Station	Date	General Locality	Dredge Down Position	Dredge Down Time	Dredge Down Fms.	Dir.	Dredge Up Position	Dredge Up Time	Dredge Up Fms.	Remarks
	Jan. 1940									
1043-40	25	Turner's Island, S. of Tiburon Island	28 43 30 N 112 19 05 W		2				3	Dipping and netting
1044-40	25	S. of Tiburon Island	28 44 45 N 112 18 20 W		2				16	Sand. Beam trawl
1045-40	25	S. shore of Tiburon Island	28 45 35 N 112 17 45 W		Shore					Shingle
		Gulf of California—West Coast								
1046-40	26	Puerto Refugio, Angel de la Guardia Island	29 32 01 N 113 34 08 W		Shore					Shingle
1047-40	26	Puerto Refugio, Angel de la Guardia Island	29 31 57 N 113 13 43 W		Shore					Sand, rock
1048-40	26	Puerto Refugio, Angel de la Guardia Island	29 32 33 N 113 33 57 W		11				22	Shell, sand
1049-40	27	Puerto Refugio, Angel de la Guardia Island	29 32 47 N 113 34 35 W		Shore					Rocky reef
1050-40	27	Puerto Refugio, Angel de la Guardia Island	29 32 02 N 113 33 47 W		2					Sand. Beam trawl
1051-40	27	Puerto Refugio, Angel de la Guardia Island	29 33 23 N 113 33 53 W		21					Shell
1052-40	27	Puerto Refugio, Angel de la Guardia Island	29 32 17 N 113 34 30 W		6					Mud
1053-40	28	Puerto Refugio, Angel de la Guardia Island	29 32 47 N 113 34 35 W		Shore					Rock
1054-40	28	Puerto Refugio, Angel de la Guardia Island	29 35 35 N 113 36 00 W		78				90	Shell, mud
1055-40	28	N. of Granite Island, Angel de la Guardia Island	29 34 50 N 113 33 45 W		57					Shell, cake urchins

Station	Date	General Locality	Dredge Down Position	Dredge Down Time	Dredge Down Fms.	Dir.	Dredge Up Position	Dredge Up Time	Dredge Up Fms.	Remarks
	Jan. 1940									
1056-40	28	Between Angel de la Guardia and Mejia Isls.	29 32 47 N 113 35 27 W		6				11	Sand, coralline
1057-40 D-1	29	Off Puerto Refugio, Angel de la Guardia Island	29 33 45 N 113 31 25 W	9:30 AM	54	96	29 33 45 N 113 30 40 W	9:50 AM	51	Gravel, *Clypeasters*
1057-40 D-2	29	Off Puerto Refugio, Angel de la Guardia Island	29 33 40 N 113 30 35 W	10:14 AM	51	119	29 33 40 N 113 30 35 W	10:25 AM	51	Rock
1057-40 D-3	29	Off Puerto Refugio, Angel de la Guardia Island	29 33 45 N 113 30 32 W	10:48 AM	56	103	29 33 45 N 113 31 15 W	11:05 AM	51	Sandy gravel
1058-40	29	Off Puerto Refugio, Angel de la Guardia Island	29 34 35 N 113 30 30 W	11:26 AM	68	205	29 33 45 N 113 30 59 W	11:47 AM	54	Sand, small rocks
1059-40	29	Off Puerto Refugio, Angel de la Guardia Island	29 34 31 N 113 30 10 W	1:05 PM	83	210	29 34 15 N 113 30 30 W	1:20 PM	75	Sand, shell
1060-40	29	Off Willard Point, Gonzaga Bay	29 47 15 N 114 22 25 W		Surface					Electric Light at Anchorage
1061-40	30	Off Willard Point, Gonzaga Bay	29 50 00 N 114 16 40 W		30				40	Mud
1062-40	30	Off Willard Point, Gonzaga Bay	29 49 45 N 114 23 30 W		16					Mud
1063-40	30	Willard Island, Gonzaga Bay	29 48 25 N 114 23 30 W		Shore					Shingle
1064-40	30	Off Willard Island, Gonzaga Bay	29 49 25 N 114 23 30 W		10				20	Mud
1065-40	30	Off Willard Island, Gonzaga Bay	29 47 15 N 114 22 25 W		Surface					Electric Light at Anchorage
1066-40	31	Consag Rock	31 07 00 N 114 27 35 W		Shore					Rock
1067-40	31	Off Consag Rock	30 53 00 N 114 28 48 W		40				45	Basket stars

Station	Date	General Locality	Dredge Down Position	Dredge Down Time	Fms.	Dir.	Dredge Up Position	Dredge Up Time	Fms.	Remarks
	Feb. 1940									
1068-40	1	Off Consag Rock	31 06 30 N 114 28 00 W	8:15 AM	50	180	31 06 00 N 114 28 00 W	8:40 AM	24	Brown mud
1069-40	1	Off Consag Rock	31 06 30 N 114 28 15 W	9:40 AM	21	180	31 06 15 N 114 28 15 W	9:45 AM	21	Brown mud
1070-40	2	San Felipe Bay	31 01 50 N 114 49 30 W		3					Mud
1071-40	2	San Felipe Bay	31 01 00 N 114 49 50 W		2½					Sand
			Gulf of California—East Coast							
1072-40 D-1	2	Off Rocky Point, Sonora	31 19 15 N 113 39 00 W	4:02 PM	10	220	31 19 00 N 113 39 15 W	4:17 PM	10	Sand, shell
1072-40 D-2	2	Off Rocky Point, Sonora	31 19 00 N 113 39 05 W	4:32 PM	11	180	31 18 45 N 113 39 05 W	4:45 PM	11	Mud, sand
1072-40 D-3	2	Off Rocky Point, Sonora	31 19 05 N 113 39 15 W	4:59 PM	11	175	31 18 50 N 113 39 10 W	5:09 PM	11	Mud, sand
1073-40	3	Off Rocky Point, Sonora	31 19 05 N 113 39 15 W		3				10	Sand, algae
1074-40	3	Off Rocky Point, Sonora	31 18 35 N 113 37 55 W	9:01 AM	11	315	31 18 50 N 113 38 25 W	9:22 AM	11	Mud, sand
1075a-40 D-1	3	Inside Georges Island	31 00 40 N 113 16 15 W	12:27 PM	11½	145	31 00 15 N 113 15 50 W	12:37 PM	13	Sand, shell
1075b-40 D-2	3	Inside Georges Island	31 00 15 N 113 15 50 W	12:47 PM	13	192	30 59 57 N 113 16 00 W	1:01 PM	12	Sand, shell
1076-40	3	Tepoca Bay, Sonora	30 15 45 N 112 53 20 W		Shore					Rock, reef
1077-40	4	Tepoca Bay, Sonora	30 15 45 N 112 53 20 W		Shore					Rock, reef

Station	Date	General Locality	Dredge Down Position	Dredge Down Time	Fms.	Dir.	Dredge Up Position	Dredge Up Time	Fms.	Remarks
	Feb. 1940									
1078-40 D-1	4	Tepoca Bay, Sonora	30 15 37 N 112 52 22 W	8:40 PM	11	197	30 15 00 N 112 52 34 W	9:03 PM	13	Sandy mud
1078-40 D-2	4	Tepoca Bay, Sonora	30 15 41 N 112 52 08 W	9:18 AM	12	200	30 14 57 N 112 52 27 W	9:32 AM	12	Sand, shell
1079-40	4	Pond Island, Angel de la Guardia Island	29 02 35 N 113 07 40 W		Shore					Rock
1080-40 D-1	5	S. of Pond Island, Angel de la Guardia Island	28 58 45 N 113 05 40 W	9:09 AM	70	90	28 58 45 N 113 05 20 W	9:28 AM	85	Sand, shell
1080-40 D-2	5	S. of Pond Island, Angel de la Guardia Island	28 58 00 N 113 05 55 W	9:46 AM	62	45	28 58 55 N 113 05 00 W	10:08 AM	76	Sand
1081-40 D-1	5	N. of Isla Partida	28 56 00 N 113 02 45 W	10:42 AM	46	55	28 56 20 N 113 02 25 W	10:53 AM	75	Coralline
1081-40 D-2	5	N. of Isla Partida	28 56 25 N 113 04 45 W	11:07 AM	55	355	28 56 50 N 113 04 30 W	11:23 AM	76	Rock
1082-40	5	Between Isla Raza and Isla Partida	28 51 35 N 113 02 10 W	12:28 PM	60	340	28 52 00 N 113 02 35 W	12:51 PM	58	Rock
1083-40	5	San Esteban Island	28 39 40 N 112 35 35 W		Shore					Rock
1084-40	6	San Pedro Nolasco Island	27 58 35 N 111 22 40 W	2:18 PM	111	271		2:46 PM	93	Rock
1085-40	6	Off San Pedro Nolasco Island	27 58 25 N 111 23 35 W	2:55 PM	57	335	27 58 40 N 111 23 40 W	3:08 PM	55	Rock
1086-40	6	Off Guaymas Harbor, Sonora	27 52 10 N 110 52 15 W		Surface					Electric Light at Anchorage
1086a-40	7	Ensenada de San Francisco, Sonora	27 56 15 N 111 03 02 W	11:08 AM	15	242	27 55 55 N 111 03 47 W	11:18 AM	18	Mud, sand
1087-40	7	Ensenada de San Francisco, Sonora	27 56 15 N 111 03 02 W		15				18	Sand

Station	Date	General Locality	Dredge Down Position	Dredge Down Time	Dredge Down Fms.	Dir.	Dredge Up Position	Dredge Up Time	Dredge Up Fms.	Remarks
Feb. 1940] 1088-40	7	Ensenada de San Francisco, Sonora	27 56 35 N 111 02 05 W		2				6	Sand. Beam trawl
1089-40	7	Ensenada de San Francisco, Sonora	27 57 05 N 111 03 20 W		Beach					Seine
1090-40	7	Outside Guaymas Harbor, Sonora	27 52 10 N 110 52 15 W							Hand lines at Anchorage
1091-40	8	Puerto San Carlos, Sonora	27 57 15 N 111 04 45 W		Shore					Shingle
1092-40	9	Bahia Catalina, off Guaymas, Sonora	27 51 50 N 111 06 15 W		Shore					Shingle
		Gulf of California—West Coast								
1093-40	10	Puerto Escondido	25 49 25 N 111 18 35 W		8				15	Sand, sponge, coral
1094-40	10	Puerto Escondido	25 50 05 N 111 19 00 W		Shore					Mouth of Lagoon. Rock
1095-40	11	Puerto Escondido	25 50 05 N 111 19 00 W		1				2	Dipnetting
1096-40	11	Puerto Escondido	25 48 10 N 111 17 55 W		18				21	Sand, cake urchins
1097-40	11	Puerto Escondido	25 48 10 N 111 17 55 W		14				18	Sand, coral
1098-40	11	Puerto Escondido	25 50 05 N 111 19 00 W		Beach					Seine
1099-40	12	Agua Verde Bay	25 31 05 N 111 02 30 W		Shore					Skiff and clam rake
1100-40	12	Agua Verde Bay	25 31 40 N 110 59 35 W		6				22	Sand
1101-40	12	Agua Verde Bay	25 31 00 N 111 01 45 W		10				10	Mud, coral

Station	Date	General Locality	Dredge Down Position	Dredge Down Time	Fms.	Dir.	Dredge Up Position	Dredge Up Time	Fms.	Remarks
	Feb. 1940									
1102-40	12	Agua Verde Bay	25 31 40 N 110 59 35 W		20					Mud
1103-40	12	Agua Verde Bay	25 31 05 N 111 02 30 W		Shore					Seine
1104-40	12	Agua Verde Bay	25 31 05 N 111 02 30 W		Shore					Rock
1105-40	13	4 mi. SE. of Marcial Point	25 27 20 N 110 58 00 W	8:16 AM	127	360	25 28 28 N 110 58 00 W	8:50 AM	113	Green mud
1106-40	13	Off San Francisco Island	24 47 40 N 110 38 03 W	12:30 PM	44	216	24 47 25 N 110 38 25 W	12:49 PM	43	Gray sand
1107-40	13	Off San Gabriel Bay, Espiritu Santo Island	24 26 39 N 110 22 53 W	3:33 PM	29	154	24 26 19 N 110 22 45 W	3:41 PM	35	Green mud
1108-40	13	San Gabriel Bay, Espiritu Santo Island	24 25 25 N 110 20 55 W		Shore					Shingle
1109-40	14	San Gabriel Bay, Espiritu Santo Island	24 25 25 N 110 20 55 W		½				2	Dipnetting
1110-40	14	San Gabriel Bay, Espiritu Santo Island	24 25 25 N 110 20 55 W		Shoal					Coral
1111-40	14	San Lorenzo Channel	24 21 55 N 110 15 15 W		6				13	Sand, shell, coralline
1112-40	14	San Gabriel Bay, Espiritu Santo Island	24 25 25 N 110 20 55 W		Shore					Shingle, tide pools at stone pits
1113-40 D-1	15	NE. of Espiritu Santo Island	24 32 08 N 110 20 27 W	9:16 AM	58	343	24 32 50 N 110 20 27 W	9:31 AM	52	Green sand
1113-40 D-2	15	NE. of Espiritu Santo Island	24 32 08 N 110 20 07 W	9:44 AM	58	131	24 31 50 N 110 19 45 W	9:56 AM	69	Sand
1114-40	16	Fraile Bay	23 22 30 N 109 25 30 W		Shore					Seine

Station	Date	General Locality	Dredge Down Position	Dredge Down Time	Fms.	Dir.	Dredge Up Position	Dredge Up Time	Fms.	Remarks
	Feb. 1940									
1115-40	16	San Jose del Cabo Bay	23 01 15 N 109 42 30 W		Shore					Rock
1116-40	16	Off Gorda Point	23 03 32 N 109 34 05 W	12:32 PM	55	325	23 03 45 N 109 34 25 W	12:49 PM	51	Fine sand, mud
1117-40	16	Off Gorda Point	23 04 13 N 109 35 17 W	1:31 PM	17	225	23 04 03 N 109 35 27 W	1:46 PM	25	Gray sand
1118-40 D-1	17	Inner Gorda Bank	23 02 00 N 109 31 15 W	8:36 AM	59	34	23 02 25 N 109 31 00 W	8:57 AM	61	Coarse gray sand
1118-40 D-2	17	Inner Gorda Bank	23 02 25 N 109 30 48 W	9:06 AM	59	289	23 02 30 N 109 31 07 W	9:29 AM	78	Coarse gray sand
1118-40 D-3	17	Inner Gorda Bank	23 02 17 N 109 31 00 W	12:56 PM	69	211	23 02 00 N 109 31 09 W	1:16 PM	60	Coarse gray sand
1118-40 D-4	17	Inner Gorda Bank	23 02 00 N 103 31 09 W	1:20 PM	60	270	23 02 00 N 109 31 38 W	1:43 PM	66	Coarse gray sand
			West Coast of Lower California							
1119-40	19	5 mi. S. of San Benito Islands	28 12 00 N 115 33 33 W	9:24 AM	95	328	28 13 28 N 115 34 22 W	9:53 AM	87	Sand
			ALLAN HANCOCK CRUISES OF 1940 AND 1941							
	April 1940		**California**							
1120-40 D-1	11	Off San Nicolas Island	33 17 50 N 119 29 30 W	8:20 AM	30	80	33 17 45 N 119 29 10 W	8:35 AM	29	Sand, broken shells
1120-40 D-2	11	Off San Nicolas Island	33 17 50 N 119 28 55 W	8:45 AM	30	311	33 18 15 N 119 29 25 W	9:00 AM	33	Sand, shell
1120-40 D-3	11	Off San Nicolas Island	33 18 10 N 119 29 50 W	10:50 AM	32	78	33 18 20 N 119 28 45 W	11:03 AM	32	Sand, broken shells
1121-40	11	Off San Nicolas Island	33 20 20 N 119 29 50 W	9:15 AM	48	125	33 19 45 N 119 29 05 W	9:30 AM	40	Broken shell, boulder

Station	Date	General Locality	Dredge Down Position	Dredge Down Time	Fms.	Dir.	Dredge Up Position	Dredge Up Time	Fms.	Remarks
	April 1940									
1122-40	11	Off San Nicolas Island (Outside of Anchorage)	33 18 00 N 119 24 10 W		30					Sand, rock, shell
1122a-40	11	Off San Nicolas Island	33 16 35 N 119 28 30 W							Anchorage. Hand line fishing
1123-40	12	Off San Nicolas Island	33 15 50 N 119 24 40 W	7:45 AM	28	34	33 16 10 N 119 24 30 W	8:05 AM	31	Sponge, rock
1124-40	12	Off San Nicolas Island	33 16 10 N 119 24 30 W	8:11 AM	31	51	33 16 15 N 119 24 10 W	8:27 AM	34	Sand, shell, urchins
1125-40	12	Off San Nicolas Island	33 18 10 N 119 22 40 W	9:06 AM	97	317	33 18 25 N 119 22 15 W	9:35 AM	104	Green sand
1126-40 D-1	20	Off Huntington Beach	33 37 02 N 118 01 55 W	9:40 AM	8	144	33 37 00 N 118 04 00 W	9:55 AM	15	Sand
1126-40 D-2	20	Off Huntington Beach	33 36 30 N 118 03 00 W	10:55 AM	14	88	33 36 25 N 118 04 00 W	11:05 AM	15	Fine black sand
1127-40	20	Off Huntington Beach	33 38 30 N 118 00 20 W		4-20					(Beam trawl)
1128-40	20	Newport Harbor, in channel, in bay.	33 35 30 N 117 52 10 W		4-10					Mud, sand, etc.
1129-40 D-1	21	Off Newport Beach	33 35 25 N 117 55 30 W	8:33 AM	38	52	33 35 40 N 117 55 25 W	8:50 AM	35	Mud
1129-40 D-2	21	Off Newport Beach	33 35 15 N 117 54 40 W	9:10 AM	40	97	33 35 10 N 117 54 15 W	9:25 AM	50	Mud
1130-40 D-1	21	Off Abalone Point, Laguna Beach	33 32 15 N 117 48 10 W	11:15 AM	25	180	33 32 50 N 117 49 00 W	11:30 AM	27	Mud
1130-40 D-2	21	Off Abalone Point, Laguna Beach	33 32 40 N 117 48 45 W	12:25 PM	28	155	33 32 10 N 117 48 15 W	12:40 PM	29	Mud
1131-40	21	Off Abalone Point, Laguna Beach	33 30 40 N 117 47 10 W	1:30 PM	54	230	33 30 20 N 117 47 30 W	1:45 PM	57	Mud

Station	Date	General Locality	*Dredge Down* Position	*Dredge Down* Time	Fms.	Dir.	*Dredge Up* Position	*Dredge Up* Time	Fms.	Remarks
	May 1940									
1132-40	5	Off Redondo Beach	33 49 10 N 118 26 10 W	10:10 AM	85	143	33 48 50 N 118 25 55 W	10:30 AM	43	Mud
1133-40 D-1	5	Off Redondo Beach	33 49 30 N 118 26 15 W	10:45 AM	172	206	33 49 15 N 118 26 30 W	11:00 AM	136	Mud, worms
1133-40 D-2	5	Off Redondo Beach	33 49 15 N 118 26 20 W	11:15 AM	140	135	33 48 45 N 118 25 55 W	11:35 AM	49	Mud
1134-40	5	Off Redondo Beach	33 49 30 N 118 25 15 W	12:30 PM	32	103	33 49 20 N 118 24 50 W	12:45 PM	16	Sand, shell
1135-40	5	Off Redondo Beach	33 50 20 N 118 24 35 W	1:00 PM	18	79	33 50 15 N 118 25 10 W	1:15 PM	45	Coarse sand and gravel
1136-40	5	Off Redondo Beach	33 48 25 N 118 30 20 W	1:55 PM	240	154	33 47 45 N 118 29 50 W	2:30 PM	70	Green mud
1137-40	5	Off Redondo Beach	33 49 50 N 118 26 10 W	4:40 PM	120	61½	33 49 55 N 118 25 45 W	5:00 PM	96	Gray mud, shell
1138-40	6	Off Redondo Beach			13		33 50 05 N 118 24 00 W		22	Mud (Small Dredge)
1139-40	6	Off Redondo Beach			11		33 49 30 N 118 23 50 W		20	Gravel (Small Dredge)
1140-40	6	Off Redondo Beach			10		33 50 30 N 118 24 15 W		20	Sand. Beam trawl
1141-40 D-1	6	Off El Segundo	33 53 25 N 118 28 40 W	11:00 AM	28	189	33 53 15 N 118 28 35 W	11:13 AM	30	Gray-green sand
1141-40 D-2	6	Off El Segundo	33 53 15 N 118 28 35 W	11:25 AM	30	117	33 52 58 N 118 28 15 W	11:35 AM	31	Gray-green sand
1142-40	6	Off Point Vicente Light House	33 44 10 N 118 24 20 W	1:26 PM	17	165	33 43 45 N 118 24 15 W	1:40 PM	41	Coarse sand, mud
1143-40	6	Off Portuguese Point	33 44 59 N 118 22 35 W	1:55 PM	16	162	33 43 45 N 118 22 20 W	2:05 PM	20	Gray sand, sea weed

Station	Date	General Locality	Dredge Down Position	Dredge Down Time	Fms.	Dir.	Dredge Up Position	Dredge Up Time	Fms.	Remarks
	June 1940									
1144-40	30	Santa Barbara Island North end	33 34 50 N 119 00 45 W	2:35 PM	77	240	33 34 30 N 119 01 30 W	3:05 PM	81	Fine sand, sponge
1145-40	30	Santa Barbara Island East side	33 28 20 N 119 00 20 W	5:00 PM	41	14	33 28 40 N 119 00 15 W	5:15 PM	47	Rock, kelp, fine sand
	July 1940									
1146-40	1	E. of Santa Barbara	33 29 10 N 119 00 00 W		36				48	Beam trawl. Sand, fish
1147-40	1	Santa Catalina Island West end	33 27 50 N 118 37 45 W	1:54 PM	59	340	33 28 15 N 118 37 55 W	2:10 PM	69	Dead shells, sand
1148-40	1	Santa Catalina Island West end	33 29 20 N 118 36 10 W	2:25 PM	81	331	33 29 55 N 118 36 30 W	2:50 PM	126	Gray-green mud
1149-40	4	Santa Catalina Island Avalon Bay	33 20 50 N 118 17 45 W	4:00 PM	82	123	33 20 35 N 118 17 15 W	4:15 PM	88	Mud
1150-40	4	Santa Catalina Island Avalon Bay	33 20 30 N 118 17 10 W	4:30 PM	98	105	33 20 20 N 118 16 10 W	4:50 PM	116	Sand, sponge, cobble
1151-40	5	SE. end of Santa Catalina Island	33 16 15 N 118 14 45 W	9:37 AM	117	125½	33 15 55 N 118 13 50 W	10:30 AM	128	Rocks, sand, dead shell, sponge
1152-40	5	SE. end of Santa Catalina Island	33 15 55 N 118 13 50 W	10:47 AM	132	131	33 15 25 N 118 13 00 W	11:05 AM	148	Rocky
1153-40	5	East of Long Point Santa Catalina Island		1:00 PM	35		33 24 10 N 118 21 25 W	4:30 PM	46	Mud bottom. Beam trawl. 6 hauls
1154-40	6	W. of Long Point to Coral Beach, Santa Catalina Isl.		8:00 AM	20		33 25 05 N 118 22 35 W	12:00 M	50	Mud bottom. Beam trawl. 3 hauls
1155-40	6	White Cove, Santa Catalina Island		2:30 PM	16		33 23 35 N 118 21 30 W	5:00 PM	35	Algae, kelp, mud, debris, holothurians. Beam trawl. 2 hauls
1156-40	7	6½ mi. E. of Long Point Santa Catalina Island	33 24 25 N 118 13 31 W	9:40 AM	230	267	33 24 15 N 118 14 45 W	10:45 AM	380	Boulders, pebbles

Station	Date	General Locality	Dredge Down Position	Dredge Down Time	Fms.	Dir.	Dredge Up Position	Dredge Up Time	Fms.	Remarks
	July 1940									
1157-40	7	3¼ mi. E. of Long Point Santa Catalina Island	33 24 15 N 118 18 15 W	11:27 AM	290	270	33 24 10 N 118 19 10 W	12:15 PM	285	Mud
1158-40	7	3 mi. off Seal Beach		2:30 PM	11		33 41 55 N 118 08 35 W	4:00 PM	11	Sand, debris, fish, shell. Beam trawl. 2 hauls
1159-40 D-1	22	10 mi. SE. of Long Beach	33 36 50 N 118 06 15 W	2:42 PM	25	284	33 37 05 N 118 06 45 W	2:55 PM	23	Mud, fine sand
1159-40 D-2	22	10 mi. SE. of Long Beach	33 35 45 N 118 03 25 W	3:05 PM	28	294	33 36 45 N 118 05 50 W	3:25 PM	25	Mud, fine sand
1159-40 D-3	22	10 mi. SE. of Long Beach	33 37 00 N 118 06 00 W	3:35 PM	24½	239	33 36 55 N 118 05 05 W	3:50 PM	22	Fine sand
1160-40	22	11½ mi. SE. of Long Long Beach	33 36 15 N 118 06 45 W	3:55 PM	32	139	33 35 40 N 118 05 45 W	4:20 PM	52	Mud, sand, dead shells
1161-40	23	2 mi. off Belmont Pier	33 43 00 N 118 10 10 W	8:30 AM	7			11:10 AM	10	Sand
1162-40	23	11 mi. S. of Seal Beach	33 33 05 N 118 09 45 W	12:20 PM	95	45	33 33 50 N 118 09 35 W	12:55 PM	82	Sponge, sand
1163-40	23	13½ mi. S. of Seal Beach	33 30 32 N 118 06 35 W	1:20 PM	215	55	33 31 10 N 118 05 30 W	2:25 PM	225	Green mud
1164-40	23	9¼ mi. S. of Seal Beach	33 34 55 N 118 06 00 W	3:00 PM	110	360	33 35 25 N 118 06 10 W	3:35 PM	58	Gray-green mud
1165-40	23	Off San Pedro Breakwater	33 40 50 N 118 11 45 W	4:25 PM	14	244	33 40 40 N 118 12 00 W	4:40 PM	14	Sand, shell
	Aug. 1940									
1166-40 D-1	8	7 mi. E. of Long Point Santa Catalina Island	33 24 35 N 118 13 20 W	10:20 AM	230	234	33 24 10 N 118 13 50 W	11:15 AM	340	Boulders, rubble
1166-40 D-2	8	7 mi. E. of Long Point Santa Catalina Island	33 24 35 N 118 13 20 W	11:40 AM	230	248	33 24 15 N 118 13 55 W	12:25 PM	330	Boulders, rubble

Station	Date	General Locality	Dredge Down Position	Dredge Down Time	Fms.	Dir.	Dredge Up Position	Dredge Up Time	Fms.	Remarks
	Aug. 1940									
1167-40	8	Between Avalon & Long Point, Santa Catalina Isl.	33 23 30 N 118 21 50 W	2:30 PM	30	139	33 21 00 N 118 18 55 W	5:00 PM	44	Mud, sponge, holothurians
1168-40	9	3½ mi. off Newport Beach	33 34 15 N 117 58 35 W	3:18 PM	34	294	33 34 20 N 117 59 00 W	3:30 PM	37	Gray-green mud
1169-40	9	3¼ mi. W. of Huntington Beach	33 37 45 N 118 03 50 W	4:05 PM	17	314	33 38 00 N 118 04 10 W	4:20 PM	18	Mud, sand
1170-40	19	Isthmus Cove, Santa Catalina Island	33 26 45 N 118 27 10 W	8:30 AM	80	292	33 27 10 N 118 28 30 W	12:00 M	100	Sponge, sand, gravel
1171-40	19	White Cove, Santa Catalina Island	33 24 15 N 118 21 40 W	1:00 PM	25	311	33 23 00 N 118 20 45 W	4:15 PM	38	Sponge, sand, gravel
1172-40	20	5½ mi. SE. of Santa Catalina Island	33 15 55 N 118 12 25 W	9:43 AM	150	217	33 15 30 N 118 12 50 W	10:15 AM	145	Boulders, gravel
1173-40	20	4 mi. SE. of Santa Catalina Island	33 16 55 N 118 13 55 W	10:42 AM	115	276	33 17 10 N 118 15 10 W	11:20 AM	108	Fine green sand
1174-40 D-1	20	San Pedro Channel	33 24 15 N 118 00 20 W	2:10 PM	74	270	33 24 20 N 118 00 50 W	2:25 PM	67	Sponge, broken dead shell
1174-40 D-2	20	San Pedro Channel	33 23 40 N 118 00 50 W	2:40 PM	69	118	33 24 10 N 117 58 40 W	3:05 PM	110	Rock, sand, dead shell
	Sept. 1940									
1175-40	9	W. of Santa Barbara Island	33 29 40 N 119 07 00 W	3:26 PM	125	263	33 29 50 N 119 07 40 W	3:45 PM	150	Gray sand
1176-40	9	W. of Santa Barbara Island	33 29 30 N 119 06 45 W	4:28 PM	100	235	33 29 50 N 119 07 30 W	4:40 PM	100	Gray sand
1177-40	9	N. of Santa Barbara Island	33 30 58 N 119 00 50 W	5:20 PM	37	320	33 30 25 N 119 00 25 W	5:30 PM	40	Gray sand
1178-40	10	N. of Santa Catalina Island, off Eagle Bank	33 30 45 N 118 30 40 W	9:00 AM	43	110	33 27 40 N 118 30 00 W	9:15 AM	40	Gray sand

Station	Date	General Locality	Dredge Down Position	Dredge Down Time	Fms.	Dir.	Dredge Up Position	Dredge Up Time	Fms.	Remarks
	Sept. 1940									
1179-40	10	Isthmus Cove, Santa Catalina Island	33 26 50 N 118 29 30 W	9:15 AM	7½	340	33 27 00 N 118 29 35 W	9:30 AM	14	Mud, sand, coralline
1180-40	10	Isthmus Cove, Santa Catalina Island	33 27 00 N 118 29 35 W	10:00 AM	18	330	33 27 20 N 118 29 50 W	10:30 AM	13	Coralline, kelp
1181-40 D-1	10	Santa Catalina Island, Off Howland's Landing	33 28 15 N 118 28 20 W	12:55 PM	61	257	33 28 10 N 118 28 50 W	1:10 PM	64	Broken shell, Brachiopods
1181-40 D-2	10	Santa Catalina Island, Off Howland's Landing	33 28 08 N 118 28 48 W	1:15 PM	58	289	33 28 50 N 118 31 20 W	1:45 PM	58	Broken shell, Brachiopods
1181-40 D-3	10	Santa Catalina Island, Off Howland's Landing	33 30 20 N 118 32 28 W	4:05 PM	47	330	33 29 02 N 118 32 40 W	4:20 PM	49	Coarse sand, Brachiopods
1182-40	10	Santa Catalina Island, Off Howland's Landing	33 30 58 N 118 31 58 W	1:50 PM	160	248	33 29 50 N 118 32 20 W	2:35 PM	160	Mud
1183-40	10	Santa Catalina Island, Off Howland's Landing	33 29 28 N 118 33 30 W	3:10 PM	130	290	33 29 45 N 118 34 10 W	3:46 PM	160	Mud
1184-40 D-1	11	W. end of Santa Catalina Island	33 29 10 N 118 36 30 W	8:45 AM	62	15	33 29 50 N 118 37 20 W	9:04 AM	123	Nil—mud
1184-40 D-2	11	W. end of Santa Catalina Island	33 29 05 N 118 36 25 W	9:23 AM	62	358	33 29 30 N 118 36 50 W	9:45 AM	126	Nil—mud
1184-40 D-3	11	W. end of Santa Catalina Island	33 28 50 N 118 36 00 W	9:55 AM	46	350	33 29 05 N 118 35 55 W	10:15 AM	55	Gray sand
1185-40 D-1	28	N. end of Santa Catalina Island	33 28 30 N 118 31 00 W	2:38 PM	52	285	33 28 40 N 118 31 20 W	2:44 PM	50	Broken shell, green sand
1185-40 D-2	28	N. end of Santa Catalina Island	33 28 30 N 118 30 50 W	3:30 PM	50	327	33 28 15 N 118 30 45 W	3:45 PM	50	Sand, shell
1185-40 D-3	28	N. end of Santa Catalina Island	33 29 00 N 118 30 45 W	4:05 PM	110	287	33 29 10 N 118 31 10 W	4:35 PM	90	Sand, shell
1186-40	29	Off Ship Rock, Santa Catalina Island	33 26 45 N 118 29 20 W	9:00 AM	7	300	33 26 55 N 118 29 40 W	11:15 AM	16	Sand, mud, algae. Small dredge boat

Station	Date	General Locality	Dredge Down Position	Dredge Down Time	Fms.	Dir.	Dredge Up Position	Dredge Up Time	Fms.	Remarks
	Sept. 1940									
1187-40	29	Off Bird Rock, Santa Catalina Island	33 27 15 N 118 29 15 W	9:00 AM	31	290	33 27 20 N 118 29 00 W	11:15 AM	40	Rock, coarse shell, kelp. Sm. dredge boat
1188-40 D-1	29	5½ mi. off SE. end, Santa Catalina Island	33 15 50 N 118 13 20 W	1:00 PM	145	104	33 15 45 N 118 12 29 W	1:37 PM	150	Gravel, rock
1188-40 D-2	29	6 mi. SE. of Santa Catalina Island	33 15 30 N 118 12 15 W	1:53 PM	150	130	33 15 00 N 118 11 35 W	2:35 PM	155	Gravel, rock
	Oct. 1940									
1189-40	29	Santa Cruz Island	34 02 45 N 119 32 50 W	2:30 PM	Beach low water			4:30 PM		Heavy shingle
1190-40	30	Anacapa Passage	33 58 45 N 119 32 15 W	8:38 AM	50	34	33 59 15 N 119 32 00 W	8:55 AM	15	Sand, gravel
1191-40 D-1	30	S. side of Santa Cruz Island	33 58 10 N 119 37 40 W	9:43 AM	40	249	33 57 50 N 119 38 10 W	10:05 AM	39	Gray sand
1191-40 D-2	30	S. side of Santa Cruz Island	33 57 40 N 119 38 00 W	10:20 AM	39	244	33 57 45 N 119 38 20 W	10:38 AM	37	Sand, shell
1192-40	30	Off Bowen Point Santa Cruz Island	33 56 00 N 119 43 15 W	11:05 AM	90	344	33 56 25 N 119 43 25 W	11:40 AM	58	Sand, broken shell
1193-40	30	Willow Anchorage, S. side, Santa Cruz Island	33 57 40 N 119 45 10 W	2:00 PM	Beach low water			4:50 PM	Shore	Shore collecting
1194-40	31	S. side of Santa Cruz Island, off Gull Island	33 56 40 N 119 47 05 W	7:50 AM	39	247	33 56 35 N 119 47 40 W	8:10 AM	43	Gray sand, mud
1195-40	31	S. side of Santa Cruz Island, off Gull Island	33 55 45 N 119 47 07 W	8:38 AM	138	263½	33 55 40 N 119 47 45 W	9:15 AM	64	Sand, broken shell. Some rock
1196-40	31	S. side of Santa Cruz Island, off Gull Island	33 55 50 N 119 48 50 W	9:35 AM	110	304	33 56 10 N 119 49 20 W	10:05 AM	140	Rock, sponge
1197-40	31	E. of Gull Island, S. of Santa Cruz Island	33 57 15 N 119 47 15 W	7:30 AM	10	270	33 57 30 N 119 48 05 W	8:30 AM	6	Sand, red-green algae. *Dendraster*, crabs

Station	Date	General Locality	Dredge Down Position	Dredge Down Time	Fms.	Dir.	Dredge Up Position	Dredge Up Time	Fms.	Remarks
	Oct. 1940									
1198-40	31	E. of Gull Island, S. of Santa Cruz Island	33 57 30 N 119 46 15 W	8:30 AM	9	280	33 57 30 N 119 46 30 W	9:30 AM	18	*Asterinas* Coarse sand, shell.
1199-40	31	E. of Gull Island, S. of Santa Cruz Island	33 57 20 N 119 48 40 W	9:30 AM	11	206	33 56 50 N 119 48 50 W	10:30 AM	19	Mud, sand, algae, brown kelp, rocks
	Nov. 1940									
1200-40	16	W. end of Santa Catalina Island	33 29 40 N 118 37 15 W	2:35 PM	132	333	33 29 50 N 118 37 20 W	3:10 PM	126	Green mud
1201-40	16	Off W. end of Santa Catalina Island	33 30 10 N 118 37 25 W	3:30 PM	150	234	33 29 50 N 118 37 55 W	4:10 PM	134	Green mud
1202-40	17	Off Point Firmin	33 41 45 N 118 17 50 W	2:15 PM	16	271	33 41 45 N 118 18 00 W	2:26 PM	18	Gray mud
1203-40	23	W. of Dutch Harbor, San Nicolas Island	33 12 50 N 119 29 45 W	PM	18	280	33 13 10 N 119 30 15 W	PM	18	Sand. Small dredge
1204-40	23	W. of Dutch Harbor, San Nicolas Island	33 12 55 N 119 30 30 W	PM	8	280	33 13 05 N 119 30 50 W	PM	9	Rocky. Small dredge
1205-40 D-1	24	S. side of San Nicolas Island	33 12 45 N 119 29 15 W	8:20 AM	20	258	33 12 40 N 119 29 40 W	8:40 AM	23	Green sand
1205-40 D-2	24	S. side of San Nicolas Island	33 12 40 N 119 29 30 W	8:42 AM	24	230	33 12 30 N 119 30 02 W	9:00 AM	34	Green sand
1206-40	24	Off Dutch Harbor, San Nicolas Island	33 13 00 N 119 29 20 W	AM	4		33 13 00 N 119 29 20 W	AM	9	Fine sand. Skiff
1206a-40	24	Dutch Harbor	33 13 10 N 119 29 10 W	AM	Shore		33 13 10 N 119 29 10 W	AM	Shore	Rocky shore
1207-40	24	2¼ mi. S. of San Pedro Breakwater	33 40 10 N 118 14 10 W	3:55 PM	15	328	33 40 30 N 118 14 20 W	4:05 PM	15	Sand, pebble, broken shell
1208-40	27	Playa del Rey	(Old Pier)	1:00 PM				3:00 PM		Low tide

Station	Date	General Locality	Dredge Down Position	Dredge Down Time	Fms.	Dir.	Dredge Up Position	Dredge Up Time	Fms.	Remarks
	Nov. 1940									
1209-40	29	Laguna Beach	33 32 45 N 117 48 30 W	3:00 PM	Shore		33 32 45 N 117 48 30 W	5:00 PM	Shore	Rocky and underlaid. Heavy covered sand
1210-40	28	La Jolla								Shale—S.S. reefs just N. of caves
1211-40	29	Mission Bay								Very poor
1212-40	30	San Pedro Channel 70 fathom Bank	33 24 10 N 117 59 40 W	8:25 AM	86	276	33 24 15 N 118 01 15 W	8:50 AM	129	Rock, sponge
1213-40	30	San Pedro Channel 70 fathom Bank	33 24 35 N 117 59 35 W	9:30 AM	114	247	33 24 15 N 118 00 35 W	9:56 AM	131	Rock, pebbles
1214-40	30	San Pedro Channel 70 fathom Bank	33 24 45 N 118 00 50 W	10:20 AM	150	341½	33 25 25 N 118 01 12 W	11:20 AM	200	Sandy black mud
1215-40	30	San Pedro Channel 70 fathom Bank	33 24 10 N 117 59 35 W	7:30 AM	68	106	33 23 50 N 117 59 00 W	11:30 AM	82	Tangles. 3 hauls
1216-40	30	Point Fermin	33 42 30 N 118 17 00 W	2:30 PM	Shore		33 42 30 N 118 17 00 W	4:20 PM	Shore	Shore collecting
1217-40	30	Inside at Point Fermin	33 42 45 N 118 16 45 W	2:30 PM	Shore		33 42 45 N 118 16 45 W	4:20 PM	Shore	Rock wall, loose rock
1218-40	30	Laguna Beach								Reefs at low tide. Site of old pier
	Dec. 1940									
1219-40 D-1	12	Dutch Harbor, San Nicolas Island	33 13 05 N 119 29 30 W	8:25 AM	20	159	33 12 30 N 119 29 15 W	8:45 AM		Fine sand
1219-40 D-2	12	Dutch Harbor, San Nicolas Island	33 12 45 N 119 28 50 W	8:54 AM	15	267	33 12 45 N 119 29 30 W	9:05 AM	22	Fine sand
1220-40	12	1½ mi. off Dutch Harbor, San Nicolas Island	33 11 50 N 119 29 10 W	9:23 AM	63	189	33 11 30 N 119 29 15 W	9:45 AM	83	Gray sand, mud, dead shell

Station	Date	General Locality	Dredge Down Position	Dredge Down Time	Dredge Down Fms.	Dredge Down Dir.	Dredge Up Position	Dredge Up Time	Dredge Up Fms.	Remarks
	Dec. 1940									
1221-40	27	Avalon, Santa Catalina Island	33 20 45 N 118 19 45 W	12:00 M	Shore		33 20 45 N 118 19 45 W	2:00 PM	Shore	Rock
	Jan. 1941									
1222-41	24	Newport & Balboa Channel	33 36 02 N 117 52 50 W	3:00 PM	Shore low water		33 36 02 N 117 52 50 W	5:00 PM	Shore	Tide—1.2′. Shore collecting
1223-41 D-1	25	San Pedro Channel, 12 mi. SW. of Newport	33 27 15 N 118 02 35 W	8:22 AM	225	243	33 27 00 N 118 03 25 W	9:20 AM	235	Mud. Temp. app. 47° F. Green sand
1223-41 D-2	25	San Pedro Channel, 12 mi. SW. of Newport	33 27 10 N 118 02 25 W	10:00 AM	235	285	33 27 20 N 118 03 20 W	10:55 AM	250	Green sand, mud
1224-41	25	Newport Channel, Balboa	33 36 02 N 117 52 50 W	1:30 PM	Shore		33 36 02 N 117 52 50 W	5:00 PM	Shore	Tide—1.6′. Shore collecting
1225-41	25	SE. of Newport Breakwater	33 35 25 N 117 52 06 W	1:30 PM	Shore		33 35 25 N 117 52 06 W	5:00 PM	Shore	Tide—1.6′. Shore collecting
1226-41	26	4½ mi. SW. of Balboa, San Pedro Channel	33 33 20 N 117 56 30 W	8:15 AM	140	268	33 33 35 N 117 58 20 W	8:45 AM	135	Fine gray mud
1227-41	26	3½ mi. W. of Balboa, San Pedro Channel	33 34 00 N 117 58 20 W	9:20 AM	75	263	33 33 55 N 117 59 00 W	9:35 AM	56	Green mud (sticky)
1228-41	26	11 mi. SSE. of San Pedro Brkwtr., S. Pedro Chnl.	33 32 50 N 118 08 40 W	10:25 AM	126	248	33 32 30 N 118 09 25 W	11:00 AM	138	Gray-green sand
1229-41	26	10 mi. S. of San Pedro Brkwtr., S. Pedro Chnl.	33 33 35 N 118 09 10 W	11:20 AM	83	242	33 33 20 N 118 10 10 W	11:50 AM	81	Gray-green sand
1230-41	26	San Pedro Breakwater	33 42 08 N 118 16 05 W	2:00 PM	Shore		33 42 08 N 118 16 05 W	4:00 PM	Shore	Shore collecting
	Feb. 1941									
1231-41	15	6 mi. SE. of San Pedro Breakwater	33 38 10 N 118 09 50 W	8:57 AM	20	101	33 38 10 N 118 09 35 W	9:10 AM	21	Sandy
1232-41 D-1	15	5 mi.—152° from San Pedro Breakwater	33 38 15 N 118 12 15 W	9:44 AM	19	36	33 38 25 N 118 12 05 W	10:03 AM	18	Coarse sand, dead shell

Station	Date	General Locality	Dredge Down Position	Dredge Down Time	Fms.	Dir.	Dredge Up Position	Dredge Up Time	Fms.	Remarks
	Feb. 1941									
1232-41 D-2	15	5 mi.—152° from San Pedro Breakwater	33 38 30 N 118 12 20 W	10:31 AM	18	143	33 38 20 N 118 12 10 W	10:50 AM	19	Coarse sand, shell
1232-41 D-3	15	5 mi.—152° from San Pedro Breakwater	33 38 20 N 118 12 15 W	10:55 AM	18	95	33 38 20 N 118 12 00 W	11:10 AM	17	Coarse sand, shell, clay
1233-41	16	Along Huntington Beach	33 42 15 N 118 06 10 W	9:15 AM	5	259		11:45 AM	10	Sm. dredge boat along beach, around ship and back
1234-41 D-1	16	3½ mi.—238° off Huntington Beach	33 37 35 N 118 05 10 W	12:47 PM	18	269	33 38 00 N 118 05 15 W	1:03 PM	19	Mud, sand
1234-41 D-2	16	3½ mi.—238° off Huntington Beach	33 38 00 N 118 05 15 W	1:14 PM	19	90	33 38 00 N 118 05 05 W	1:30 PM	18	Sandy
1235-41	16	3½ mi.—238° off Huntington Beach	33 37 40 N 118 04 10 W	1:40 PM	18	313	33 37 55 N 118 04 05 W	1:53 PM	18	Green mud, fine sand
1236-41	16	6 mi. SW. of Seal Beach	33 36 30 N 118 06 25 W	2:24 PM	27	46	33 36 45 N 118 06 15 W	2:35 PM	26	Green sand, mud
1237-41	16	80 fm. bank off Huntington Beach	33 34 30 N 118 07 10 W	3:00 PM	77	62	33 34 45 N 118 06 32 W	3:20 PM	74	Gray-green mud
		ALLAN HANCOCK PACIFIC EXPEDITION OF 1941								
		California								
1238-41	22	Off Wilson Cove, San Clemente Island	33 00 29 N 118 33 15 W	12:48 PM	14	183	33 01 01 N 118 33 25 W	1:06 PM	16	Kelp, gray sand
1239-41	22	Off Wilson Cove, San Clemente Island	33 00 40 N 118 32 45 W	1:35 PM	52	133	33 00 30 N 118 32 20 W	1:50 PM	61	Coralline, shell
1240-41	23	9 mi. off San Diego	32 34 50 N 117 22 05 W	11:04 AM	78	335½	32 33 15 N 117 22 25 W	11:50 AM	81	Green sand, pebbles Temp. 58° F.
1241-41 D-1	23	7½ mi. S. of Point Loma	32 33 10 N 117 15 16 W	12:27 PM	30	187	32 32 16 N 117 15 28 W	1:45 PM	31	Coarse sand, Temp. 58° F.

Station	Date	General Locality	Dredge Down Position	Dredge Down Time	Fms.	Dir.	Dredge Up Position	Dredge Up Time	Fms.	Remarks
	Feb. 1941									
1241-41 D-2	23	7½ mi. S. of Point Loma	32 32 16 N 117 15 28 W	1:46 PM	32	177	32 32 45 N 117 15 30 W	2:03 PM	33	Coarse sand, Temp. 58° F.
1242-41	23	San Diego Bay Anchorage	32 38 50 N 117 12 15 W	1:50 PM	6	274	32 38 55 N 117 13 00 W	3:30 PM	7	Small dredge boat
1243-41	23	2¾ mi. off Point Loma, San Diego	32 37 45 N 117 12 35 W	4:02 PM	13	314	33 37 50 N 117 12 45 W	4:12 PM	9	Broken shell, worms
				Mexico						
1244-41	24	4 mi. N. of Todos Santos Island, Mexico	31 52 20 N 116 49 15 W	4:56 PM	40	183½	31 52 10 N 116 49 25 W	5:14 PM	40	Rock
1245-41	24	4 mi. N. of Todos Santos Island, Mexico	31 53 20 N 116 48 15 W	5:29 PM	41		31 53 20 N 116 48 15 W	5:46 PM	41	Shell, mud, gray sand
1246-41 D-1	25	Ranger Bank, off Ced- ros Island, Mexico	28 33 44 N 115 30 00 W	10:50 AM	78	218	28 32 14 N 115 30 42 W	11:10 AM	81	Coral, loose rock
1246-41 D-2	25	Ranger Bank, off Ced- ros Island, Mexico	28 32 15 N 115 30 42 W	11:20 AM	81	189	28 32 47 N 115 30 44 W	11:45 AM	83	Loose rock, pebbles, shell
1247-41	25	Ranger Bank, off Ced- ros Island, Mexico	28 30 46 N 115 29 45 W	12:46 PM	76	333	28 31 15 N 115 30 17 W	1:07 PM	77	Coral, loose rock
1248-41	25	East San Benito Island, Mexico	23 18 10 N 115 32 20 W	2:40 PM	Beach		23 18 10 N 115 32 20 W	5:10 PM	Beach	Rock
1249-41	26	1 mi. S. of San Benito Islands, Mexico	28 17 55 N 115 33 55 W	8:47 AM	34	142	28 17 10 N 115 33 20 W	9:00 AM	44	White sand (fine)
1250-41	26	1 mi. S. of San Benito Islands, Mexico	28 17 15 N 115 35 40 W	9:23 AM	44	272	28 17 20 N 115 35 45 W	9:35 AM	49	Coralline, sand, shell
1251-41 D-1	26	5½ mi. S. of San Benito Islands, Mexico	28 13 00 N 115 33 30 W	10:11 AM	81	52	28 13 18 N 115 33 15 W	10:30 AM	66	Fine green sand and gray
1251-41 D-2	26	5½ mi. S. of San Benito Islands, Mexico	28 12 35 N 115 34 35 W	10:50 AM	79	299	28 13 55 N 115 35 05 W	11:10 AM	69	Gray, coarse sand

Station	Date	General Locality	Dredge Down Position	Dredge Down Time	Fms.	Dir.	Dredge Up Position	Dredge Up Time	Fms.	Remarks
	Feb. 1941									
1252-41	26	8½ mi. S. of San Benito Islands, Mexico	28 10 25 N 115 34 15 W	12:39 PM	71	189	28 10 00 N 115 34 20 W	12:56 PM	72	Coral sand, fine pebbles
1253-41	26	8 mi. W. of Cedros Island, Mexico	28 05 50 N 115 31 00 W	1:30 PM	64	251	28 05 45 N 115 31 35 W	1:50 PM	65	Gravel, loose rock
1254-41	26	8 mi. SW. of Cedros Island, Mexico	28 00 17 N 115 28 43 W	2:29 PM	63	220	28 00 00 N 115 29 00 W	2:49 PM	65	Green, fine sand, coral
1255-41	26	South Bay Landing, Cedros Island, Mexico	28 04 00 N 115 20 10 W	4:00 PM	Beach		28 04 00 N 115 20 10 W	6:00 PM	Beach	Rock
1256-41	27	8½ mi. S. of Cedros Island, Mexico	27 55 20 N 115 21 32 W	9:19 AM	55	123	27 54 58 N 115 21 05 W	9:40 AM	52	Fine green-gray mud, small shell
1257-41	27	3 mi. NW. of Natividad Island, Mexico	27 55 53 N 115 15 58 W	10:19 AM	30	23	27 56 05 N 115 16 00 W	10:33 AM	31	Coarse sand, sponge-covered rocks
1258-41	27	7½ mi. SSW. of Natividad Island, Mexico	27 44 17 N 115 14 20 W	11:37 AM	66	270	27 44 17 N 115 14 40 W	11:55 AM	63	Loose rock, coral
1259-41	27	8½ mi. S. of Dewey Channel, Mexico	27 42 00 N 115 05 15 W	12:42 PM	49	16	27 42 15 N 115 05 02 W	1:04 PM	49	Sand, broken shell, gravel, Temp. 54° F.
1260-41 D-1	27	Dewey Chnl., opp. San Eugenio Point, Mexico	27 49 50 N 115 06 05 W	1:55 PM	23	180	27 49 35 N 115 06 00 W	2:04 PM	26	Coralline, rock
1260-41 D-2	27	Dewey Chnl., opp. San Eugenio Point, Mexico	27 49 32 N 115 06 15 W	2:14 PM	21	359	27 49 40 N 115 06 20 W	2:26 PM	24	Coralline, rock, Temp. 59° F.
1261-41 D-1	27	4 mi. N. of Dewey Channel, Mexico	27 54 15 N 115 06 40 W	2:56 PM	24	266	27 54 15 N 115 07 00 W	3:03 PM	25	Gray-green sand
1261-41 D-2	27	4 mi. N. of Dewey Channel, Mexico	27 54 15 N 115 07 00 W	3:15 PM	24	270	27 54 15 N 115 07 25 W	3:52 PM	25	Gray-green sand
1262-41	28	1½ mi. off N. end of Cedros Island, Mexico	28 21 10 N 115 11 47 W	8:00 AM	20		28 21 10 N 115 11 47 W	11:30 AM	25	Fine broken shell. Small dredge
1263-41	28	1½ mi. off N. end of Cedros Island, Mexico	28 22 18 N 115 11 00 W	8:00 AM	45		28 22 18 N 115 11 00 W	11:00 AM	55	Fine sand, broken shell. Small dredge

Station	Date	General Locality	Dredge Down Position	Dredge Down Time	Fms.	Dir.	Dredge Up Position	Dredge Up Time	Fms.	Remarks
	Feb. 1941									
1264-41	28	1½ mi. off N. end of Cedros Island, Mexico	28 23 20 N 115 11 52 W	8:00 AM	55		28 23 20 N 115 11 52 W	11:00 AM	60	Shale, pebbles. Small dredge
1265-41 D-1	28	2 mi. SE. of Cedros Island Light, Mexico	28 20 35 N 115 10 10 W	2:25 PM	55	76	28 20 45 N 115 09 45 W	2:45 PM	55	Green & brown sand
1265-41 D-2	28	2 mi. SE. of Cedros Island Light, Mexico	28 21 05 N 115 10 45 W	3:10 PM	47	54	28 21 25 N 115 10 17 W	3:28 PM	51	Green & brown sand
		ALLAN HANCOCK CRUISES OF SPRING, SUMMER, AND FALL, 1941								
	Mar. 1941			California						
1266-41	16	Anacapa Island	34 00 30 N 119 24 15 W	6:00 AM	Beach	270	34 00 30 N 119 24 30 W	7:15 AM	Shore	Shore rocky, mussels, barnacles, sea stars
1267-41 D-1	16	3 mi. NW. of Anacapa Island Light	34 02 30 N 119 24 30 W	8:00 AM	47	45	34 02 35 N 119 24 15 W	8:13 AM	47	Gray-green sand, Temp. 56° F.
1267-41 D-2	16	2½ mi. NW. of Anacapa Island Light	34 02 45 N 119 23 35 W	8:27 AM	51	90	34 03 00 N 119 23 45 W	8:44 AM	52	Gray-green sand, Temp. 54° F.
1268-41	16	2½ mi. NW. of Anacapa Island Light	34 03 00 N 119 23 50 W	8:55 AM	51		34 03 00 N 119 23 50 W	9:20 AM	48	Gray-green sand
1269-41 D-1	16	1 mi. W.NW. of Anacapa Island	34 01 25 N 119 27 20 W	9:43 AM	41	360	34 02 00 N 119 27 30 W	10:00 AM	43	Rock, sponge
1269-41 D-2	16	½ mi. NW. of Anacapa Island	34 01 20 N 119 27 10 W	10:15 AM	37	315	34 01 35 N 119 27 25 W	10:35 AM	40	Gray-green sand
1270-41	16	½ mi. S. of West end of Anacapa Island	34 00 05 N 119 26 40 W	10:35 AM	25		34 00 05 N 119 26 40 W	11:05 AM	26	Coralline, rock
1271-41	16	¾ mi. SE. of Cat Rock, Anacapa Island	33 59 50 N 119 24 30 W	11:22 AM	23		33 59 50 N 119 24 30 W	11:30 AM	25	Coralline, gray coarse sand
1272-41	23	6½ mi. N. of Anacapa Island Lighthouse	34 07 20 N 119 23 15 W	8:37 AM	125	135	34 07 00 N 119 22 45 W	9:08 AM	124	Gray sand
1273-41	23	5 mi. NE. of Anacapa Island Lighthouse	34 05 10 N 119 18 00 W	9:45 AM	125	225	34 05 00 N 119 18 15 W	10:13 AM	135	Coarse sand

Station	Date	General Locality	Dredge Down Position	Dredge Down Time	Fms.	Dir.	Dredge Up Position	Dredge Up Time	Fms.	Remarks
	Mar. 1941									
1274-41	23	3½ mi. S. of Hueneme	34 05 30 N 119 12 40 W	10:40 AM	29		34 05 30 N 119 12 40 W	10:50 AM	30	Shell, mud, Temp. 56° F.
1275-41	23	1½ mi. SE. of Point Mugu	34 04 00 N 119 02 45 W	11:50 AM	26	135	34 03 45 N 119 02 30 W	12:00 M	30	Mud, Temp. 56° F.
1276-41 D-1	23	10¾ mi. W. of Point Dume	34 00 20 N 119 01 20 W	12:40 PM	47	180	34 00 00 N 119 01 20 W	12:50 PM	48	Loose rock, sponge
1276-41 D-2	23	10¾ mi. W. of Point Dume	34 00 10 N 119 01 30 W	1:09 PM	47	360	34 00 15 N 119 01 30 W	1:29 PM	48	Loose rock, sponge
	April 1941									
1277-41	9	San Miguel Island Anchorage	34 03 35 N 120 20 50 W		22					Rocky—fishing from *Velero III*
1278-41	10	1 mi. NE. of San Miguel Island	34 05 15 N 120 20 40 W	9:35 AM	35	315	34 05 40 N 120 20 55 W	9:45 AM	39	Fine broken shell
1279-41	10	1.8 mi. NE. of San Miguel Island	34 05 50 N 120 20 25 W	10:00 AM	40	45	34 06 10 N 120 20 00 W	10:15 AM	47	Rocky
1280-41	10	2½ mi. E. of S. Point, Santa Rosa Island	33 53 30 N 120 03 30 W	2:20 PM	15	135	33 53 25 N 120 03 25 W	2:30 PM	21	Shell, red algae
1281-41	10	3 mi. E. of S. Point, Santa Rosa Island	33 53 30 N 120 02 55 W	2:42 PM	23	90	33 53 30 N 120 02 40 W	3:00 PM	26	Sand, nullipores
1282-41	10	2½ mi. E. of S. Point, Santa Rosa Island	33 53 45 N 120 03 40 W	3:15 PM	17	135	33 53 45 N 120 03 40 W	3:30 PM	18	Gravel, red algae
1283-41	10	2¼ mi. E. of S. Point, Santa Rosa Island	33 53 20 N 120 03 50 W	3:50 PM	23	135	33 53 15 N 120 03 30 W	4:07 PM	28	Gravel, sand
1284-41	10	1 mi. S. of E. Point, Santa Rosa Island	33 55 30 N 119 58 30 W	4:38 PM	15		33 55 30 N 119 58 30 W	4:48 PM	16	Loose rock, sand, nullipores
1285-41	11	3 mi. SW. of Fraser Point, Santa Cruz Island	34 02 00 N 119 59 00 W	8:20 AM	15	90	34 02 00 N 119 58 45 W	8:27 AM	19	Fine sand, nullipores, *Ophiothrix*

Station	Date	General Locality	Dredge Down Position	Dredge Down Time	Fms.	Dir.	Dredge Up Position	Dredge Up Time	Fms.	Remarks
	April 1941									
1286-41	11	3 mi. S. of Fraser Point, Santa Cruz Island	34 00 40 N 119 57 00 W	8:50 AM	20	90	34 00 40 N 119 56 45 W	9:07 AM	24	Sand, shell, nullipores
1287-41	11	3½ mi. S. of Fraser Point, Santa Cruz Island	34 00 00 N 119 56 40 W	9:24 AM	25	90	34 00 00 N 119 56 25 W	9:37 AM	28	Sand, broken shell
1288-41	11	5 mi. S. of Fraser Point, Santa Cruz Island	33 58 20 N 119 55 00 W	10:00 AM	103	180	33 57 40 N 119 54 55 W	10:28 AM	74	Green mud, Temp. 49° F.
1289-41	11	2.6 mi. E. of E. Point, Santa Rosa Island	33 56 05 N 119 54 50 W	11:15 AM	47	225	33 55 50 N 119 55 00 W	11:32 AM	49	Green mud
1290-41	11	4.2 mi. SE. of E. Point, Santa Rosa Island	33 53 10 N 119 55 00 W	12:48 PM	51		33 53 10 N 119 55 00 W	1:04 PM	53	Green mud
1291-41	11	6¼ mi. SE. of S. Point, Santa Rosa Island	33 51 00 N 120 00 20 W	1:34 PM	46		33 51 00 N 120 00 20 W	1:50 PM	46	Rocky, Alcyonarians
1292-41	11	6 mi. E. of S. Point, Santa Rosa Island	33 53 30 N 120 00 00 W	2:08 PM	28	90	33 53 30 N 119 59 40 W	2:20 PM	30	Rocky
1293-41	11	3½ mi. E. of S. Point, Santa Rosa Island	33 53 20 N 119 58 00 W	2:42 PM	35	90	33 53 20 N 119 57 55 W	2:53 PM	38	Sand, rock
1294-41	11	½ mi. S. of Gull Island, Santa Cruz Island	33 56 30 N 119 49 40 W	3:38 PM	34	90	33 56 30 N 119 49 35 W	4:00 PM	41	Sand, shell
1295-41 D-1	12	1 mi. SE. of Smugglers Cove, Santa Cruz Island	34 00 25 N 119 31 30 W	8:37 AM	15	360	34 00 35 N 119 31 30 W	8:42 AM	21	Coralline, sand, pebbles
1295-41 D-2	12	1 mi. SE. of Smugglers Cove, Santa Cruz Island	34 00 30 N 119 31 30 W	8:42 AM	17	360	34 00 40 N 119 31 35 W	9:04 AM	19	Coralline, sand, pebbles
1296-41	12	1 mi. E. of Smugglers Cove, Santa Cruz Island	34 01 10 N 119 31 20 W	9:15 AM	20	360	34 01 20 N 119 31 20 W	9:25 AM	19	Rock, kelp
1297-41	12	½ mi. E. of San Pedro Point, Santa Cruz Island	34 02 00 N 119 30 35 W	9:38 AM	26	45	34 02 15 N 119 30 05 W	9:58 AM	40	Rocky
1298-41	12	1 mi. N. of San Pedro Point, Santa Cruz Island	34 03 20 N 119 30 40 W	10:10 AM	45	270	34 03 20 N 119 30 40 W	10:28 AM	46	Sand, broken shell

Station	Date	General Locality	Dredge Down Position	Dredge Down Time	Fms.	Dir.	Dredge Up Position	Dredge Up Time	Fms.	Remarks
	April 1941									
1299-41	12	3 mi. NW. of San Pedro Point, Santa Cruz Island	34 05 00 N 119 32 35 W	10:45 AM	65	225	34 04 55 N 119 32 40 W	11:05 AM	80	Green mud, Temp. 49° F.
1300-41	12	1½ mi. NW. of Cavern Point, Santa Cruz Island	34 04 35 N 119 34 15 W	11:20 AM	54	315	34 04 40 N 119 34 30 W	11:45 AM	56	Mud, sand, dead shell
1301-41	12	0.3 mi. NW. of Pelican Bay, Santa Cruz Island	34 02 10 N 119 41 50 W	2:50 PM	35	45	34 02 20 N 119 41 40 W	3:00 PM	39	Mud, brittle stars
1302-41	12	½ mi. NE. of Platt Harbor, Santa Cruz Island	34 03 25 N 119 43 30 W	3:18 PM	31	135	34 03 20 N 119 43 20 W	3:43 PM	37	Green mud
1303-41	12	½ mi. N. of Platt Point, Santa Cruz Island	34 03 50 N 119 45 25 W	3:55 PM	36	360	34 03 55 N 119 45 25 W	4:07 PM	47	Dead shell
1304-41	12	3 mi. N. of Arch Rock, Santa Cruz Island	34 06 25 N 119 48 40 W	4:42 PM	60	135	34 06 20 N 119 48 25 W	4:56 PM	55	Mud, broken shell
1305-41	13	Prisoner's Harbor, Santa Cruz Island	34 01 25 N 119 41 05 W						8	Set Line
	May 1941									
1306-41 D-1	3	7 mi. E. of Long Point, Santa Catalina Island	33 24 40 N 118 13 35 W	10:15 AM	228	270	33 25 00 N 118 14 30 W	11:00 AM	267	Rock
1306-41 D-2	3	7 mi. E. of Long Point, Santa Catalina Island	33 24 40 N 118 13 35 W	11:25 AM	228	270	33 24 25 N 118 14 15 W	12:00 M	267	Rock, black sand
1306-41 D-3	3	7 mi. E. of Long Point, Santa Catalina Island	33 24 40 N 118 13 35 W	12:35 PM	228	315	33 24 45 N 118 14 00 W	1:20 PM	267	Rock
1307-41 D-1	3	2.8 mi. WNW. of Long Point, Santa Catalina Isl.	33 26 00 N 118 24 40 W	2:42 PM	68	360	33 26 15 N 118 24 40 W	3:10 PM	88	
1307-41 D-2	3	2.8 mi. WNW. of Long Point, Santa Catalina Isl.	33 26 00 N 118 24 40 W	3:15 PM	64	315	33 26 05 N 118 24 50 W	3:30 PM	69	Gray sand
1308-41	3	3.5 mi. WNW. of Long Point, Santa Catalina Isl.	33 26 20 N 118 25 20 W	3:50 PM	70	225	33 26 10 N 118 25 30 W	4:05 PM	51	Sand, fine broken shell

Station	Date	General Locality	Dredge Down Position	Dredge Down Time	Fms.	Dir.	Dredge Up Position	Dredge Up Time	Fms.	Remarks
	May 1941									
1309-41	3	3.5 mi. WNW. of Long Point, Santa Catalina Isl.	33 26 00 N 118 25 35 W	4:15 PM	40		33 26 00 N 118 25 35 W	4:30 PM	40	Lamp Shells
1310-41	4	Fourth of July Cove, Santa Catalina Island	33 26 50 N 118 30 00 W	8:50 AM	Shore		33 26 50 N 118 30 00 W	9:50 AM	Shore	Loose rocks cov. with barnacles, worm tubes
1311-41	4	1½ mi. SE. of W. end of Santa Catalina Island	33 27 20 N 118 35 35 W	11:00 AM	40		33 27 20 N 118 35 35 W	11:10 AM	50	Sand, sticky mud. Mud 50°, water 64° F.
1312-41	4	½ mi. SW. of Ribbon Rock, Santa Catalina Isl.	33 26 05 N 118 34 50 W	11:28 AM	51	270	33 26 05 N 118 35 00 W	11:50 AM	56	Mud
1313-41	4	1¾ mi. W. of Catalina Head, Santa Catalina Isl.	33 25 40 N 118 32 30 W	12:48 PM	50	270	33 25 25 N 118 33 00 W	1:05 PM	51	Mud
1314-41	4	1¾ mi. S. of Catalina Head, Santa Catalina Isl.	33 23 40 N 118 30 45 W	1:28 PM	90	225	33 23 30 N 118 30 50 W	1:50 PM	104	Mud
1315-41	15	Olive Mill Road, Montecito	34 25 00 N 119 38 25 W	5:00 AM		90	34 25 00 N 119 38 00 W	9:00 AM	Shore	Algae covered. Rocks underlaid with sand
1316-41 D-1	17	1 mi. SW. of Ben Weston Point, Santa Catalina Isl.	33 20 55 N 118 30 25 W	12:50 PM	45	315	33 21 15 N 118 30 45 W	1:10 PM	49	Mud, sand, gravel
1316-41 D-2	17	1 mi. SW. of Ben Weston Point, Santa Catalina Isl.	33 20 55 N 118 30 25 W	1:22 PM	45	270	33 20 55 N 118 30 35 W	1:40 PM	46	Mud, sand, gravel
1317-41	17	3.2 mi. S. of Ben Weston Point, Santa Catalina Isl.	33 18 05 N 118 29 30 W	2:35 PM	175	45	33 18 35 N 118 29 25 W	3:18 PM	115	Loose rock, gravel
1318-41	17	4½ mi. W. of Church Rock, Santa Catalina Isl.	33 18 00 N 118 25 00 W	3:40 PM	50	270	33 18 05 N 118 25 20 W	4:10 PM	51	Sticky mud
1319-41	18	3½ mi. E. of Church Rock, Santa Catalina Isl.	33 18 00 N 118 15 20 W	8:50 AM	103	45	33 18 10 N 118 14 50 W	9:28 AM	107	Sand
1320-41	18	3 mi. WNW. of Church Rock, Santa Catalina Isl.	33 18 50 N 118 23 05 W	10:10 AM	18	180	33 18 35 N 118 23 05 W	10:22 AM	23	Rock, mud
1321-41	18	2 mi. W. of Church Rock, Santa Catalina Island	33 17 40 N 118 21 55 W	10:40 AM	45	180	33 17 25 N 118 21 50 W	10:55 AM	53	Mud, sand

Station	Date	General Locality	Dredge Down Position	Dredge Down Time	Fms.	Dir.	Dredge Up Position	Dredge Up Time	Fms.	Remarks
	May 1941									
1322-41	18	3 mi. SE. of Church Rock, Santa Catalina Island	33 16 00 N 118 16 40 W	11:25 AM	105	315	33 16 20 N 118 16 45 W	11:55 AM	100	Fine gray sand
1323-41	18	7 mi. WSW. of Church Rock, Santa Catalina Isl.	33 14 40 N 118 12 15 W	12:50 PM	155	90	33 14 40 N 118 11 10 W	1:26 PM	152	Loose rock
1324-41	18	7 mi. WSW. of Church Rock, Santa Catalina Isl.	33 15 45 N 118 11 30 W	1:45 PM	168	315	33 16 00 N 118 11 55 W	2:35 PM	152	Rocky
1325-41	18	2½ mi. SE. of Church Rock, Santa Catalina Isl.	33 17 00 N 118 16 40 W	3:00 PM	61	45	33 17 15 N 118 16 30 W	3:20 PM	59	Rock, broken shell
	June 1941									
1326-41	8	1 mi. NE. of Castle Rock, San Clemente Island	33 03 15 N 118 36 20 W	2:00 PM	50	180	33 03 00 N 118 36 20 W	2:25 PM	46	Gray sand
1327-41	8	½ mi. W. of Castle Rock, San Clemente Island	33 02 00 N 118 37 20 W	2:40 PM	22	270	33 02 00 N 118 37 35 W	3:00 PM	37	Fine broken shell
1328-41	8	1 mi. SW. of Castle Rock, San Clemente Island	33 01 40 N 118 37 40 W	3:10 PM	40	270	33 01 40 N 118 37 55 W	3:25 PM	46	Black sand
1329-41	8	2 mi. SW. of Castle Rock, San Clemente Island	33 01 00 N 118 38 45 W	3:45 PM	65	270	33 01 00 N 118 39 10 W	4:10 PM	107	Black sand
1330-41	9	4 mi. NE. of Buoy, Cortes Bank	32 29 45 N 119 05 00 W	9:50 AM	60	135	32 29 40 N 119 04 30 W	10:10 AM	59	Sand, broken shell, loose rock
1331-41	9	Wilson Cove, San Clemente Island	33 00 20 N 118 33 15 W	4:30 AM	25				4	Fishing from *Velero III* & Lobster Pots
1332-41	9	3 mi. E. of Buoy, Cortes Bank	32 26 30 N 119 03 30 W	10:32 AM	48	360	32 26 45 N 119 03 30 W	10:47 AM	51	Sand, broken shell
1333-41	9	6 mi. ESE. of Buoy, Cortes Bank	32 24 15 N 119 00 30 W	11:15 AM	56		32 24 15 N 119 00 30 W	11:35 AM	56	Sand, broken shell
1334-41	9	4¾ mi. SE. of Buoy, Cortes Bank	32 24 00 N 119 02 30 W	12:40 PM	125	180	32 23 45 N 119 02 30 W	1:15 PM	131	Sand

Station	Date	General Locality	Dredge Down Position	Dredge Down Time	Fms.	Dir.	Dredge Up Position	Dredge Up Time	Fms.	Remarks
	June 1941									
1335-41	9	1 mi. SW. of Buoy, Cortes Bank	32 25 50 N 119 07 30 W	1:40 PM	32	225	32 25 30 N 119 08 00 W	1:54 PM	32	Broken shell, coralline
1336-41	9	2 mi. NW. of Buoy, Cortes Bank	32 27 45 N 119 09 15 W	2:25 PM	45	180	32 27 30 N 119 09 15 W	2:42 PM	42	Fine sand, broken rock
1337-41	10	Wilson Cove, San Clemente Island	33 00 30 N 118 33 30 W	4:00 AM	25			6:00 AM	4	Lobster traps, setline, kelp holdfast
1338-41	10	Tanner Bank	32 42 45 N 119 06 00 W	9:05 AM	55		32 42 45 N 119 06 00 W	9:22 AM	51	Black sand, broken shell
1339-41	10	Tanner Bank	32 41 30 N 119 06 35 W	9:35 AM	25		32 41 30 N 119 06 35 W	9:55 AM	28	Rock, coralline
1340-41 D-1	10	Tanner Bank	32 41 00 N 119 06 30 W	10:05 AM	40		32 41 00 N 119 06 30 W	10:20 AM	38	Gray sand, rock
1340-41 D-2	10	Tanner Bank	32 41 00 N 119 06 30 W	10:30 AM	37		32 41 00 N 119 06 30 W	10:50 AM	38	Loose rock
1340-41 D-3	10	Tanner Bank	32 41 00 N 119 06 30 W	10:58 AM	38		32 41 00 N 119 06 30 W	11:20 AM	38	Loose rock
1341-41	10	4½ mi. NNW. of Buoy, Cortes Bank	32 30 45 N 119 09 30 W	12:25 PM	60	180	32 30 30 N 119 09 30 W	12:45 PM	61	Black sand, rock
1342-41	10	9½ mi. NW. of Buoy, Cortes Bank	32 33 15 N 119 15 15 W	1:20 PM	50		32 33 15 N 119 15 15 W	1:38 PM	50	White sand, rock
1343-41	10	9½ mi. NNW. of Buoy, Cortes Bank	32 35 00 N 119 11 45 W	2:00 PM	90		32 35 00 N 119 11 55 W	2:55 PM	110	Fine green sand, gravel
1344-41 D-1	11	20 mi. S. of San Nicolas Island	32 53 00 N 119 25 00 W	8:20 AM	65		32 53 00 N 119 25 00 W	8:40 AM	65	Rocky
1344-41 D-2	11	22 mi. S. of San Nicolas Island	32 51 00 N 119 23 45 W	8:55 AM	75		32 51 00 N 119 23 45 W	9:18 AM	75	Rocky
1345-41	11	18½ mi. S. of San Nicolas Island	32 54 30 N 119 26 50 W	9:50 AM	57		32 54 30 N 119 26 50 W	10:10 AM	57	Rocky

Station	Date	General Locality	Dredge Down Position	Dredge Down Time	Fms.	Dir.	Dredge Up Position	Dredge Up Time	Fms.	Remarks
	June 1941									
1346-41	11	9½ mi. SW. of Tanner Bank	32 36 30 N 119 20 00 W	12:50 PM	72		32 36 30 N 119 20 00 W	1:15 PM	72	Loose rock, coralline
1347-41	11	11 mi. NW. of Buoy, Cortes Bank	32 32 30 N 119 18 10 W	1:40 PM	45	90	32 32 30 N 119 17 50 W	1:55 PM	46	Coralline
1348-41	11	Tanner Bank	32 43 00 N 119 11 40 W	2:55 PM	46		32 43 00 N 119 11 40 W	3:15 PM	45	Rocky
1349-41	12	4 mi. SE. of Church Rock, Santa Catalina Island	33 16 00 N 118 15 00 W	10:10 AM	116	180	33 15 45 N 118 15 00 W	10:40 AM	109	Sand, loose rock, sponge
1350-41	12	5 mi. SE. of Church Rock, Santa Catalina Island	33 16 00 N 118 13 30 W	10:50 AM	117	270	33 16 00 N 118 13 45 W	11:30 AM	118	Sand, loose washed rock
1351-41	12	7½ mi. ESE. of Church Rock, Santa Catalina Isl.	33 14 40 N 118 11 15 W	11:50 AM	152	315	33 14 45 N 118 11 30 W	12:50 PM	152	Sand
1352-41	12	6 mi. E. of Church Rock, Santa Catalina Island	33 16 45 N 118 12 20 W	1:15 PM	170	45	33 17 15 N 118 12 15 W	1:55 PM	192	Gray-green sand
1353-41	12	4 mi. E. of Church Rock, Santa Catalina Island	33 17 20 N 118 14 00 W	2:15 PM	102	360	33 17 45 N 118 14 00 W	2:45 PM	116	Gray-green sand
1354-41	12	2½ mi. SE. of Church Rock, Santa Catalina Isl.	33 16 40 N 118 17 10 W	3:00 PM	60	135	33 16 30 N 118 17 00 W	3:25 PM	80	Sand, dead shell
1355-41	12	4 mi. E. of Church Rock, Santa Catalina Island	33 18 30 N 118 15 00 W	3:45 PM	106	135	33 18 25 N 118 14 45 W	4:10 PM	110	Gray sand
1356-41	12	½ mi. E. of Abalone Point, Santa Catalina Isl.	33 20 20 N 118 18 30 W	4:50 PM	44	360	33 20 30 N 118 18 30 W	5:05 PM	46	Mud, kelp
1357-41	12	Anchorage, White Cove, Santa Catalina Island	33 23 25 N 118 21 50 W	6:30 PM	21			11:10 PM		Fishing under the gangway light
1358-41	13	1 mi. E. of White Cove, Santa Catalina Island	33 23 30 N 118 20 50 W	8:30 AM	36	90	33 23 30 N 118 20 45 W	8:45 AM	38	Lampshells, mud
1359-41	13	1¾ mi. E. of White Cove, Santa Catalina Island	33 23 40 N 118 20 00 W	9:05 AM	100	90	33 23 40 N 118 19 50 W	9:35 AM	108	Gray sand, broken shell

Station	Date	General Locality	Dredge Down Position	Dredge Down Time	Dredge Down Fms.	Dir.	Dredge Up Position	Dredge Up Time	Dredge Up Fms.	Remarks
	June 1941									
1360-41	13	2½ mi. E. of Long Point, Santa Catalina Island	33 24 25 N 118 19 15 W	9:45 AM	182	68	33 24 30 N 118 18 55 W	10:30 AM	225	Mud
	July 1941									
1361-41	11	Off Willow Cove, Santa Catalina Island	33 22 55 N 118 20 30 W		35-45					
1362-41	11	Off Willow Cove, Santa Catalina Island	33 22 50 N 118 21 15 W		15-25					
1363-41	12	White Cove, Santa Catalina Island			Shore					
1364-41	13	Off Goat Harbor, Santa Catalina Island	33 25 15 N 118 24 08 W		30					
1365-41	13	Off Goat Harbor, Santa Catalina Island	33 25 14 N 118 23 55 W		21					
1366-41	18	1 mi. E. of Long Point, Santa Catalina Island	33 24 25 N 118 21 00 W	10:50 AM	107		33 24 25 N 118 21 00 W	11:20 AM	107	Green mud
1367-41	18	White Cove, Santa Catalina Island		3:00 PM	Shore					Kelp from shore rocks
1368-41	19	Isthmus Catalina Harbor, Santa Catalina Island	33 25 55 N 118 30 05 W	12:30 PM	Shore					Mud flats at low tide
1369-41	19	1 mi. E. of Empire Landing, Santa Catalina Island	33 25 30 N 118 24 45 W	3:30 PM	15-20					Worm tubes, broken shell
1370-41	20	White Cove, Santa Catalina Island	33 23 40 N 118 22 10 W	11:00 AM	Shore					Rocks north of pier, kelp holdfasts
1371-41	20	1¼ mi. NW. of Long Point, Santa Catalina Isl.	33 25 30 N 118 22 55 W	1:50 PM	77	360	33 25 40 N 118 22 55 W	2:20 PM	115	Coarse gray sand
1372-41	20	¾ mi. E. of Empire Landing, Santa Catalina Island	33 25 50 N 118 24 50 W	2:30 PM	46	360	33 26 00 N 118 24 50 W	2:50 PM	57	Fine green sand

Station	Date	General Locality	Dredge Down Position	Dredge Down Time	Dredge Down Fms.	Dir.	Dredge Up Position	Dredge Up Time	Dredge Up Fms.	Remarks
	Aug. 1941									
1373-41	2	Off White Cove, Santa Catalina Island	33 24 10 N 118 20 25 W	4:40 PM	105		33 24 10 N 118 20 25 W	5:16 PM	105	Gray sand
1374-41	3	1 mi. E. of Empire Landing, Santa Catalina Island	33 25 45 N 118 25 10 W	10:30 AM	22		33 24 10 N 118 20 25 W			Broken shell, coarse sand
1375-41	3	1 mi. E. of Empire Landing, Santa Catalina Island	33 25 45 N 118 25 15 W	11:20 AM	18		33 24 10 N 118 20 25 W			Worm tubes, kelp
1376-41	3	Off Avalon, Santa Catalina Island	33 21 10 N 118 17 40 W	4:20 PM	83		33 24 10 N 118 20 25 W	4:40 PM		Gray sand
1377-41	3	Off Avalon, Santa Catalina Island	33 21 03 N 118 19 55 W	5:00 PM	55			5:15 PM		Gray sand
1378-41	4	1 mi. NW. of White Cove, Santa Catalina Island	33 24 20 N 118 22 00 W	10:00 AM	2-3					Mask diving for kelp holdfasts
1379-41	4	Santa Catalina Channel	33 33 00 N 118 10 00 W	3:25 PM	84			4:00 PM	95	Gray sand, mud
1380-41	8	8½ mi. E. of Long Point, Santa Catalina Island	33 24 10 N 118 13 20 W	4:03 PM	228		33 21 40 N 118 11 25 W	4:55 PM	228	Mud, rock
1381-41	9	½ mi. off White Cove, Santa Catalina Island	33 23 30 N 118 22 04 W	10:00 AM	33		33 23 30 N 118 22 02 W	12:00 M	37	Kelp, rocks, sea fans, urchins, fish, sponge
1382-41	10	Beach close in by Buoy, Wh. Cove, S. Catalina Isl.	33 23 04 N 118 20 40 W	7:00 AM	2		33 23 30 N 118 21 00 W	8:00 AM	3	Mud, sand, sticks, leaf debris
1383-41	10	E. of Long Point, Santa Catalina Island	33 23 40 N 118 20 04 W	9:00 AM	45		33 24 02 N 118 21 22 W	11:00 AM	50	Sponges, lamp shells
1384-41	10	½ mi. NE. of Long Point, Santa Catalina Island	33 24 30 N 118 21 30 W	2:27 PM	108		33 00 10 N 118 21 40 W	2:50 PM	109	Green, sandy mud
1385-41 D-1	25	16½ mi. SSE. of E. Point, Santa Rosa Island	33 41 00 N 119 52 58 W	10:30 AM	75		33 40 55 N 119 52 30 W	10:50 AM	76	Rocks, crinoids, sponges

Station	Date	General Locality	Dredge Down Position	Dredge Down Time	Dredge Down Fms.	Dir.	Dredge Up Position	Dredge Up Time	Dredge Up Fms.	Remarks
	Aug. 1941									
1385-41 D-2	25	13 mi. SSE. of E. Point, Santa Rosa Island	33 44 32 N 119 52 30 W	11:26 AM	71		33 44 32 N 119 50 10 W	11:56 AM	75	Rocks, crinoids, brittle stars
1386-41	25	7 mi. SE. of E. Point, Santa Rosa Island	33 51 00 N 119 54 20 W	12:38 PM	104		33 53 55 N 119 53 55 W	1:10 PM	115	Mud, rocks, brittle stars
1387-41	25	4½ mi. SE. of E. Point, Santa Rosa Island	33 54 05 N 119 54 30 W	1:35 PM	52		33 53 56 N 119 53 45 W	1:55 PM	52	Green, sandy mud
1388-41 D-1	25	3.6 mi. off E. Point, Santa Rosa Island	33 54 30 N 119 54 28 W	2:13 PM	54		33 54 05 N 119 54 30 W	2:35 PM	52	Blake trawl on mud
1388-41 D-2	25	3.6 mi. off E. Point, Santa Rosa Island	33 54 05 N 119 54 25 W	2:48 PM	54		33 54 25 N 119 54 30 W	3:15 PM	55	Blake trawl, green mud, crinoids
1389-41	25	1 mi. NE. of Skunk Point, Santa Rosa Island	34 00 00 N 119 59 45 W	4:15 PM	14		34 00 00 N 119 59 00 W	4:30 PM	15	Blake trawl, sand, *Cancer*, algae
1390-41	26	4.5 mi. SW.x½W. of E. Point, Santa Rosa Island	33 51 30 N 120 05 00 W	9:12 AM	43		33 51 15 N 119 59 50 W	9:25 AM	45	Green mud
1391-41	26	4.6 mi. SW.x½W. of E. Point, Santa Rosa Island	33 51 10 N 119 59 40 W	9:35 AM	40		33 51 00 N 119 59 30 W	9:50 AM	40	Blake trawl, urchins, red algae
1392-41	26	6.5 mi. SE.xE. of S. Point, Santa Rosa Island	33 49 10 N 120 55 00 W	10:15 AM	57		33 48 55 N 120 54 45 W	10:33 AM	57	Rocks, green mud
1393-41 D-1	26	10 mi. SE.x½E. of S. Point, Santa Rosa Island	33 46 30 N 119 58 30 W	11:10 AM	125		33 46 20 N 119 58 15 W	11:35 AM	107	Mud
1393-41 D-2	26	10 mi. SE.x½E. of S. Point, Santa Rosa Island	33 48 30 N 119 59 00 W	1:18 PM	110		33 46 30 N 119 58 30 W	1:45 PM	115	Rock, gravel
1394-41	26	13 mi. SE.x½S. of S. Point, Santa Rosa Island	33 43 00 N 119 58 00 W	2:20 PM	75			2:40 PM	73	Large rocks
1395-41	26	7.8 mi. S. of Santa Rosa Island	33 47 50 N 120 01 30 W	4:07 PM	70		33 47 30 N 120 02 00 W	4:27 PM	74	Blake trawl, crinoids
1396-41 D-1	27	2.5 mi. SE. of Bennett Point, San Miguel Island	33 59 10 N 120 25 10 W	9:18 AM	57		33 59 05 N 120 25 08 W	9:35 AM	57	Blake trawl, crinoids

Station	Date	General Locality	Dredge Down Position	Dredge Down Time	Fms.	Dir.	Dredge Up Position	Dredge Up Time	Fms.	Remarks
	Aug. 1941									
1396-41 D-2	27	2.5 mi. SE. of Bennett Point, San Miguel Island	33 59 40 N 120 25 10 W	9:55 AM	62		33 59 25 N 120 25 12 W	10:00 AM	62	Blake trawl, crinoids
1397-41	27	16.5 mi. SE.xS. of S. Point, Santa Rosa Island	33 38 40 N 119 58 30 W	2:10 PM	77		33 38 35 N 119 58 05 W	2:30 PM	72	Rocks, crinoids, brittle stars
1398-41	28	4 mi. E. of landing, Santa Barbara Island	33 28 40 N 119 40 00 W	8:18 AM	40		33 28 35 N 119 30 00 W	8:30 AM	40	Blake trawl, sand, urchins
	Sept. 1941									
1399-41	8	2 mi. SE. of Long Point, Santa Catalina Island	33 22 00 N 118 30 20 W	9:15 AM	47			10:30 AM		Small dredge boat. Trawl
1400-41 D-1	8	6¼ mi. NE.xE. of Long Point, Santa Catalina Isl.	33 24 15 N 118 13 30 W	1:05 PM	228		33 25 00 N 118 13 45 W	1:20 PM		Rocks, sponges
1400-41 D-2	8	6¼ mi. E.NE.xE. of Long Point, Santa Catalina Isl.	33 25 00 N 118 14 45 W	1:45 PM	267		33 25 20 N 118 14 40 W	2:15 PM		Rocks, cyclostomes
1401-41	8	6½ mi. ENE. of Long Point, Santa Catalina Isl.	33 25 30 N 118 14 50 W	2:45 PM	300		33 25 10 N 118 14 15 W	3:05 PM		Rocks, cyclostomes
1402-41 D-1	13	8 mi. E. of Long Point, Santa Catalina Island	33 24 25 N 118 14 00 W	9:34 AM	240	315	33 24 55 N 118 14 10 W	9:58 AM	267	Small rocks. Dredge
1402-41 D-2	13	8 mi. E. of Long Point, Santa Catalina Island	33 24 40 N 118 13 55 W	10:14 AM		115	33 24 00 N 118 13 25 W	11:04 AM		Small rocks. Dredge
1403-41 D-1	13	1 mi. E. of Willow Cove, Santa Catalina Island	33 22 50 N 118 19 45 W	11:49 AM	50	315	33 23 00 N 118 20 15 W		44	Sand, sea urchins. Blake trawl
1403-41 D-2	13	1 mi. ESE. of White Cove, Santa Catalina Island	33 23 35 N 118 20 15 W	1:30 PM	35	155	33 23 05 N 118 21 10 W	1:45 PM	34	Sand, sea urchins. Blake trawl
1404-41	13	1 mi. E. of Long Point, Santa Catalina Island	33 23 50 N 118 20 35 W	1:55 PM	87	325	33 24 20 N 118 20 35 W	2:23 PM	77	Sand, sea urchins. Blake trawl
1405-41	13	½ mi. E. of Long Point, Santa Catalina Island	33 23 45 N 118 21 30 W	3:53 PM	45	360	33 24 20 N 118 21 35 W	4:09 PM	50	Sand, sea urchins. Blake trawl
1406-41	14	N. side, White Cove, Santa Catalina Island	33 23 40 N 118 22 00 W	9:00 AM					Shore	On rocks near dock. Kelp

Station	Date	General Locality	Dredge Down Position	Dredge Down Time	Fms.	Dir.	Dredge Up Position	Dredge Up Time	Fms.	Remarks
	Sept. 1941									
1407-41	14	Long Point to Willow Cove, Santa Catalina Isl.	33 24 00 N 118 21 30 W	9:00 AM	30	322	33 22 15 N 118 20 30 W	11:00 AM	45	Sand, algae. Small dredge boat, 3 hauls
1408-41	14	8 mi. E. of Long Point, Santa Catalina Island	33 24 45 N 118 13 30 W	3:12 PM	228	50	33 25 40 N 118 12 20 W	3:58 PM	300	Small rocks, sand. Dredge
1409-41 D-1	15	1 mi. off E. side, Santa Barbara Island	33 28 40 N 119 00 30 W	8:45 AM	40	318	33 29 02 N 119 01 01 W	9:21 AM	20	Sand, sea urchins. Blake trawl
1409-41 D-2	15	1 mi. off E. side, Santa Barbara Island	33 28 18 N 119 00 50 W	9:27 AM	38	319	33 28 45 N 119 01 06 W	9:58 AM	26	Sand, sea urchins. Blake trawl
1409-41 D-3	15	1 mi. off E. side, Santa Barbara Island	33 28 18 N 119 00 40 W	10:19 AM	39	337	33 28 45 N 119 00 09 W	11:01 AM	28	Sand, sea urchins. Blake trawl
1410-41	15	3 mi. E. of S. Point, Santa Rosa Island	34 53 35 N 120 03 15 W	4:30 PM	20	338	34 54 05 N 120 03 30 W	4:44 PM	17	Sand, kelp. Blake trawl
1411-41 D-1	16	1 mi. S. of Point Bennett, San Miguel Island	34 00 50 N 120 27 20 W	8:50 AM	45	298	34 00 30 N 120 26 20 W	9:05 AM	48	Sand, shell. Blake trawl
1411-41 D-2	16	1½ mi. SW. of Judith Rock, San Miguel Island	34 00 10 N 120 25 45 W	9:30 AM	44	283	34 00 10 N 120 25 20 W	9:45 AM	46	Sand, shell. Blake trawl
1411-41 D-3	16	1½ mi. SW. of Judith Rock, San Miguel Island	34 00 10 N 120 25 20 W	9:50 AM	46	228	34 00 11 N 120 25 10 W	10:00 AM	45	Soft sand. Dredge
1412-41 D-1	16	1½ mi. S. of Crook Point, San Miguel Island	33 59 20 N 120 22 20 W	10:25 AM	41	350	33 59 00 N 120 22 18 W	10:40 AM	43	Sand, shell. Blake trawl
1412-41 D-2	16	2 mi. S. of Crook Point, San Miguel Island	33 58 40 N 120 21 25 W	10:45 AM	43	285	33 58 40 N 120 22 00 W	11:00 AM	41	Sand, mud. Dredge
1413-41	16	2 mi. SW. of Cardwell Point, San Miguel Island	34 59 55 N 120 19 15 W	12:32 PM	35	30	34 00 00 N 120 19 10 W	12:58 PM	34	Mud. Dredge
1414-41	16	1 mi. S. of Cardwell Point, San Miguel Island	34 00 20 N 120 17 25 W	1:15 PM	15	276	34 00 20 N 120 18 15 W	1:43 PM	24	Mud
1415-41	16	1½ mi. E. of Cardwell Point, San Miguel Island	34 00 55 N 120 16 30 W	2:12 PM	21	112	34 00 45 N 120 15 00 W	2:24 PM	20	Sand, fl. rocks, brittle stars. Blake trawl

Station	Date	General Locality	Dredge Down Position	Dredge Down Time	Fms.	Dir.	Dredge Up Position	Dredge Up Time	Fms.	Remarks
	Sept. 1941									
1416-41	16	2½ mi. NE. of Cardwell Point, San Miguel Island	34 02 45 N 120 16 00 W	3:00 PM	30	90	34 03 15 N 120 16 00 W	3:15 PM	23	Sand, rocks. Blake trawl
1417-41	16	4¼ mi. NE. of Sandy Point, Santa Rosa Island	34 04 05 N 120 13 12 W	3:37 PM	36		34 04 30 N 120 13 14 W	3:50 PM	35	Flat rocks. Dredge
1418-41 D-1	17	3½ mi. NE. of San Pedro Point, Santa Cruz Island	34 03 20 N 119 28 15 W	10:10 AM	46	157	34 03 35 N 119 28 20 W	10:23 AM	47	Sand, sea urchins. Dredge
1418-41 D-2	17	3½ mi. NE. of San Pedro Point, Santa Cruz Island	34 03 35 N 119 28 20 W	10:30 AM	46	263	34 03 30 N 119 29 03 W	10:50 AM	47	Sand, sea urchins. Blake trawl
1419-41 D-1	17	1 mi. N. of W. end, Anacapa Island	34 02 00 N 119 26 40 W	11:18 AM	45	320	34 02 20 N 119 26 05 W	11:47 AM	46	Sand, sea urchins. Blake trawl
1419-41 D-2	17	1 mi. N. of W. end, Anacapa Island	34 01 55 N 119 26 40 W	12:46 PM	45	315	34 02 25 N 119 27 20 W	1:10 PM	47	Sand, sea urchins. Blake trawl
1420-41	17	1½ mi. N. of Light, Anacapa Island	34 02 30 N 119 21 10 W	2:10 PM	47	90	34 03 00 N 119 21 10 W	2:30 PM	77	Sand. Blake trawl
1421-41	17	2 mi. E. of W. Point, Anacapa Island	34 01 00 N 119 24 15 W	3:55 PM	35	216	34 01 10 N 119 24 05 W	4:10 PM		Rock, shell, sponge. Blake trawl
1422-41	28	7¼ mi. E. of Long Point, Santa Catalina Island	33 24 55 N 118 13 25 W	8:52 AM	228	320	33 25 25 N 118 13 30 W	9:16 AM	250	Green mud. Dredge
1423-41	28	7¼ mi. E. of Long Point, Santa Catalina Island	33 25 05 N 118 12 12 W	10:08 AM	228	320	33 25 05 N 118 12 12 W	10:23 AM	228	Rocks. Dredge
1424-41	28	6¾ mi. E. of Long Point, Santa Catalina Island	33 24 45 N 118 14 20 W	11:27 AM	267	180	33 23 50 N 118 14 20 W	11:44 AM	347	Rocks. Dredge
1425-41	28	11½ mi. SE. of Church Rock, Santa Catalina Isl.	33 13 20 N 118 30 00 W	2:37 PM	280	180	33 13 20 N 118 30 00 W	3:15 PM	280	Rocks. Dredge
1426-41	29	¼ mi. off shore, ½ mi. W. of Lng. Pt., S. Catalina Isl.	33 24 00 N 118 21 30 W	9:00 AM	21	360		10:00 AM	40	Sand, brachiopods. Small boat, trawl
1427-41	29	5½ mi. NE. of W. end, Santa Catalina Island	33 34 25 N 118 35 45 W	12:32 PM	286	180	33 34 00 N 118 35 15 W	1:06 PM	300	Rocks. Dredge

Station	Date	General Locality	Dredge Down Position	Dredge Down Time	Fms.	Dir.	Dredge Up Position	Dredge Up Time	Fms.	Remarks
	Sept. 1941									
1428-41	29	3⅛ mi. NE. of W. end, Santa Catalina Island	33 31 35 N 118 34 50 W	2:05 PM	200	313	33 31 55 N 118 35 10 W	2:35 PM	200	Mud (washed out). Trawl
	Oct. 1941									
1429-41 D-1	25	2½ mi. SE. of Seal Rocks, Santa Catalina Island	33 17 20 N 118 15 35 W	11:14 AM	91	252	33 16 20 N 118 16 05 W	11:38 AM	90	(Rock) sponge, urchin, gorgonians
1429-41 D-2	25	2½ mi. SE. of Seal Rocks, Santa Catalina Island	33 17 30 N 118 15 30 W	12:42 PM	90	163	33 17 05 N 118 15 20 W	12:58 PM	95	Rock
1429-41 D-3	25	2½ mi. SE. of Seal Rocks, Santa Catalina Island	33 17 30 N 118 15 55 W	1:20 PM	87	170	33 17 05 N 118 15 45 W	1:38 PM	90	Rock, lumpy gray sand, hermits
1430-41 D-1	25	7¼ mi. SE. of Seal Rocks, Santa Catalina Island	33 14 25 N 118 10 45 W	2:25 PM	152	100	33 14 15 N 118 10 00 W	2:43 PM	200	Rock, sponge, *Munida*, crinoids
1430-41 D-2	25	7¼ mi. SE. of Seal Rocks, Santa Catalina Island	33 14 25 N 118 10 45 W	3:15 PM	152	180	33 14 15 N 118 10 45 W	4:48 PM	152+	Large boulders
1431-41	26	White Cove, Santa Catalina Island	33 23 32 N 118 22 10 W	8:30 AM			33 23 22 N 118 22 10 W	10:30 AM		Algae, sand. Small dredge
1432-41	26	White Cove, Santa Catalina Island	33 23 40 N 118 22 05 W	11:00 AM	Shoal					Kelps from rocks N. of cove
1433-41	26	1¼ mi. NE. of Long Point, Santa Catalina Island	33 25 45 N 118 21 20 W	11:51 AM	124	52	33 25 30 N 118 21 00 W	12:29 PM	179	Octopus, sea buns. Trawl on sand
1434-41	26	2¾ mi. N.xW. of Long Point, Santa Catalina Isl.	33 26 00 N 118 22 30 W	12:58 PM	143	90	33 26 00 N 118 21 35 W	1:50 PM	222	Shrimp, sea urchins. Trawl on mud
	Nov. 1941									
1435-41	8	1½ mi. SW. of Gull Isl., off Santa Cruz Island	33 56 00 N 119 50 55 W	3:29 PM	48	348	33 56 00 N 119 50 55 W	3:44 PM	48	Mud, sponge
1436-41	9	2¾ mi. N. of W. Point, Santa Cruz Island	34 07 00 N 119 56 05 W	7:12 AM	55		34 07 00 N 119 56 05 W	7:21 AM	55	Mud, shell
1437-41	18	Flat Rock Point, S. of Redondo	33 47 50 N 118 24 25 W	1:00 PM	Intertidal —1.2′ tide			4:30 PM		Rocky beach, boulders, kelp

			Dredge Down				*Dredge Up*			
Station	*Date*	*General Locality*	*Position*	*Time*	*Fms.*	*Dir.*	*Position*	*Time*	*Fms.*	*Remarks*
	Nov. 1941									
1438-41	19	Corona del Mar (Newport Harbor)	33 36 04 N 117 52 48 W	1:00 PM	Intertidal —1.3′ tide			4:30 PM		Rocks, sand flats
	Dec. 1941									
1439-41	17	Flat Rock Point, S. of Redondo	33 47 50 N 118 24 25 W	1:10 PM	Intertidal —1.5′ tide			4:30 PM		Rocky beach, kelp, sand
1440-41	18	Corona del Mar (Newport Harbor)	33 36 04 N 117 52 48 W	1:15 PM	Intertidal —1.6′ tide			4:30 PM		Rocks, sand flats, eel grass
1441-41	17	Corona del Mar (Newport Harbor)	33 35 43 N 117 52 38 W	1:00 PM	Intertidal —1.5′ tide		33 36 12 N 117 52 56 W	5:00 PM		Rocks, muddy, sand flats, eel grass
1442-41	18	Newport Bay, N. & E. of Highway 101, Bridge	33 36 58 N 117 54 12 W	12:30 PM	Intertidal —1.6′ tide		33 37 12 N 117 53 25 W	5:00 PM		Sand flats, along shore
1443-41	19	Arch Rock, S. of Corona del Mar	33 35 00 N 117 51 40 W	2:00 PM	Intertidal —1.5′ tide			5:00 PM		Rocky shore, eel grass beds

DISTRIBUTION CHARTS

19. Monterey Bay and Carmel Bay, California
20. Mugu Point Region, California
21. Anacapa Islands, Northern Channel Islands
22. Santa Cruz Island, Northern Channel Islands
23. Santa Rosa Island, Northern Channel Islands
24. San Miguel Island, Northern Channel Islands
25. Santa Monica Bay to Point Fermin, California
26. San Pedro Bay and Channel, from Point Fermin to Laguna
27. Santa Catalina Island, Southern Channel Islands
28. Long Point and White Cove, Santa Catalina Island
29. Santa Barbara Island, Southern Channel Islands
30. San Nicolas Island, Southern Channel Islands
31. San Clemente Island, Southern Channel Islands
32. Cortes and Tanner banks, southwest of San Clemente Island
33. Bank northwest of Tanner Bank, south of San Nicolas Island
34. From La Jolla, California, to Coronados Islands, Mexico
35. Todos Santos Bay, West coast of Lower California
36. San Quentin Bay, West coast of Lower California
37. Rosario Bay, West coast of Lower California
38. Lagoon Head, West coast of Lower California
39. Ranger Bank and San Benito Islands, West coast of Lower California
40. Cedros Island, West coast of Lower California
41. Natividad Island and Point San Eugenio, West coast of Lower California
42. Turtle Bay and Thurloe Bay, West coast of Lower California
43. San Juanico Bay, West coast of Lower California
44. Santa Maria Bay, West coast of Lower California
45. Cape San Lucas, Lower California
46. South coast of Socorro Island
47. Clarion Island
48. From San José del Cabo Bay to Fraile Bay, Gulf of California
49. Boca de la Trinidad, Gulf of California
50. Muertos Bay, Gulf of California
51. La Paz Bay, Gulf of California
52. San Lorenzo Channel and Espiritu Santo Island, Gulf of California
53. San Francisco Island, Gulf of California
54. Agua Verde Bay and Puerto Escondido, Gulf of California
55. Coronados Island, Mangles Anchorage, and Pulpito Point, Gulf of California

56. Ildefonso Island and Concepción Bay, Gulf of California
57. San Marcos Island and Tortuga Island, Gulf of California
58. San Francisquito Bay, Gulf of California
59. Angeles Bay, Isla Partida, and south end of Angel de la Guardia Island
60. Puerto Refugio, north end of Angel de la Guardia Island
61. Puerto Refugio (larger scale)
62. Gonzaga Bay and San Luis Island, Gulf of California
63. San Felipe Bay and Consag Rock, Gulf of California
64. Rocky Point and Georges Island, Gulf of California
65. Cape Tepoca and Cape Lobos, Gulf of California
66. Tiburon Island (southern part) and San Esteban Island, Gulf of California
67. San Pedro Nolasco Island, Ensenada de San Francisco, and Guaymas Bay
68. San Carlos Bay and San Ignacio Farallon, Gulf of California
69. Isabel Island and Tres Marias Islands, Mexico
70. Tenacatita Bay, Mexico
71. Petatlan Bay and White Friars Islands, Mexico
72. Chacahua Bay, Mexico
73. Tangola Tangola Bay, Mexico
74. Area near San José Light, Guatemala
75. Salinas Bay, Port Parker, and Playa Blanca Bay, Costa Rica
76. Port Culebra, Costa Rica
77. Gulf of Dulce, Costa Rica
78. Chatham Bay and Wafer Bay, Cocos Island
79. Secas Islands, Panama
80. Bahia Honda, Panama
81. Jicarita Island, Panama
82. Gulf of Panama, including Taboga Island
83. Piñas Bay, Panama
84. Octavia Bay and Cupica Bay, Colombia
85. Port Utria, Colombia
86. Cabita Bay, Colombia
87. Gorgona Island, Colombia
88. San Francisco Bay, Ecuador
89. Santa Elena Bay, Ecuador
90. Manta Bay, La Plata Island, and Salango Island, Ecuador
91. Sechura Bay, Peru
92. Lobos de Afuera Islands, Peru
93. Lobos de Tierra Island, Peru
94. Callao Region, Peru

95. Chincha Islands, Peru
96. Independencia Bay, Peru
97. Port San Nicolas and Port San Juan, Peru
98. Darwin Bay, Tower Island, Galapagos Islands
99. Abingdon Island and Bindloe Island, Galapagos Islands
100. Wenman Island, Galapagos Islands
101. Albemarle Island and Narborough Island, Galapagos Islands
102. Tagus Cove, Albemarle Island
103. James Island, Galapagos Islands
104. James Bay, James Island
105. Sulivan Bay, James Island
106. The Daphnes, the Seymours, Indefatigable, Duncan, and Barrington islands
107. Conway Bay, Indefatigable Island
108. Academy Bay, Indefatigable Island
109. Charles Island, Galapagos Islands
110. Black Beach Anchorage, Charles Island
111. Post Office Bay, Charles Island
112. Cormorant Bay and Onslow Island, Charles Island
113. Chatham Island, Galapagos Islands
114. Hood Island, Galapagos Islands
115. Gardner Bay, Hood Island

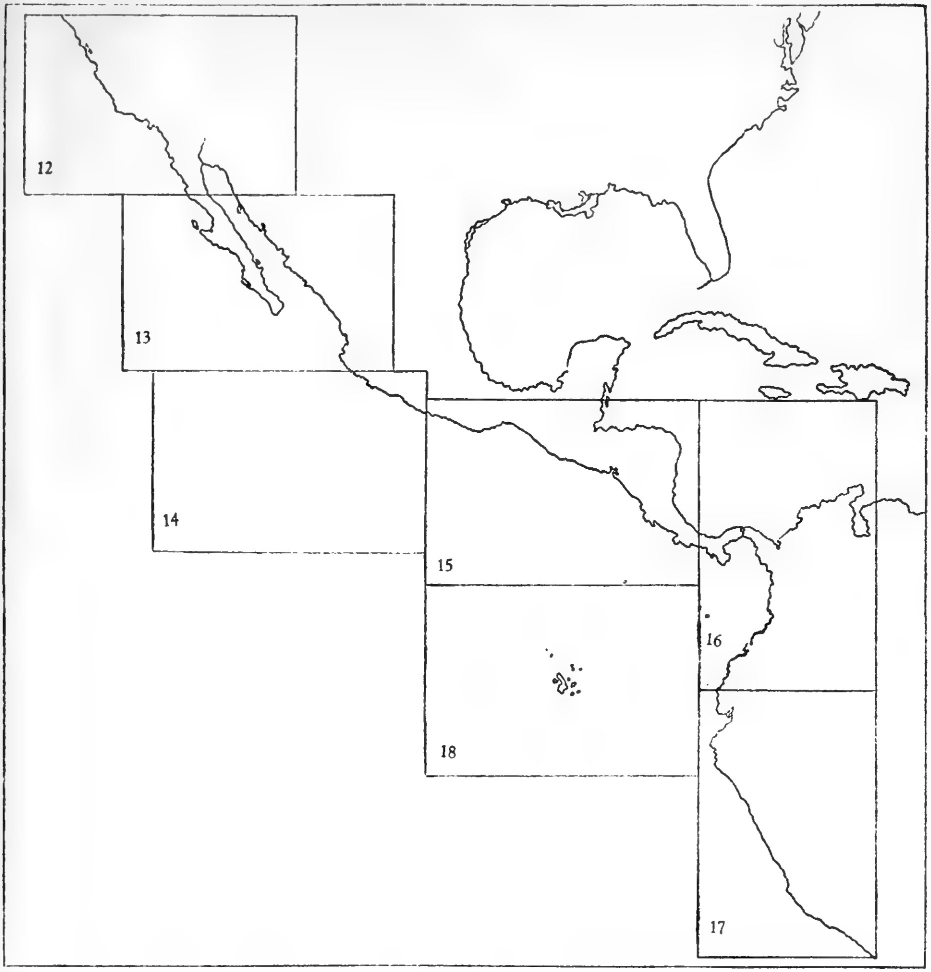


CHART 11

This reduced scale shows the relation of the more detailed charts 12-18 immediately following, reading from upper left to lower right.

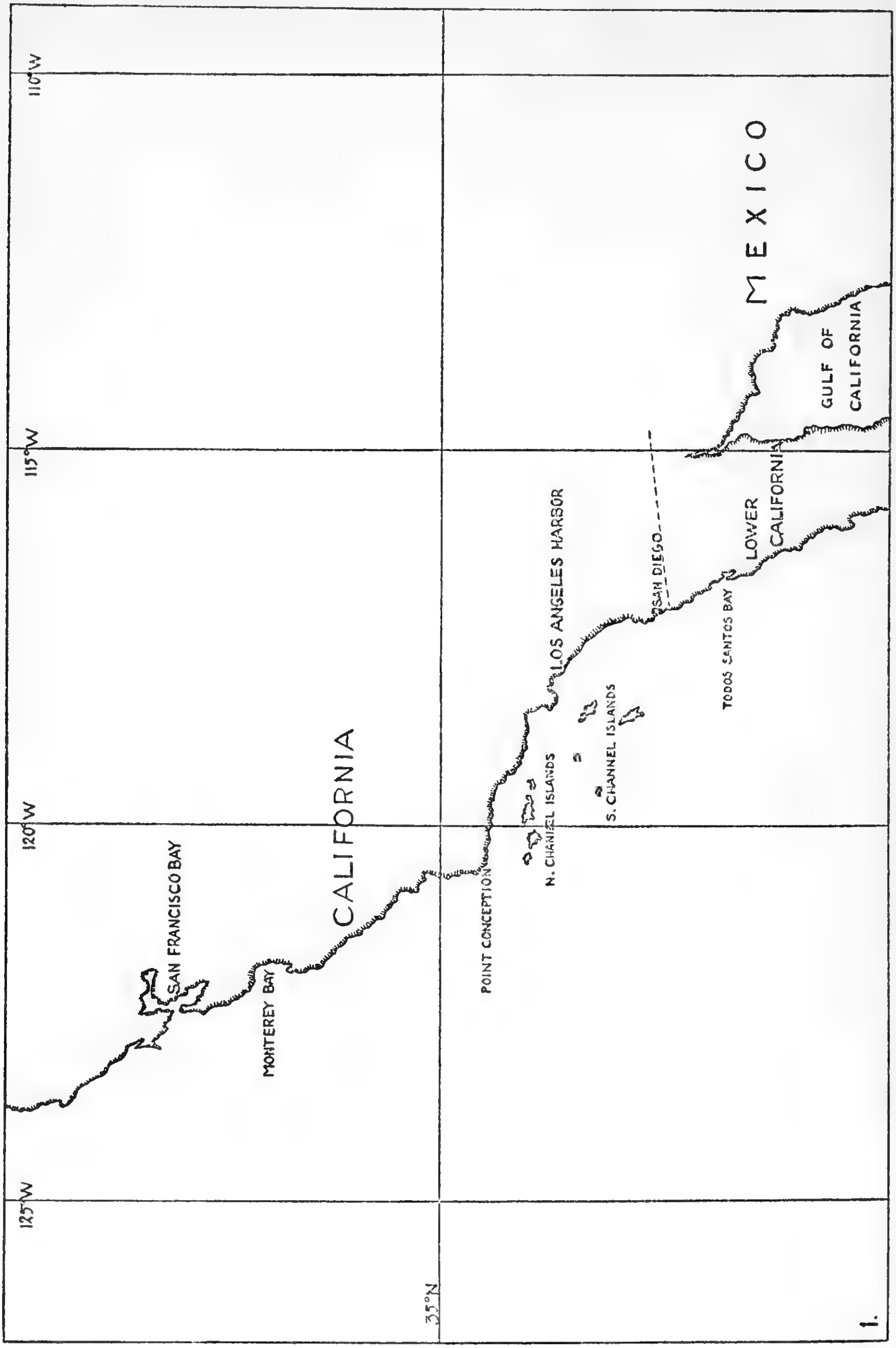

110°W
115°W
120°W
125°W
35°N
MEXICO
GULF OF CALIFORNIA
LOWER CALIFORNIA
SAN DIEGO
LOS ANGELES HARBOR
TODOS SANTOS BAY
S. CHANNEL ISLANDS
N. CHANNEL ISLANDS
POINT CONCEPTION
CALIFORNIA
SAN FRANCISCO BAY
MONTEREY BAY
1.

Chart 12

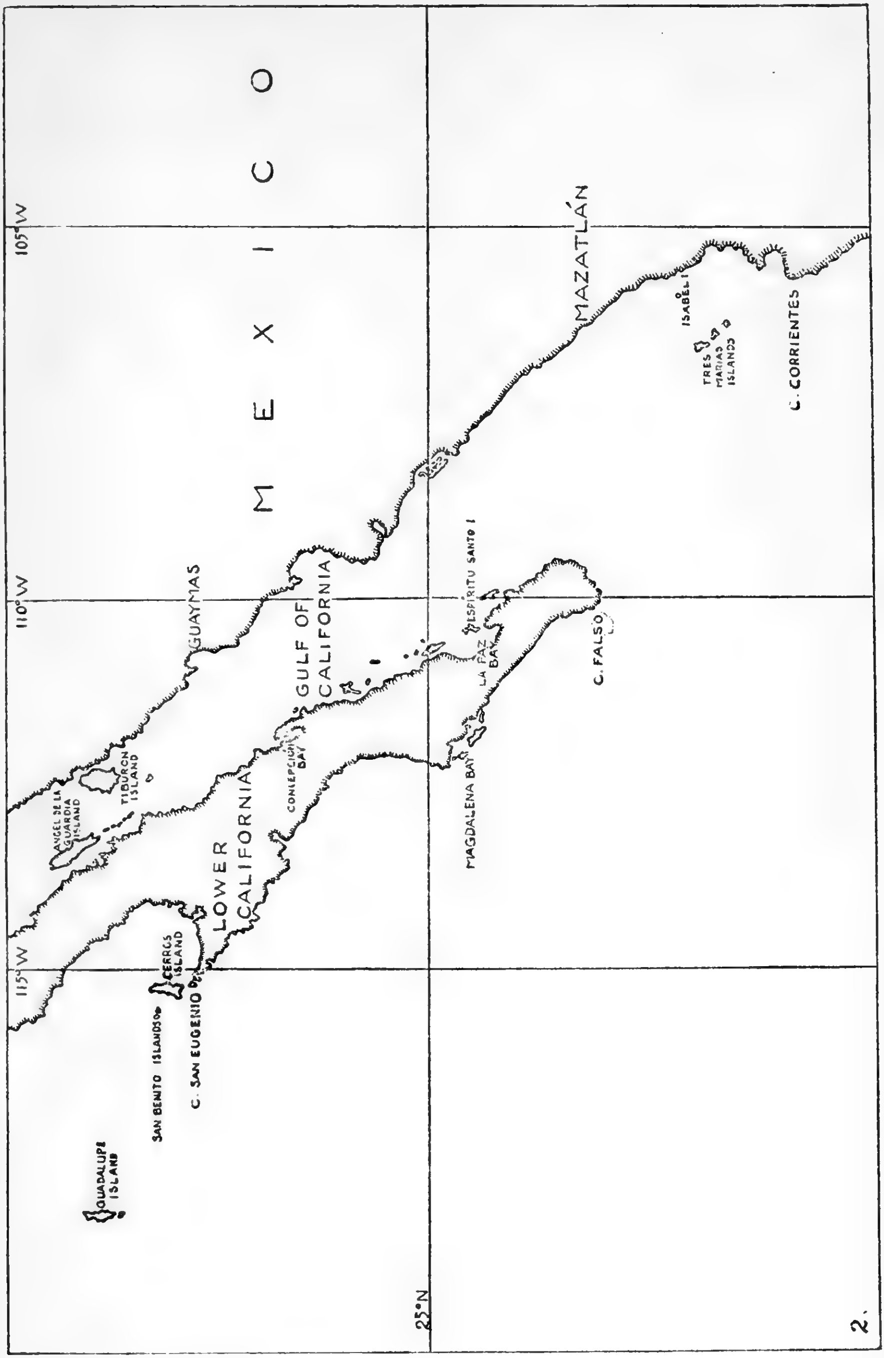

MEXICO
MAZATLÁN
ISABEL I
TRES MARIAS ISLANDS
C. CORRIENTES
GUAYMAS
GULF OF CALIFORNIA
ESPIRITU SANTO I
LA PAZ BAY
C. FALSO
TIBURON ISLAND
ANGEL DE LA GUARDIA ISLAND
CONCEPCION BAY
LOWER CALIFORNIA
MAGDALENA BAY
CERROS ISLAND
SAN BENITO ISLANDS
C. SAN EUGENIO
GUADALUPE ISLAND
105° W
110° W
115° W
25° N
2.

Chart 13

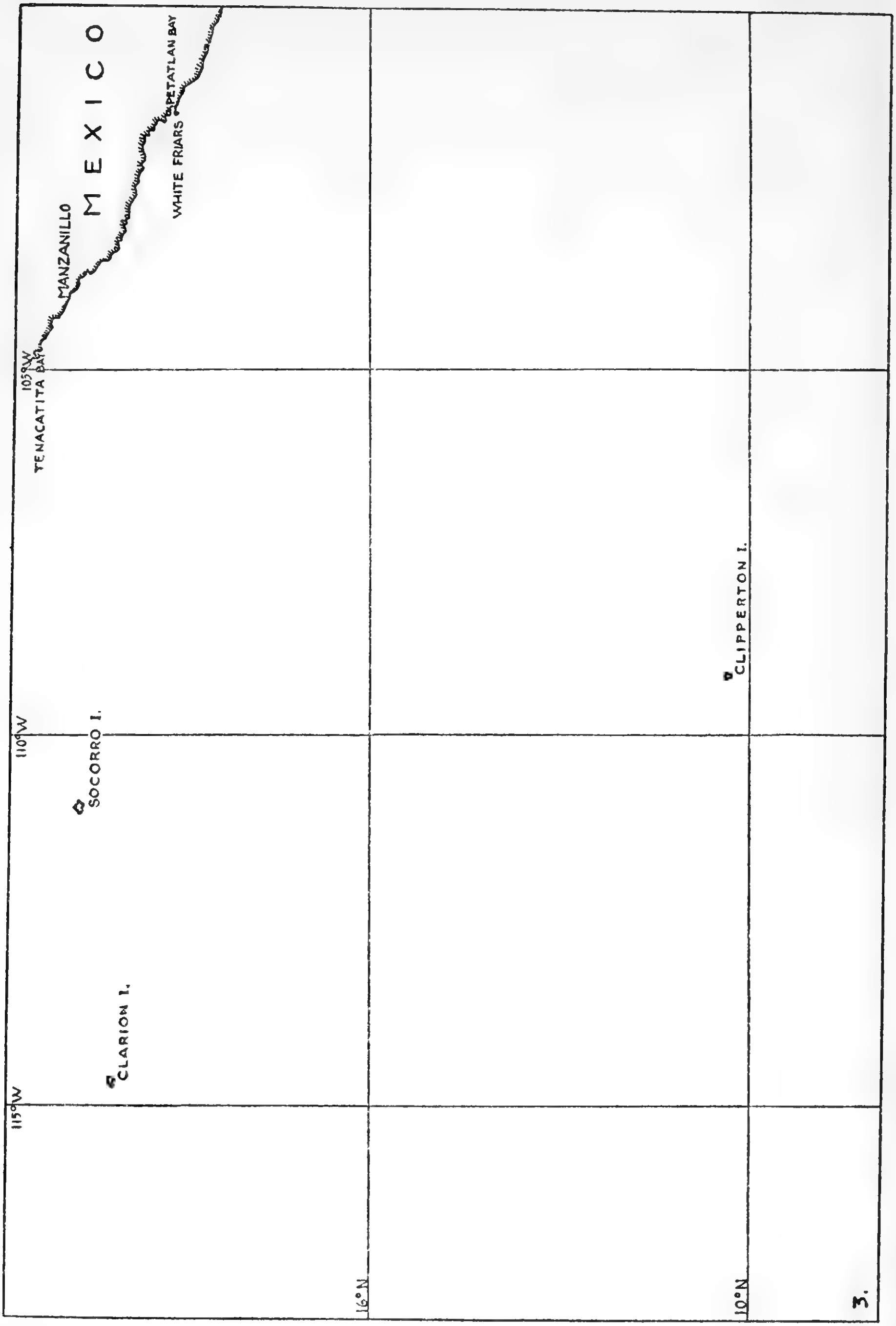

MEXICO
PETATLAN BAY
WHITE FRIARS
MANZANILLO
TENACATITA BAY
105°W
110°W
115°W
CLIPPERTON I.
SOCORRO I.
CLARION I.
16°N
10°N
3.

Chart 14

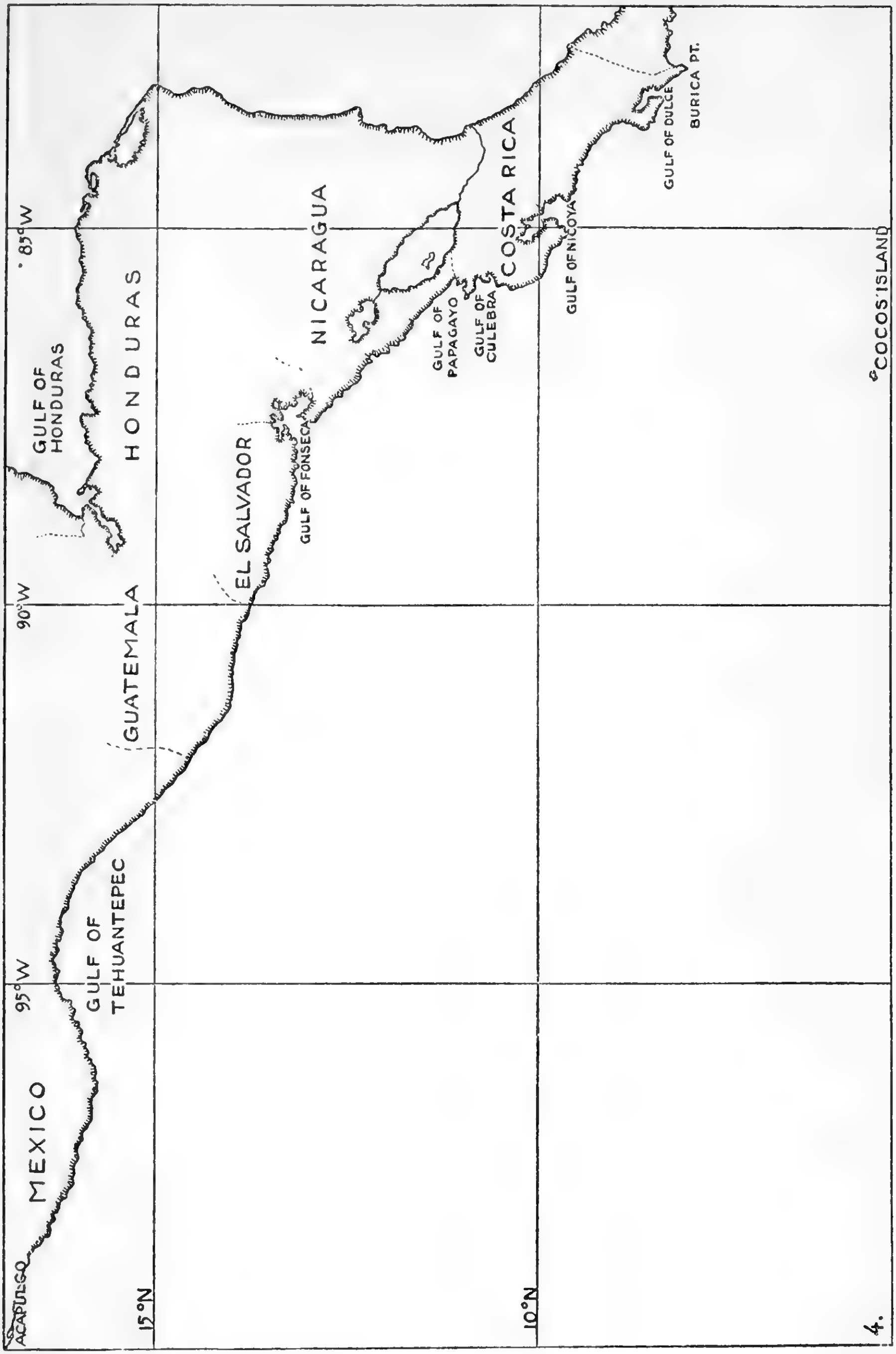

MEXICO
ACAPULCO
GULF OF TEHUANTEPEC
GUATEMALA
EL SALVADOR
GULF OF HONDURAS
HONDURAS
GULF OF FONSECA
NICARAGUA
GULF OF PAPAGAYO
GULF OF CULEBRA
COSTA RICA
GULF OF NICOYA
GULF OF DULCE
BURICA PT.
COCOS ISLAND
85°W
90°W
95°W
15°N
10°N
4.

Chart 15


80°W
75°W
15°N
10°N
5°N
0°
5.
CARIBBEAN SEA
PANAMA
COLON
BALBOA
PANAMA
GULF OF PANAMA
SECAS IS.
BAHIA HONDA
C. MALA
JICARITA I.
COLOMBIA
C. CORRIENTES
MALPELO I.
GORGONA I.
C. SAN FRANCISCO
ECUADOR

Chart 16

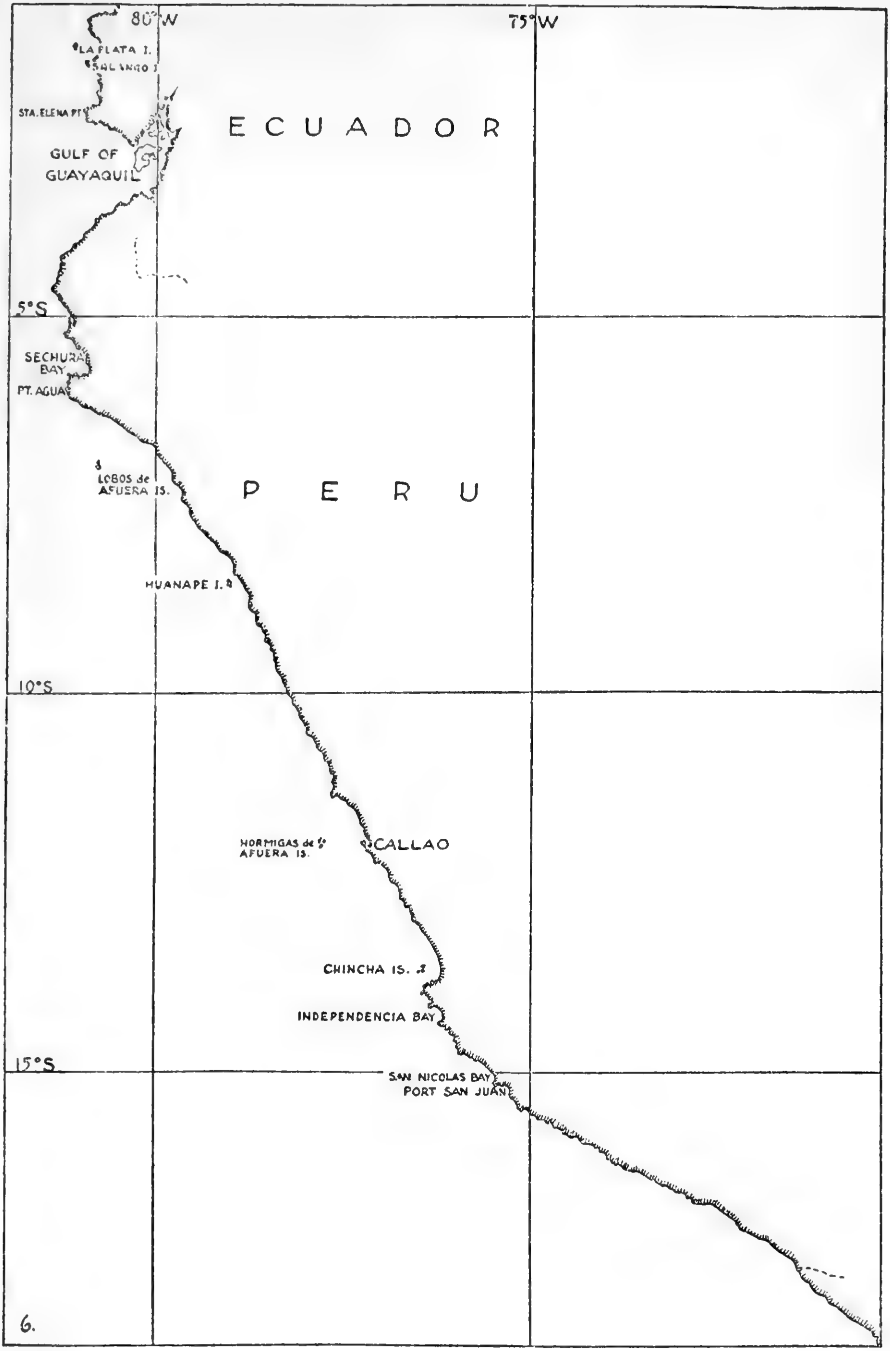

80°W
75°W
LA PLATA I.
SALANGO I.
STA. ELENA PT.
ECUADOR
GULF OF GUAYAQUIL
5°S
SECHURA BAY
PT. AGUJA
LOBOS de AFUERA IS.
PERU
HUANAPE I.
10°S
HORMIGAS de AFUERA IS.
CALLAO
CHINCHA IS.
INDEPENDENCIA BAY
15°S
SAN NICOLAS BAY
PORT SAN JUAN
6.

Chart 17


THE GALÁPAGOS ISLANDS
(BELONGING TO ECUADOR)
Compiled from the latest information
SOUNDINGS IN FATHOMS
HEIGHTS IN FEET
HARBOR AND SPECIAL CHARTS
Natural Scale
VARIATION
INCREASING
SAN SALVADOR
(JAMES I)
FERNANDINA
(NARBOROUGH I)
ISABELA
(ALBEMARLE I)
SANTA CRUZ
(INDEFATIGABLE I)
SAN CRISTOBAL
(CHATHAM I)
SANTA MARIA
Española
(Hood I)
Marchena
Tower I
C. Berkeley
C. Marshall
C. Douglas
Banks Bay
Santa Fe
Christopher Pt

Chart 18

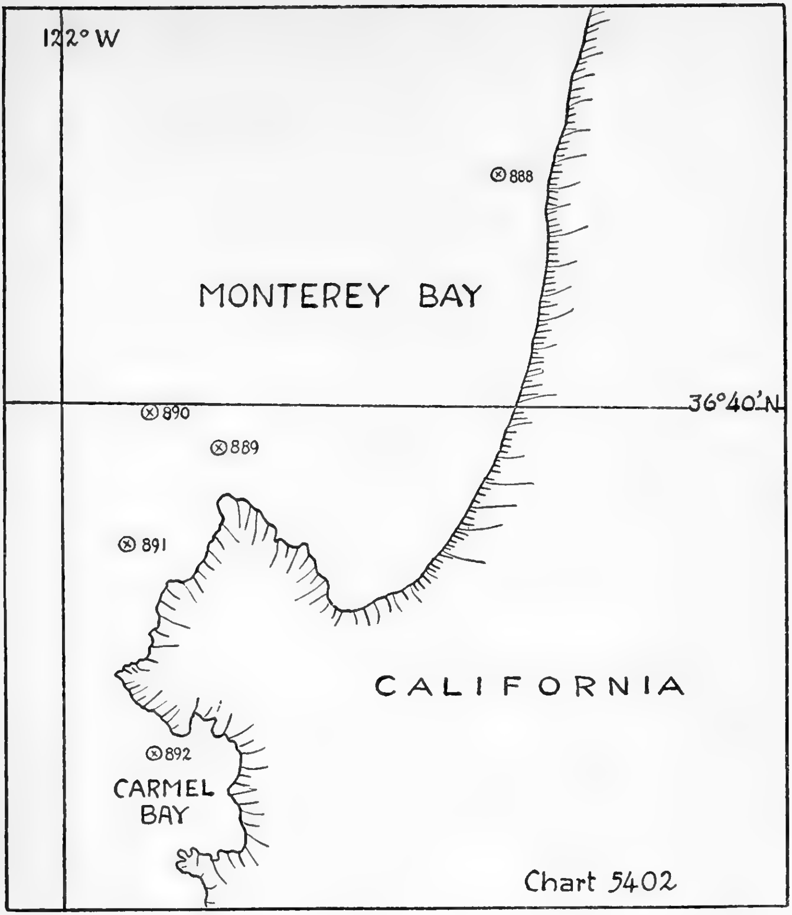


Chart 19

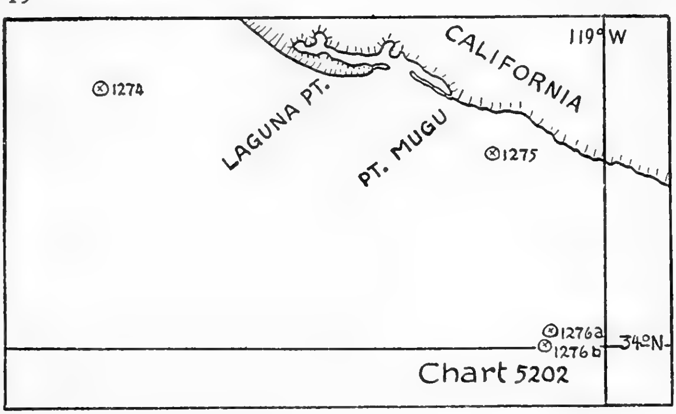


Chart 20

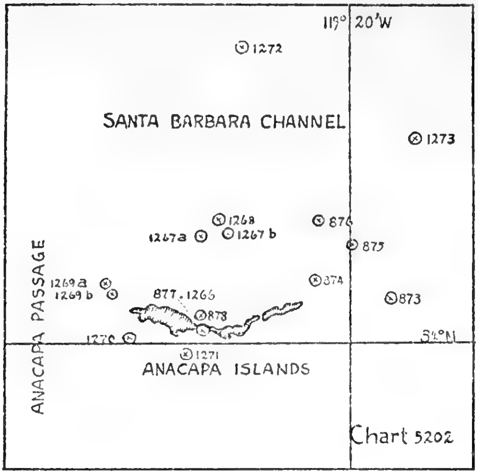


Chart 21

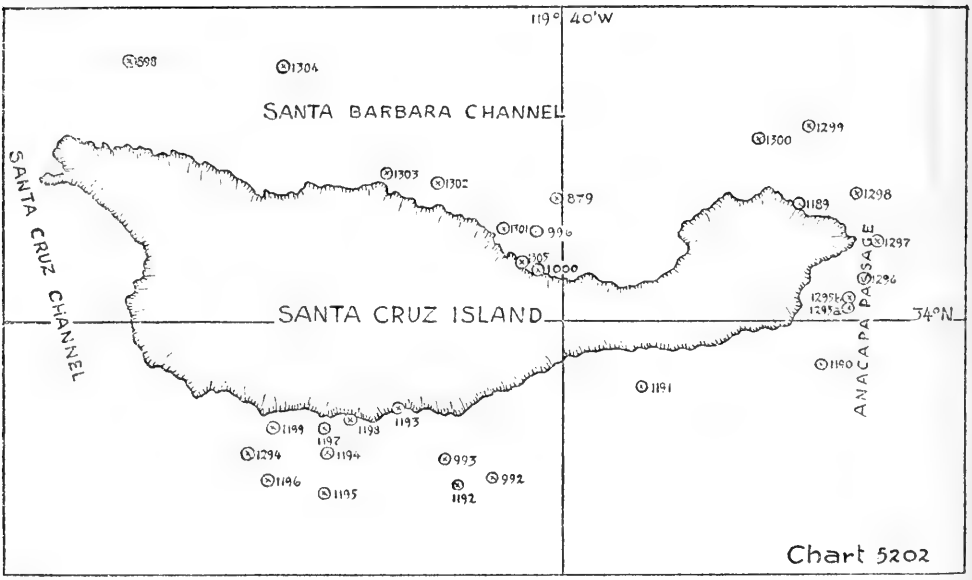


Chart 22

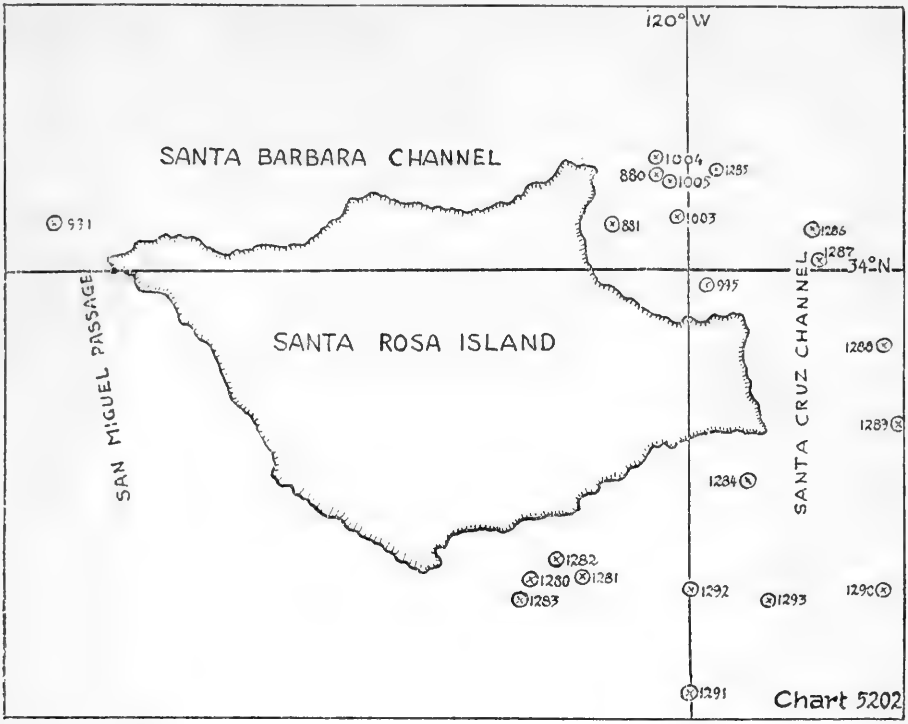


Chart 23

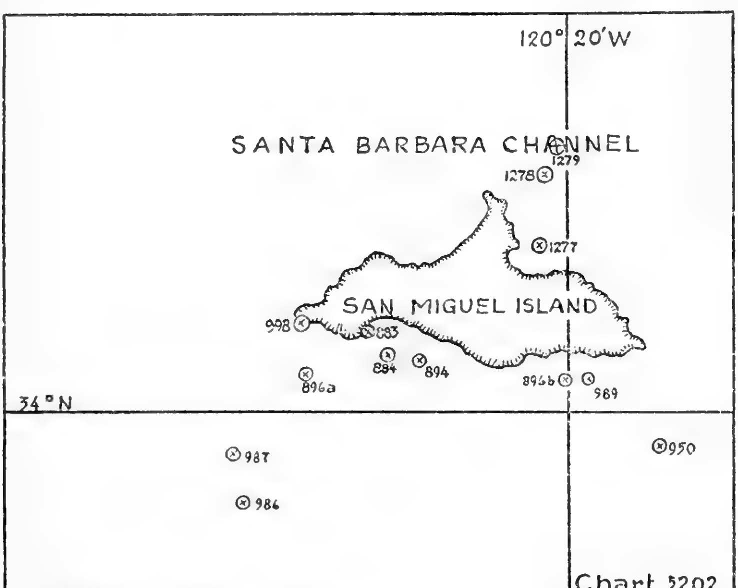


Chart 24

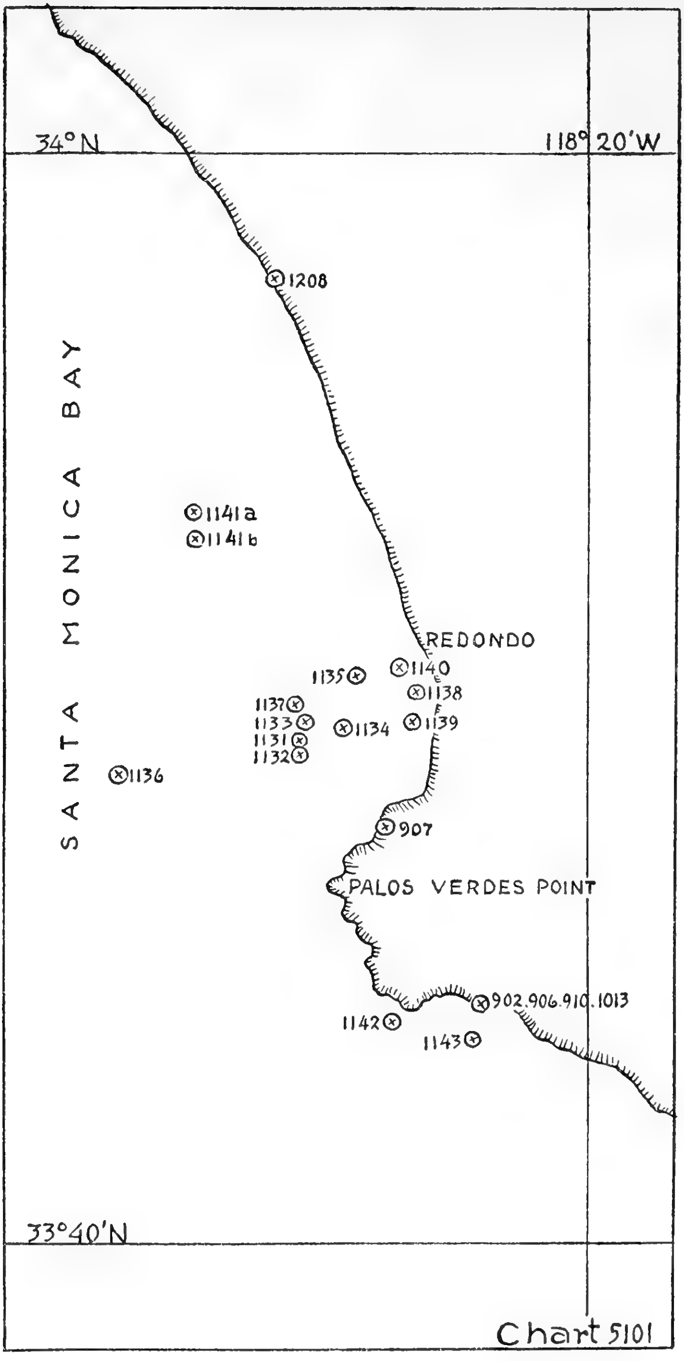

34°N
118° 20'W
SANTA MONICA BAY
1208
1141a
1141b
REDONDO
1135
1140
1138
1137
1133
1131
1132
1134
1139
1136
907
PALOS VERDES POINT
902.906.910.1013
1142
1143
33°40'N
Chart 5101

Chart 25

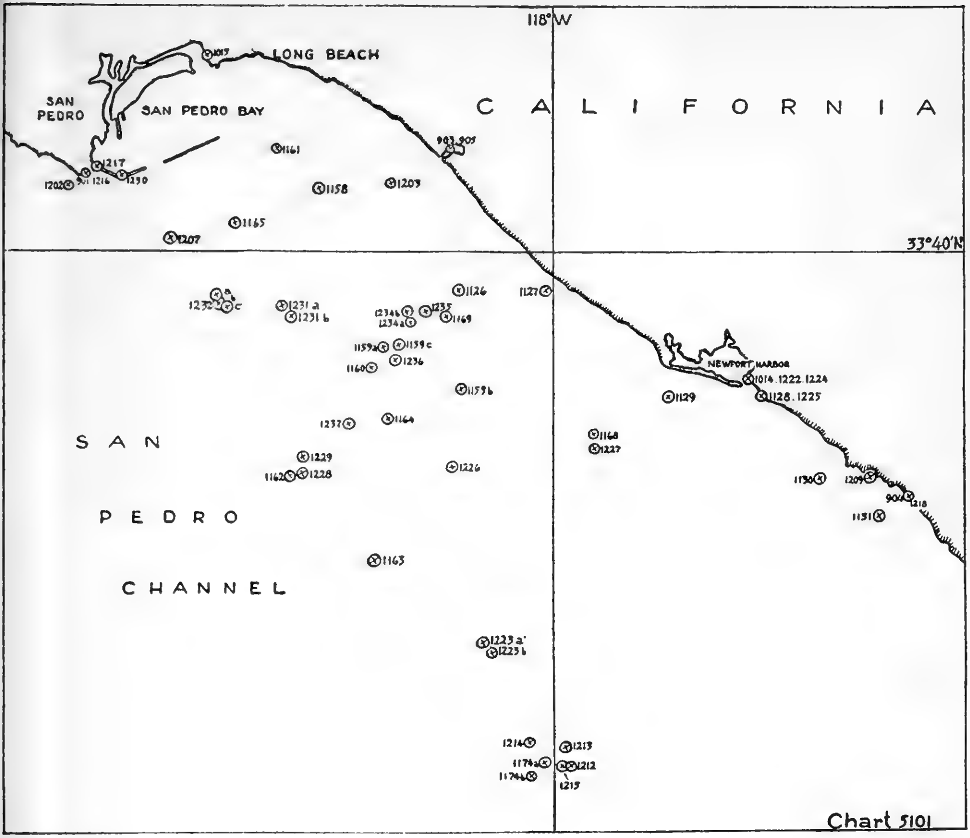

118° W
LONG BEACH
SAN PEDRO
SAN PEDRO BAY
C A L I F O R N I A
33°40' N
NEWPORT HARBOR
S A N
P E D R O
C H A N N E L
Chart 5101

Chart 26

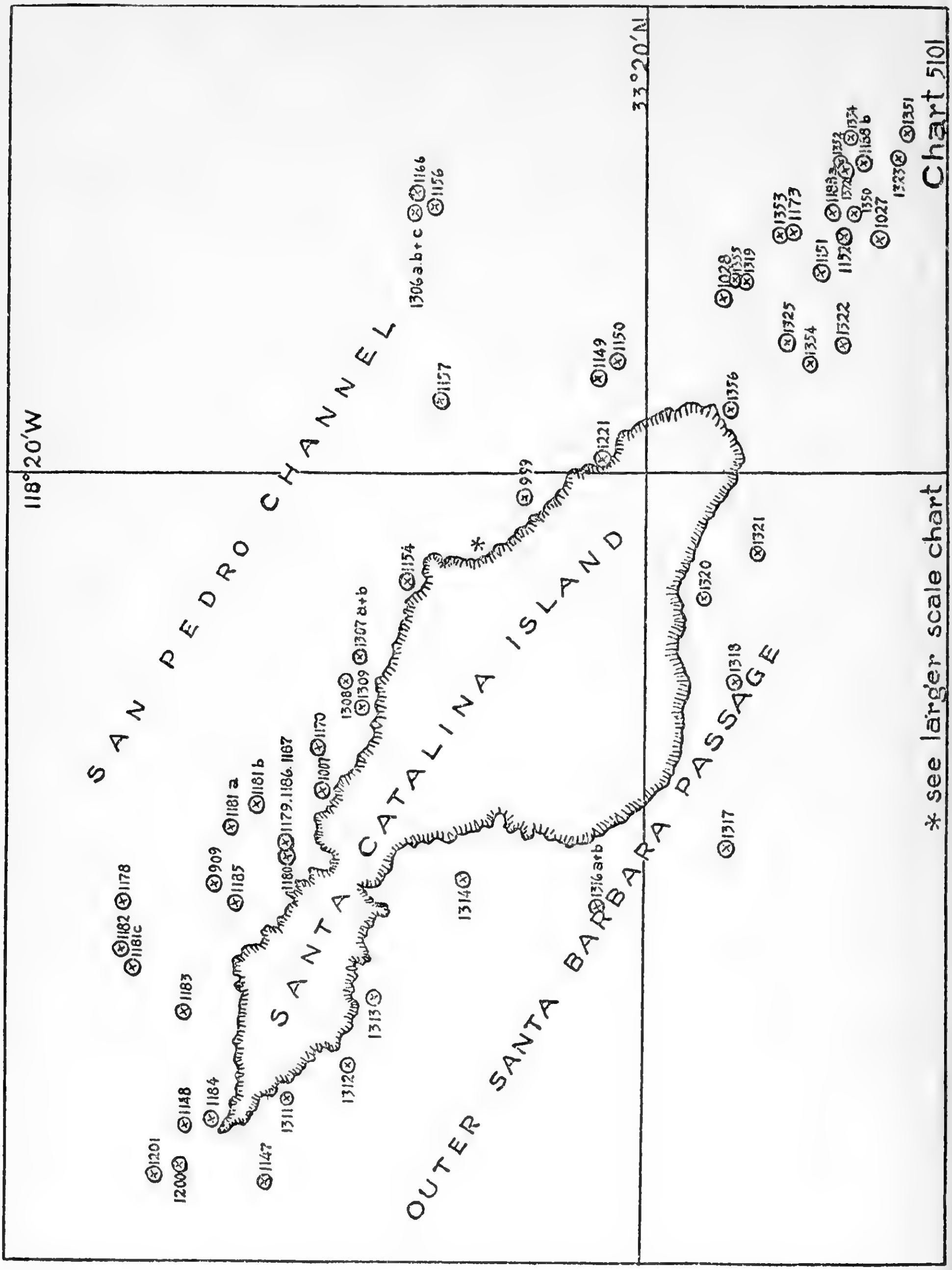

SAN PEDRO CHANNEL
SANTA CATALINA ISLAND
OUTER SANTA BARBARA PASSAGE
118°20'W
33°20'N
Chart 5101
* see larger scale chart

Chart 27

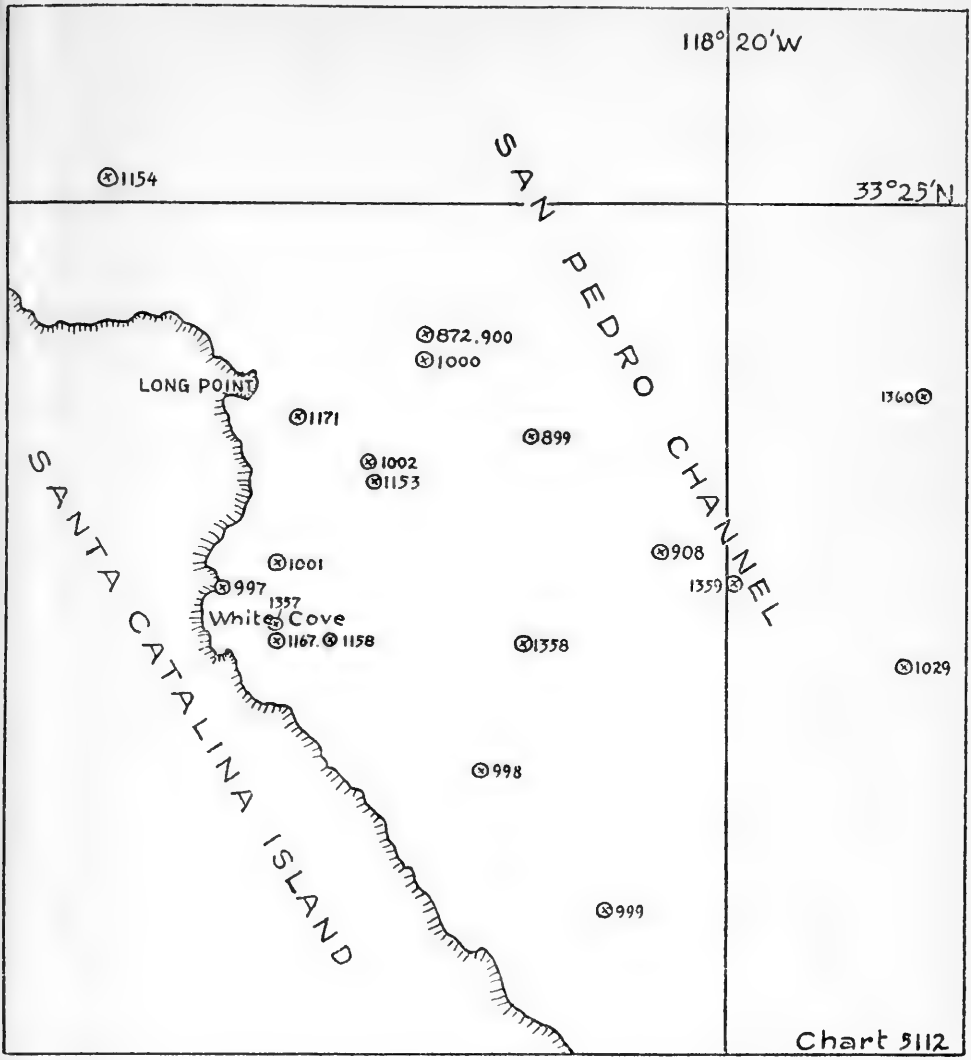

118° 20'W
33°25'N
SAN PEDRO CHANNEL
SANTA CATALINA ISLAND
LONG POINT
White Cove
1154
872.900
1000
1171
899
1002
1153
1360
1001
908
997
1357
1359
1167.
1158
1358
1029
998
999
Chart 5112

Chart 28

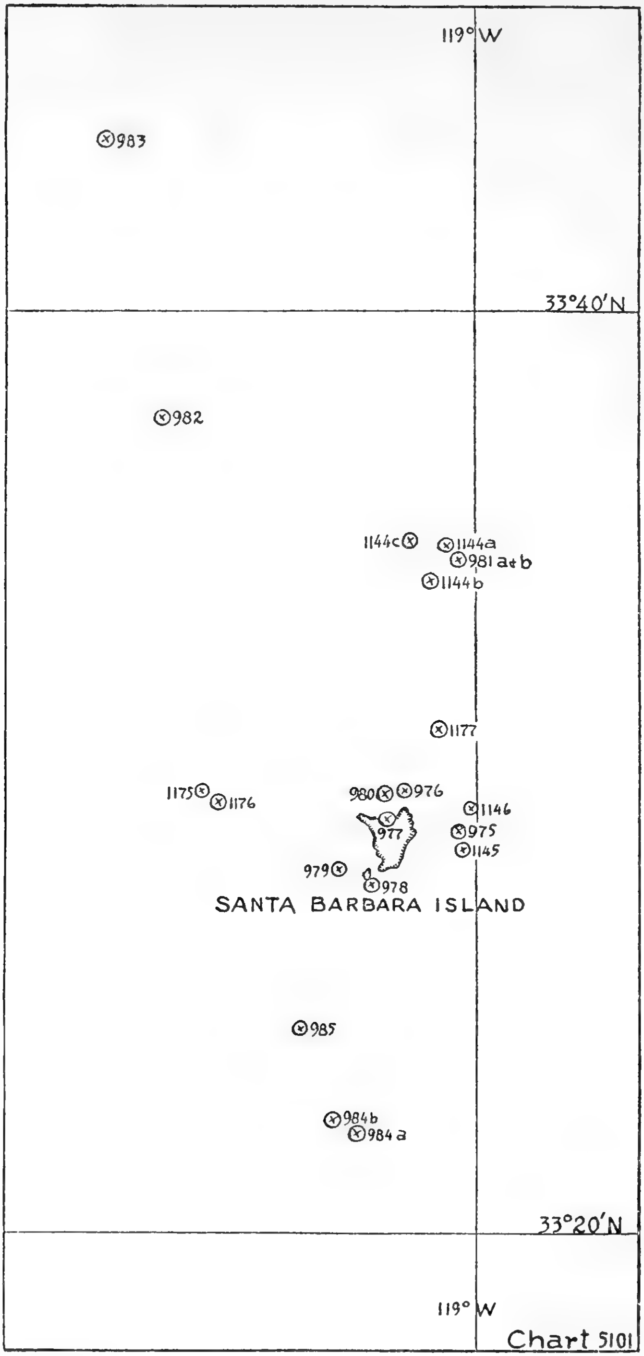

119° W
983
33°40′N
982
1144c
1144a
981 a+b
1144b
1177
1175
1176
980
976
1146
977
975
1145
979
978
SANTA BARBARA ISLAND
985
984b
984 a
33°20′N
119° W
Chart 5101

Chart 29

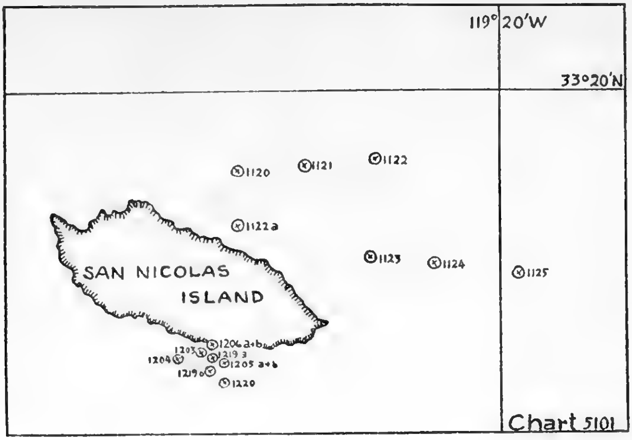


Chart 30

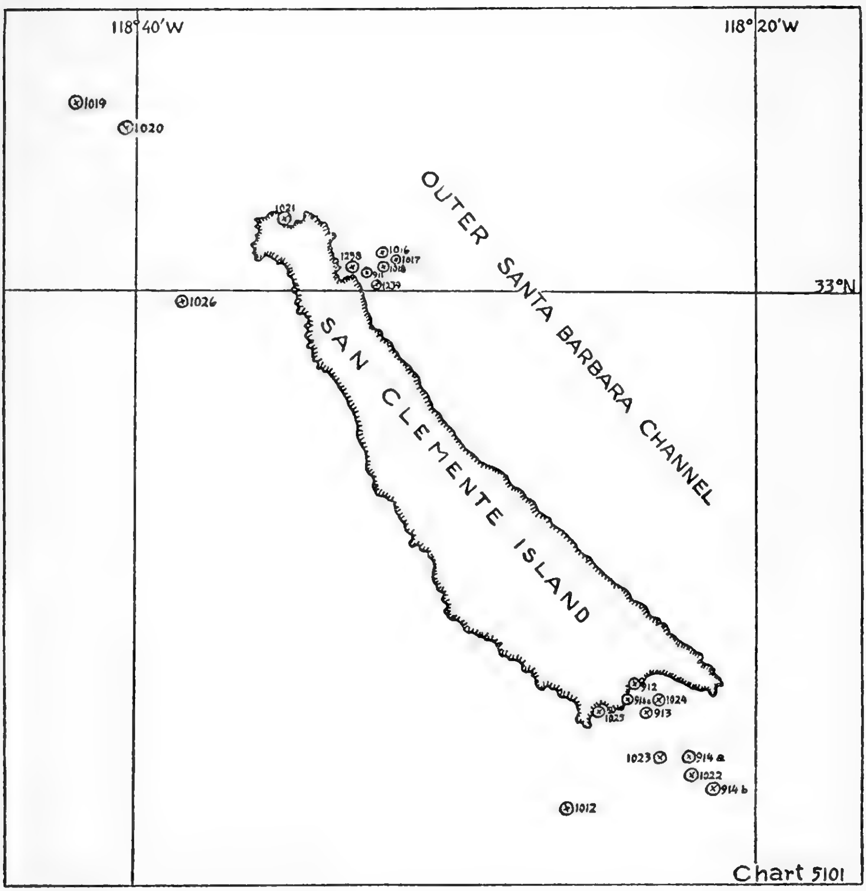


Chart 31

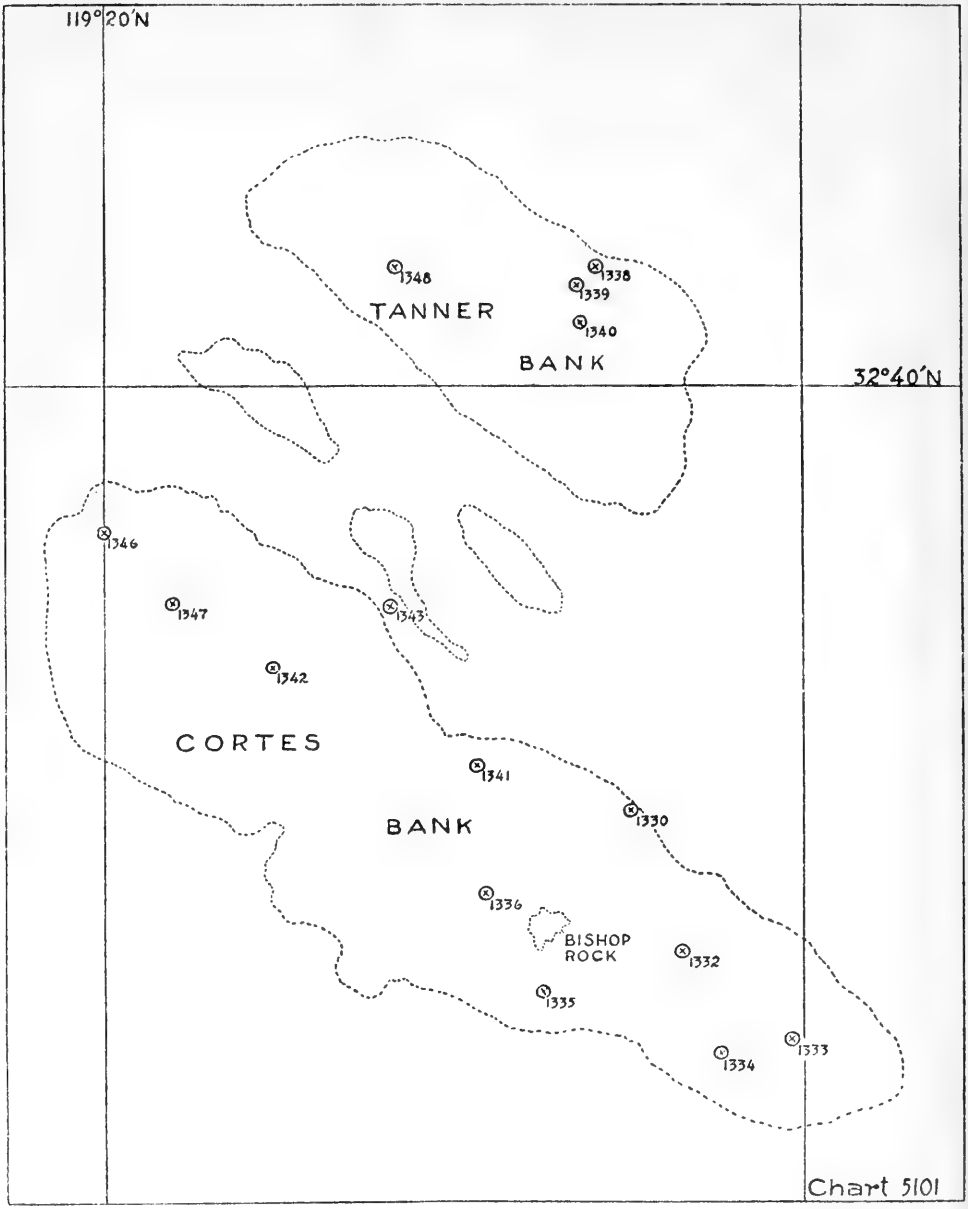

119°20′N
32°40′N
TANNER
BANK
1348
1338
1339
1340
CORTES
BANK
1346
1347
1343
1342
1341
1330
1336
BISHOP
ROCK
1332
1335
1334
1333
Chart 5101

Chart 32

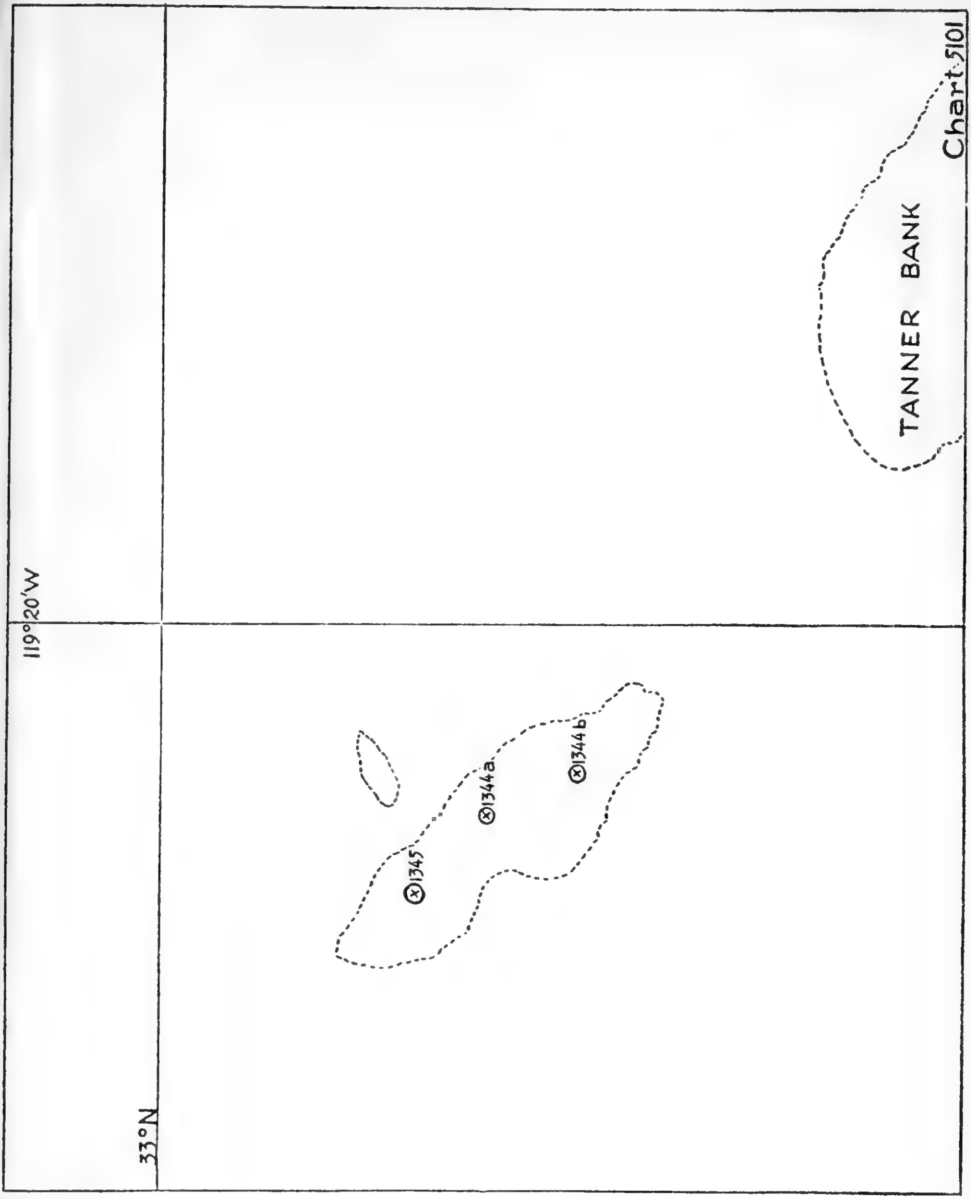


Chart 33

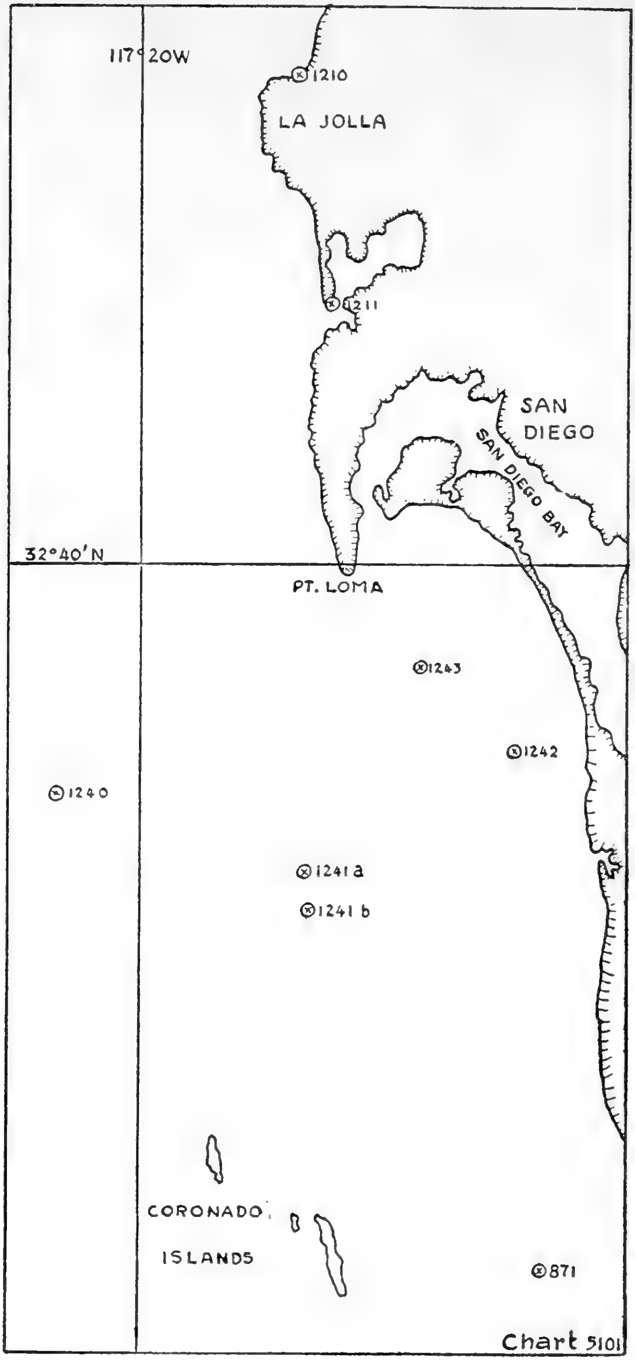

117° 20W
1210
LA JOLLA
1211
SAN
DIEGO
SAN DIEGO BAY
32°40'N
PT. LOMA
1243
1242
1240
1241 a
1241 b
CORONADO
ISLANDS
871
Chart 5101

Chart 34

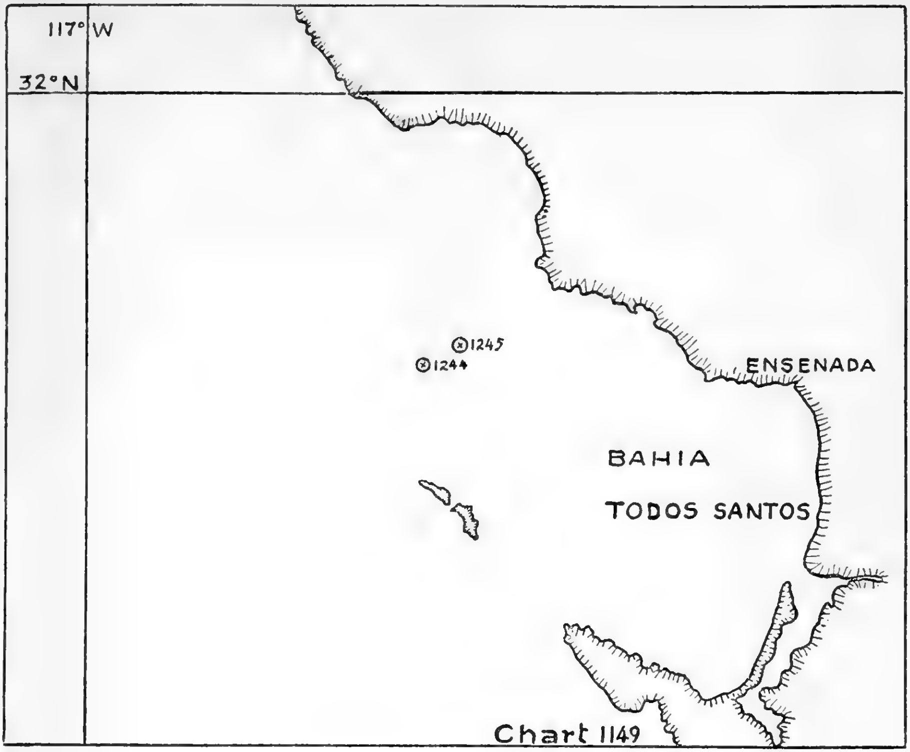


Chart 35

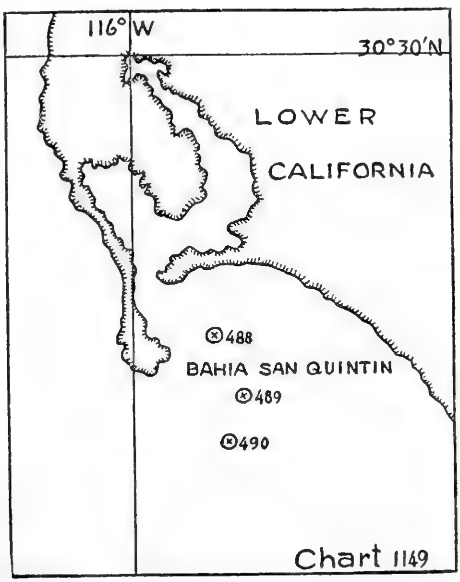


Chart 36

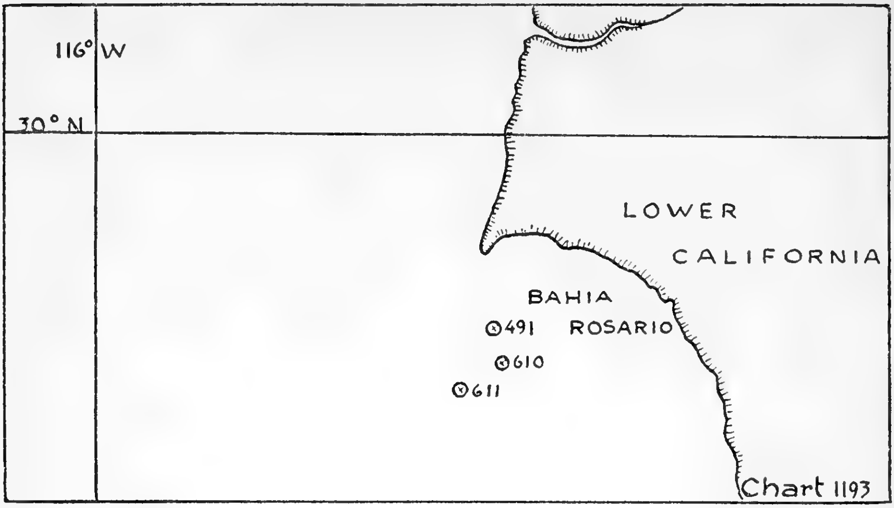


Chart 37

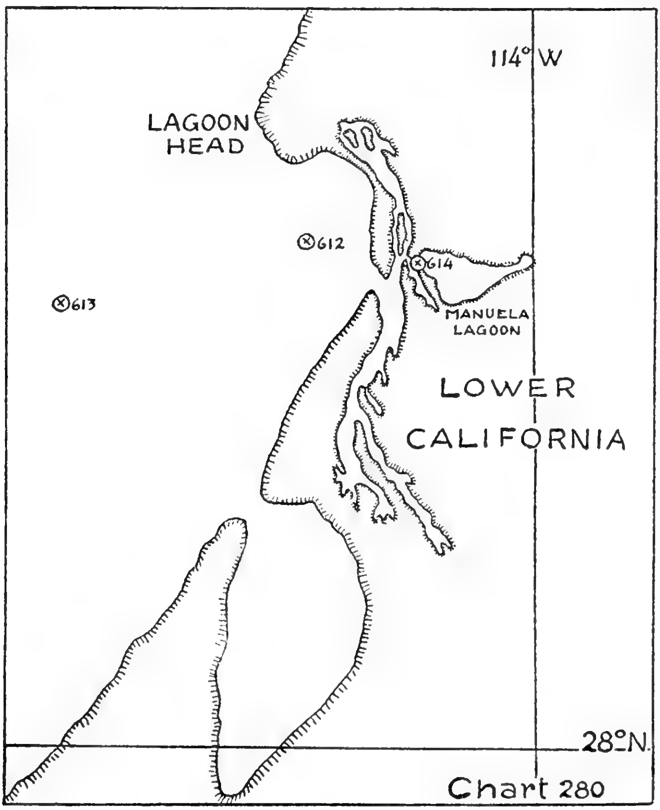


Chart 38

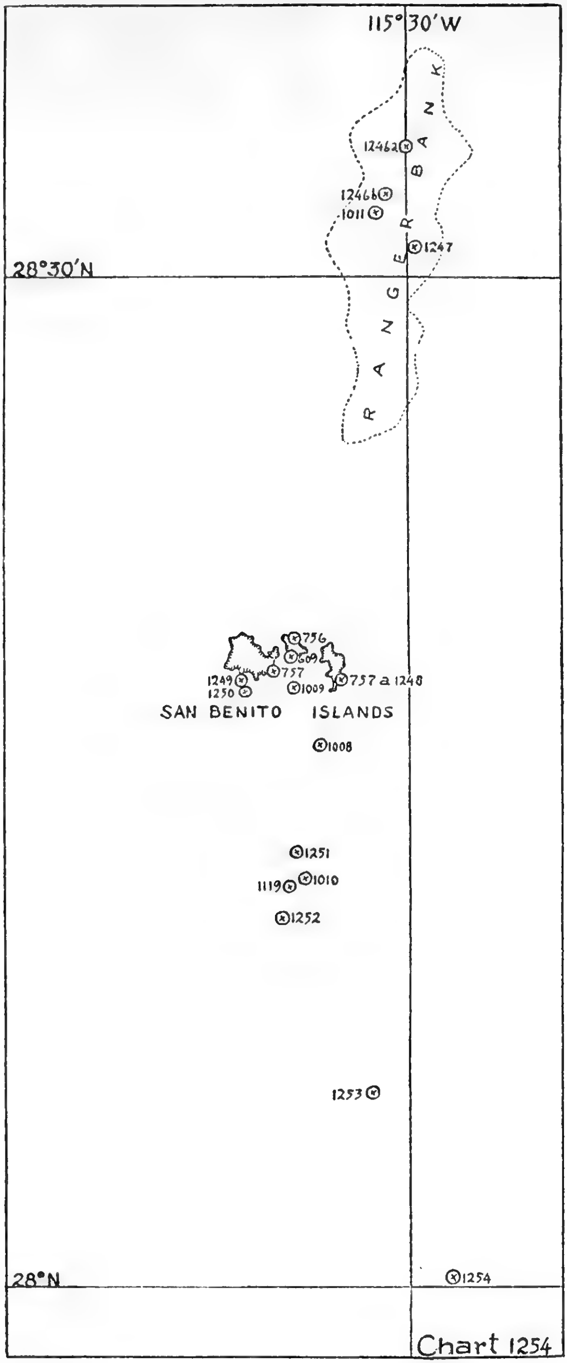

115° 30′ W
RANGER BANK
28°30′N
12462
12466
1011
1247
756
509
757
757 a 1248
1249
1250
1009
SAN BENITO ISLANDS
1008
1251
1119
1010
1252
1253
28°N
1254
Chart 1254

Chart 39

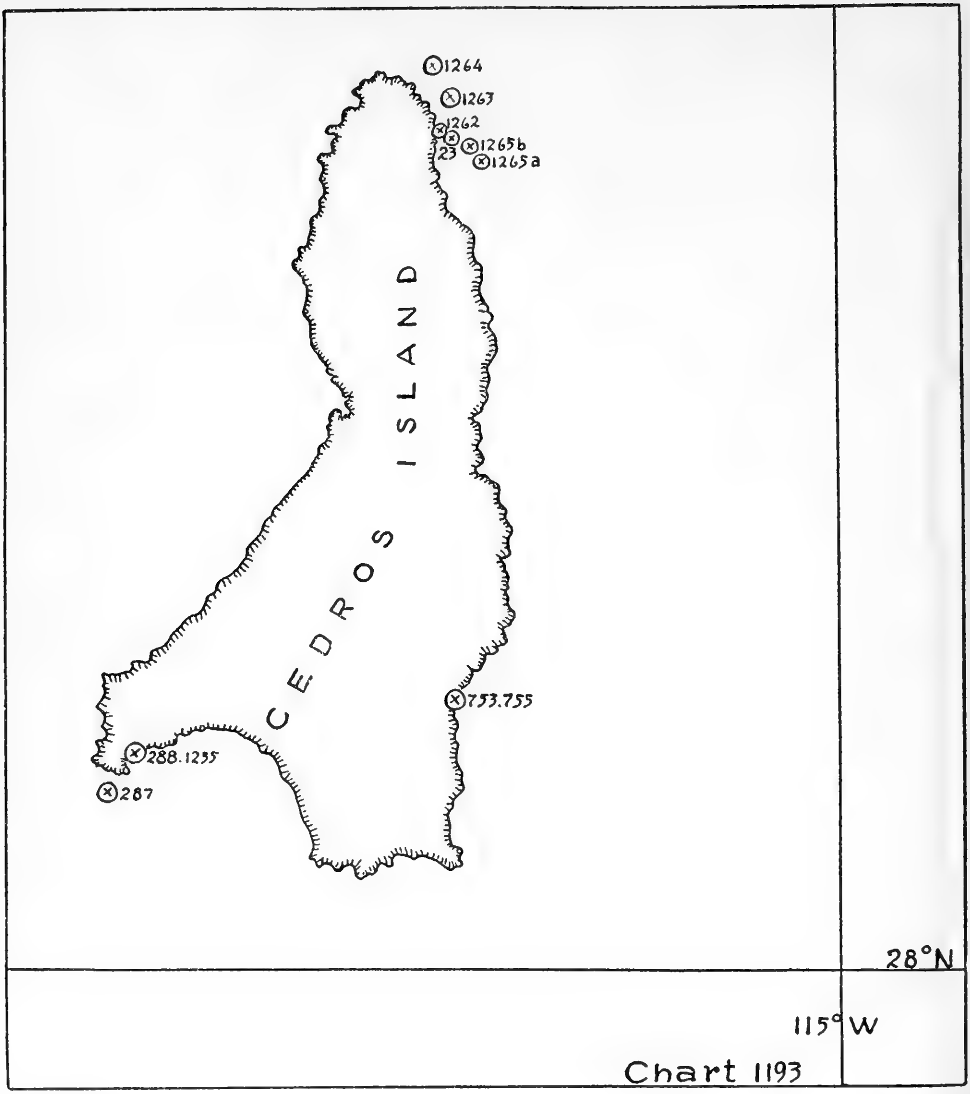
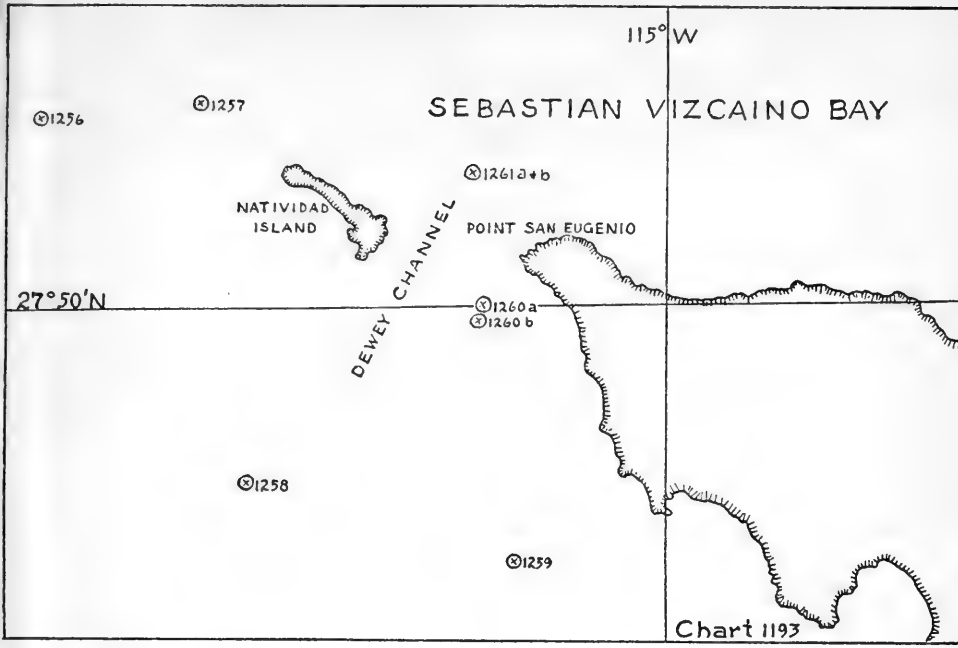

1264
1263
1262
1265b
23
1265a
ISLAND
CEDROS
753.755
288.1255
287
28°N
115°W
Chart 1193

Chart 40



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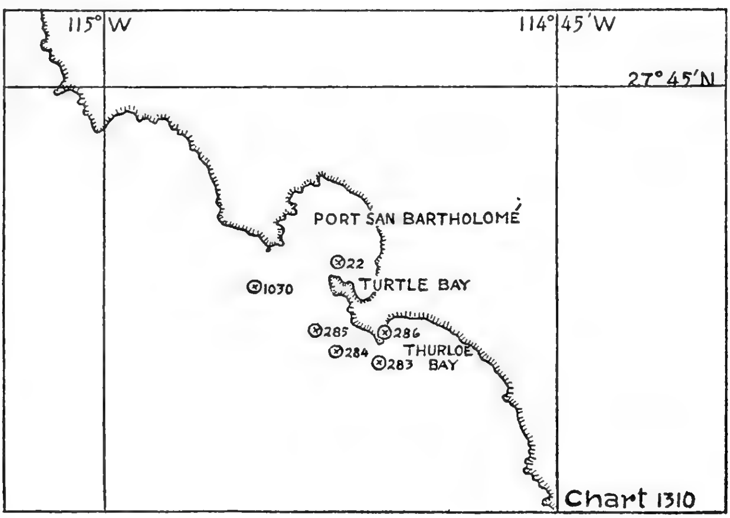

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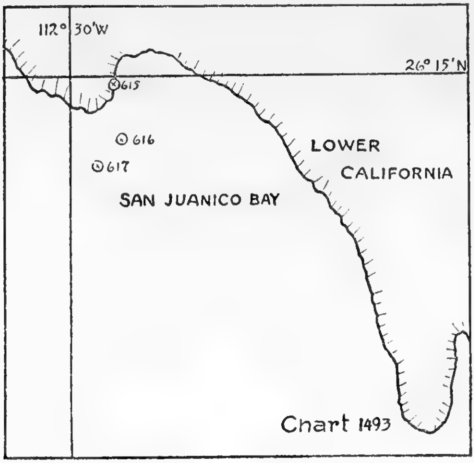

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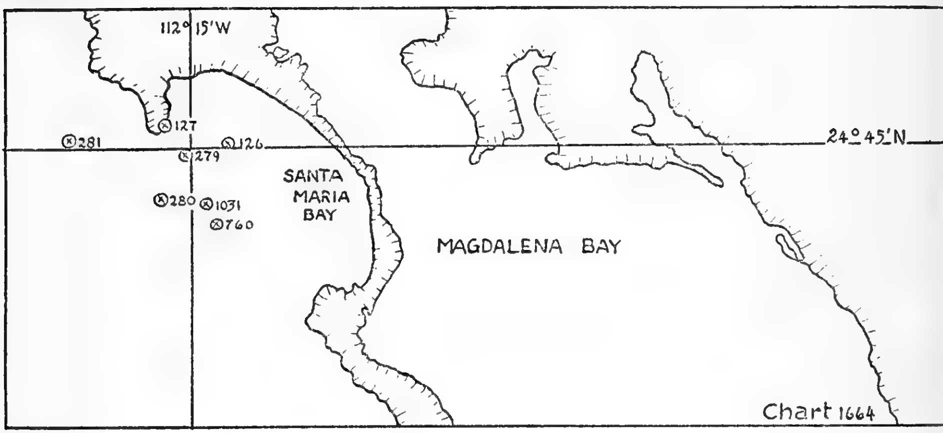

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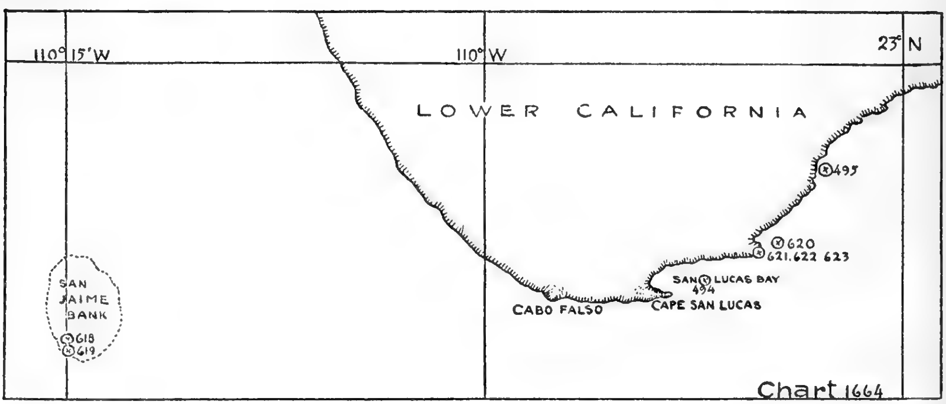

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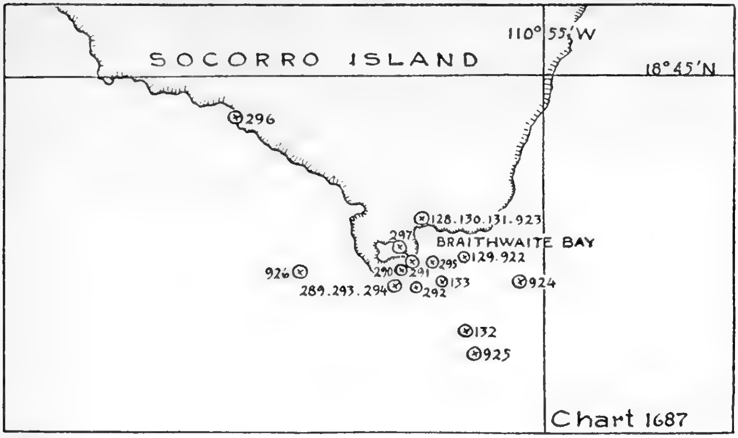

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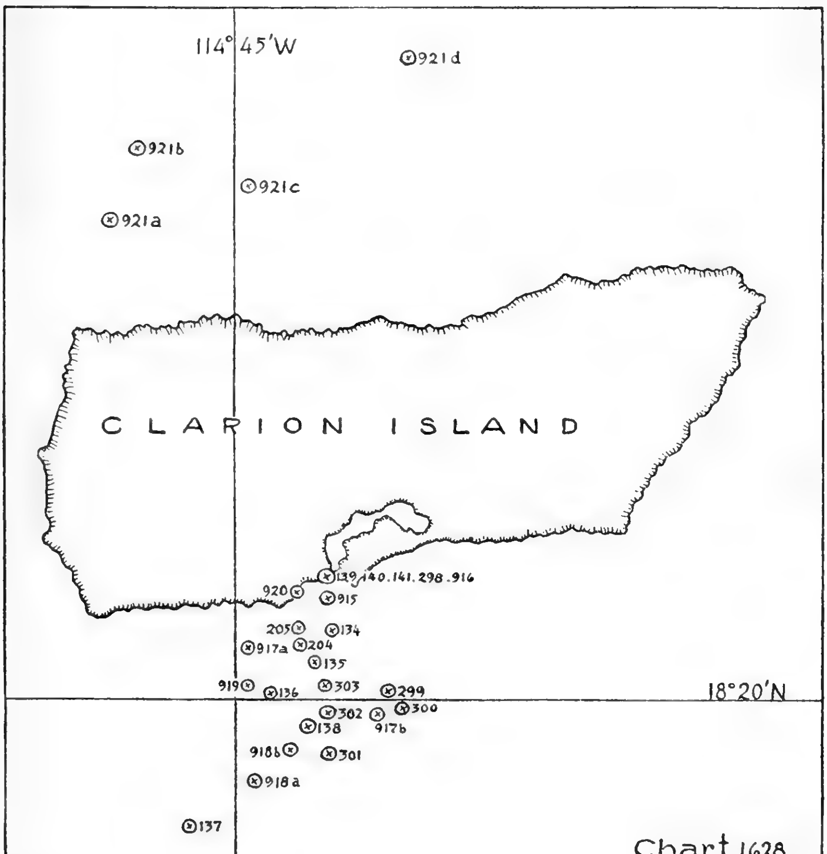

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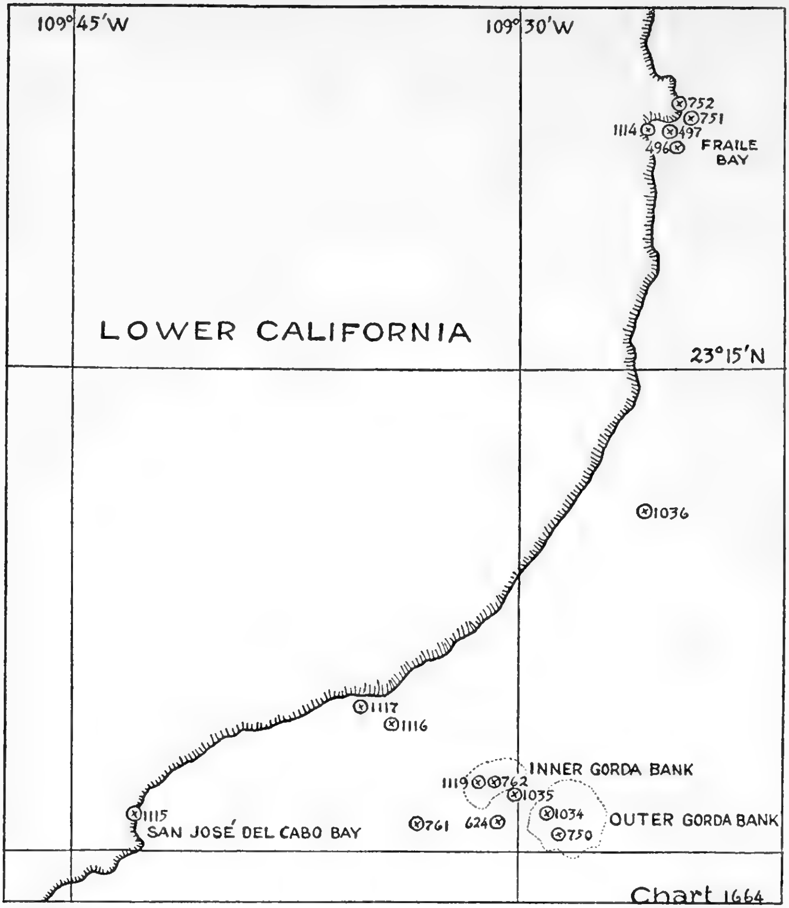

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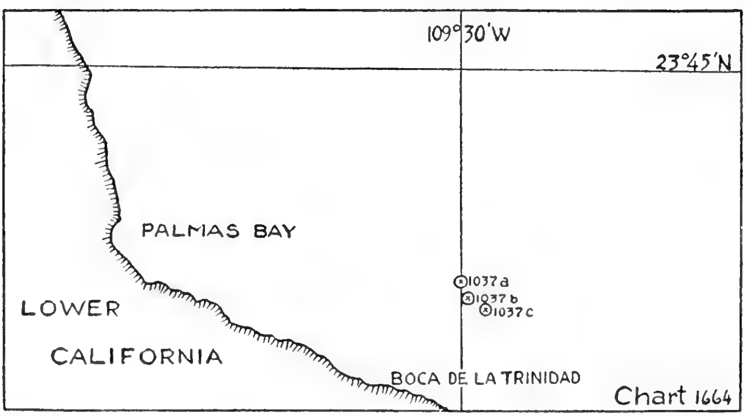

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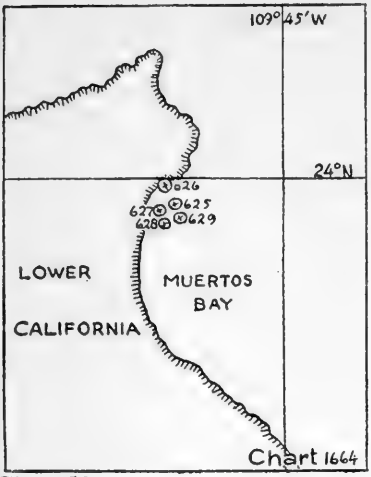

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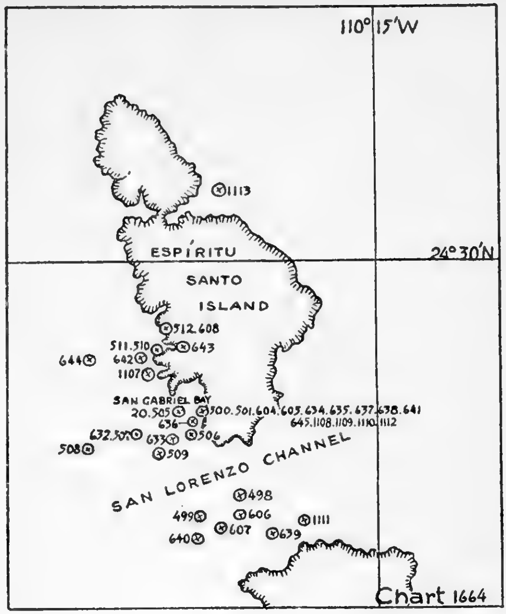

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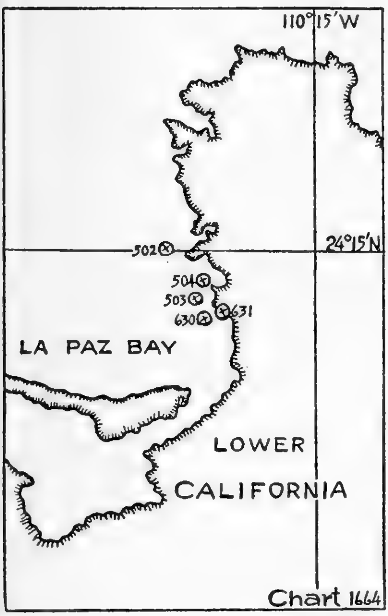

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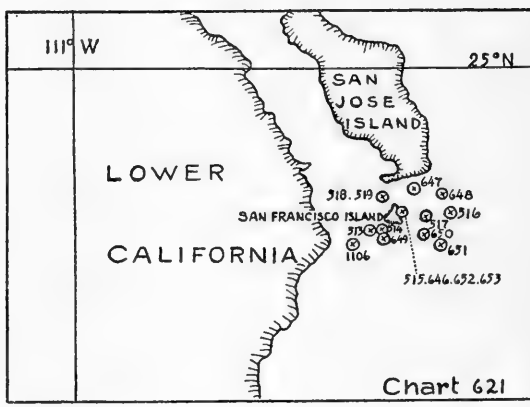

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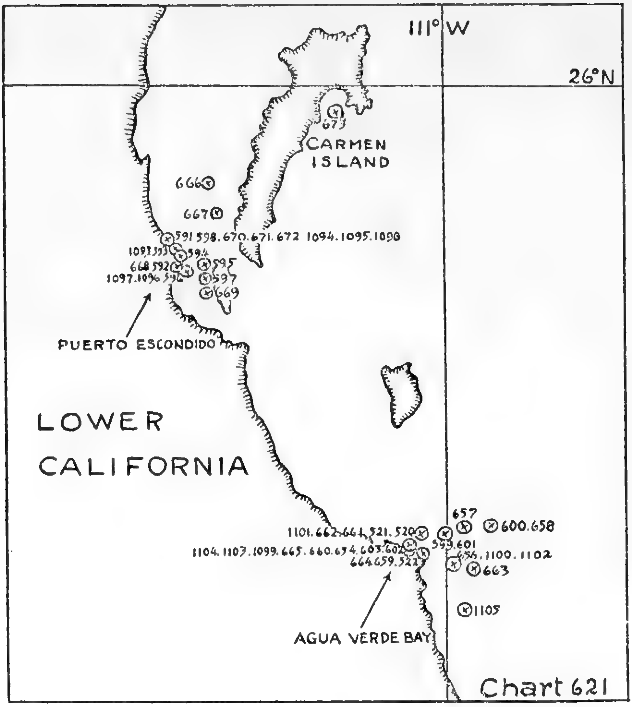

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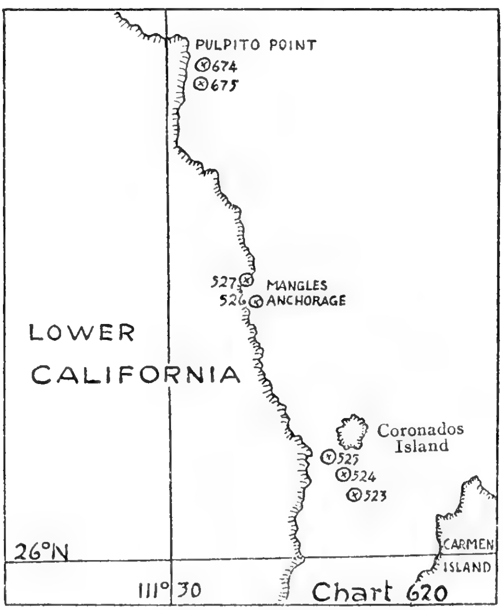

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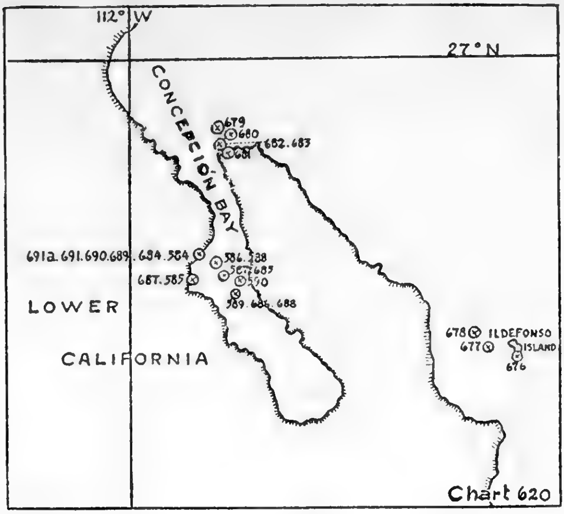

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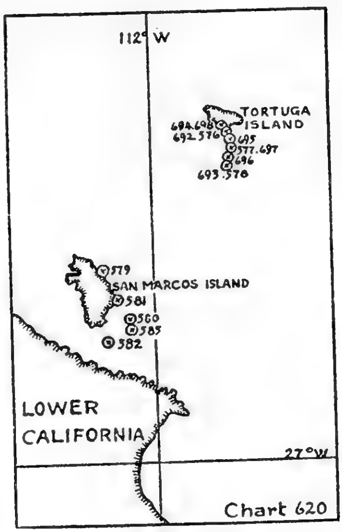

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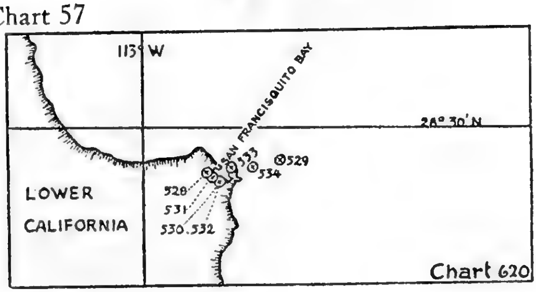

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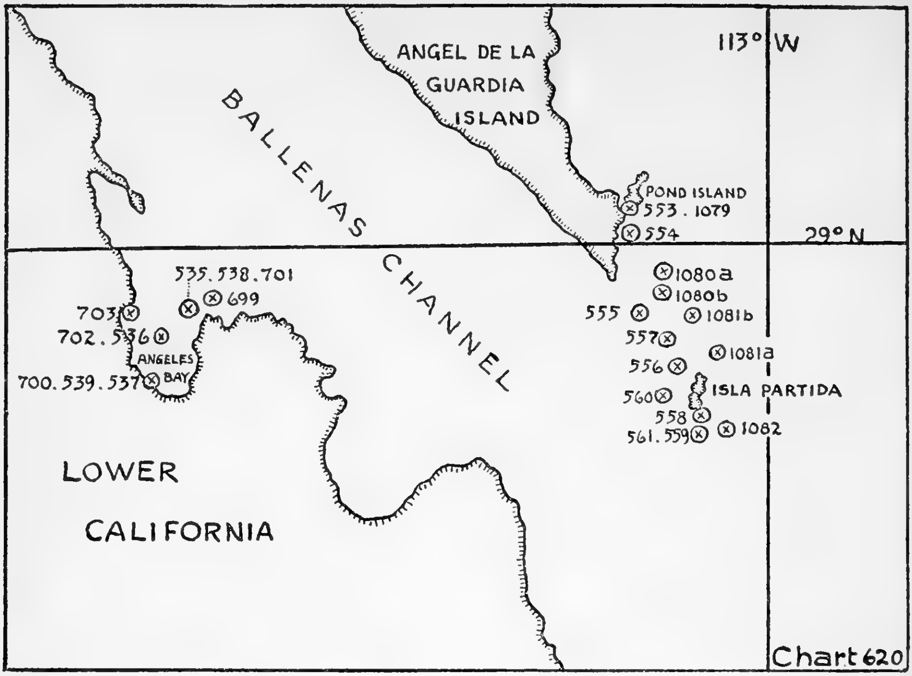

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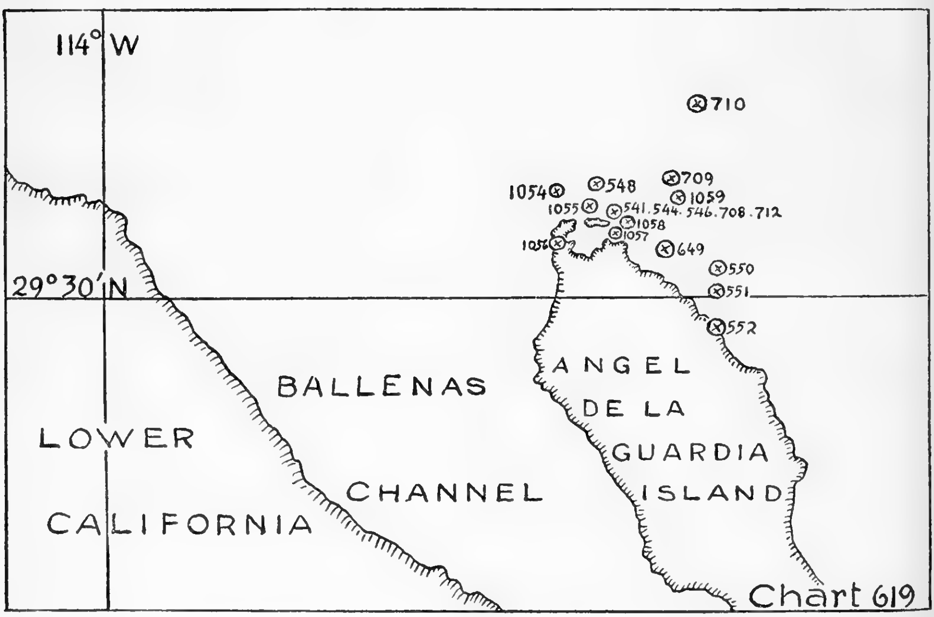

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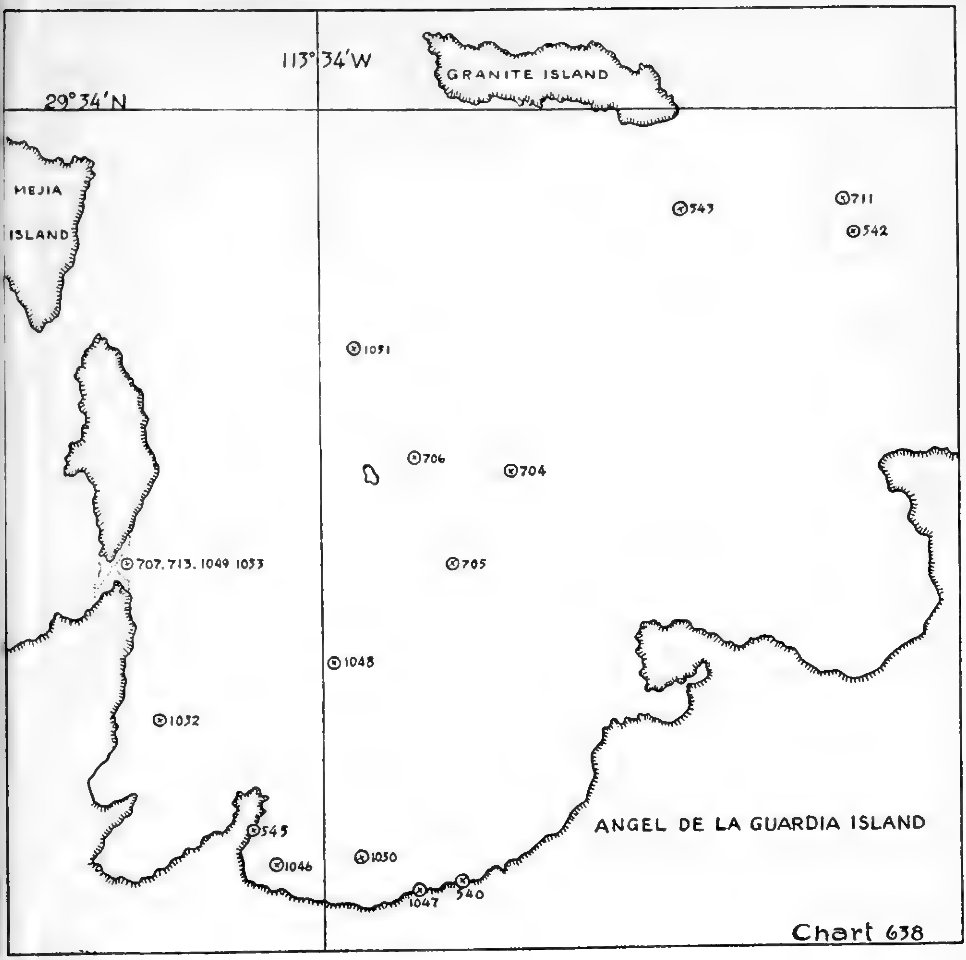
113°34'W
29°34'N
GRANITE ISLAND
MEJIA
ISLAND
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711
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1051
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707, 713, 1049 1053
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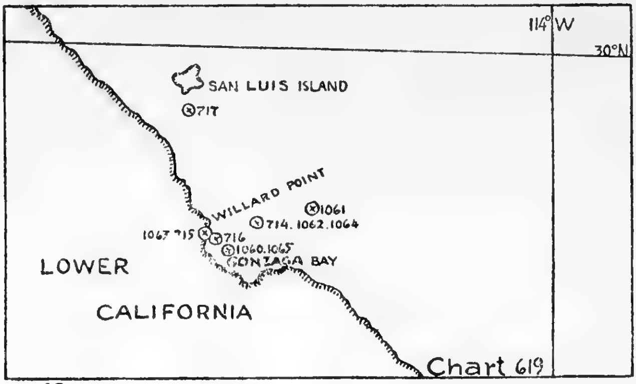
540
ANGEL DE LA GUARDIA ISLAND
Chart 638

Chart 61



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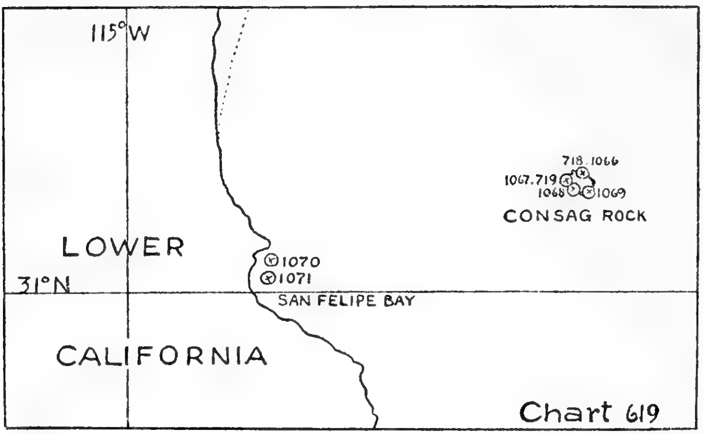

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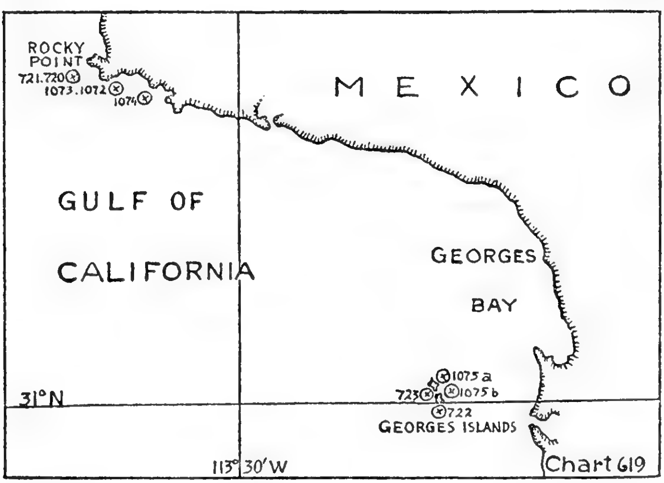

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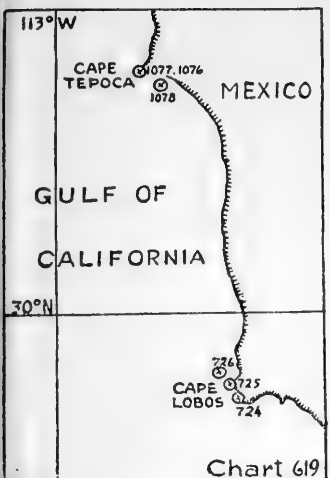

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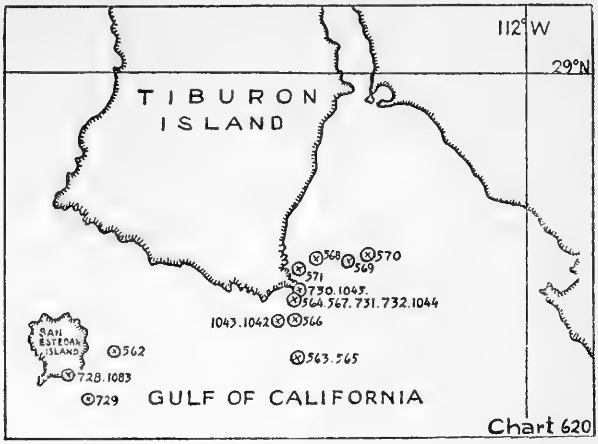

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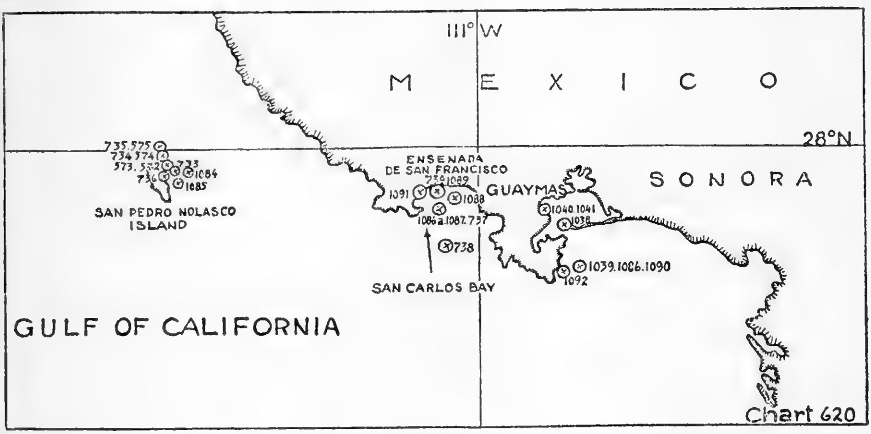

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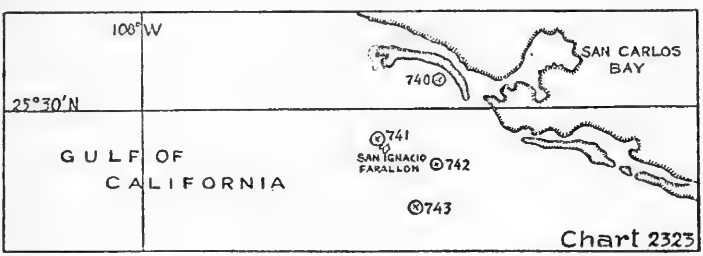

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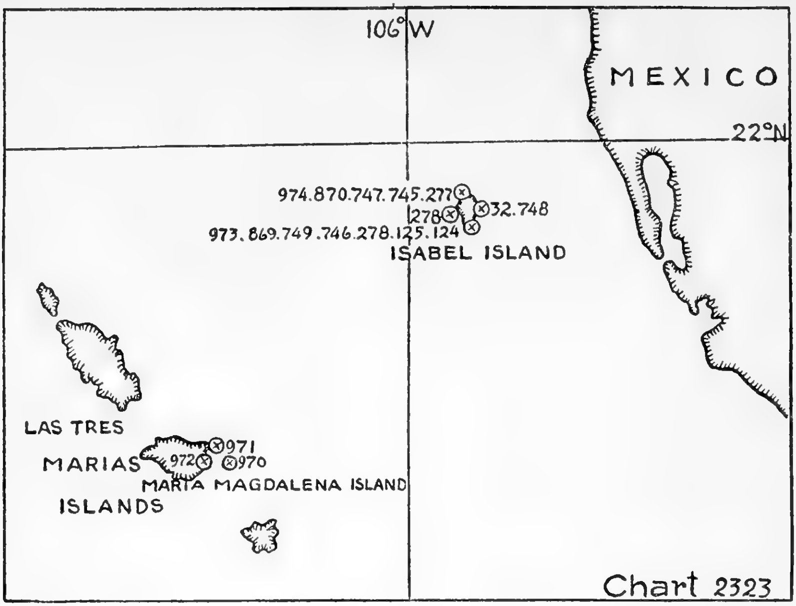

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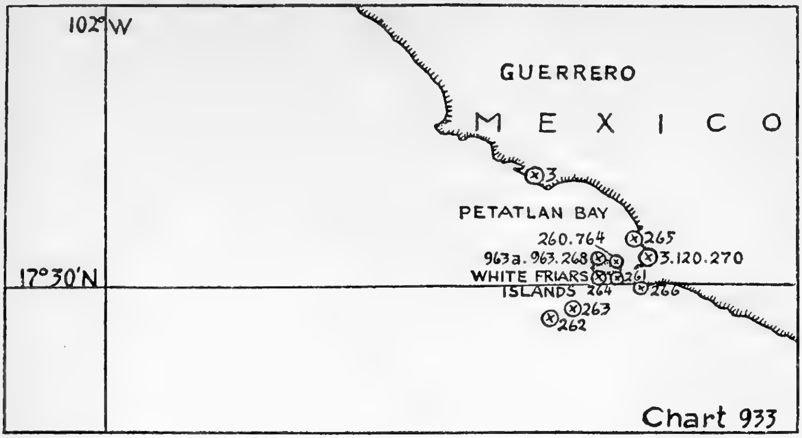

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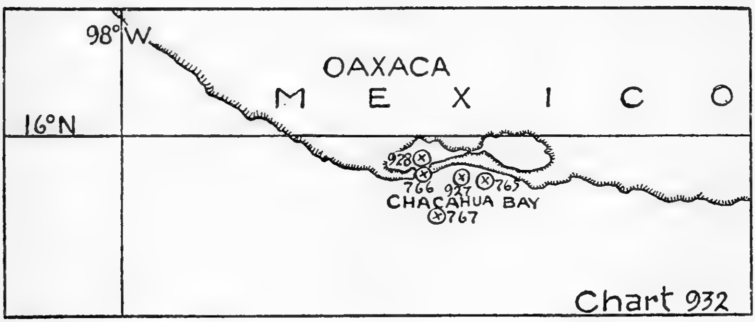

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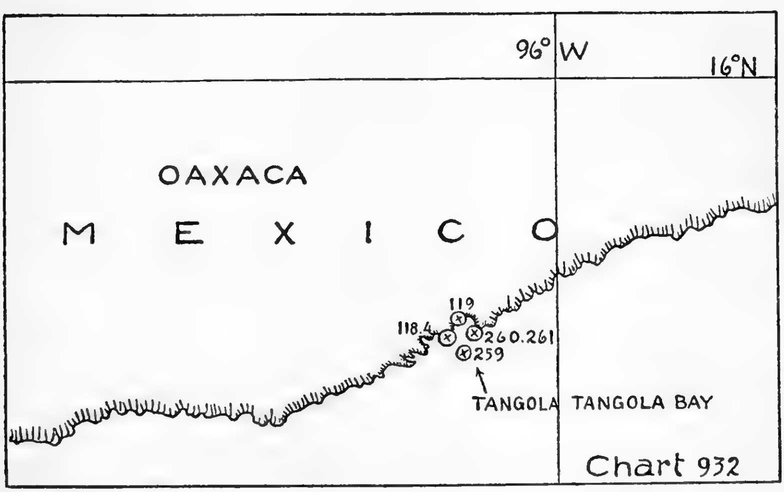

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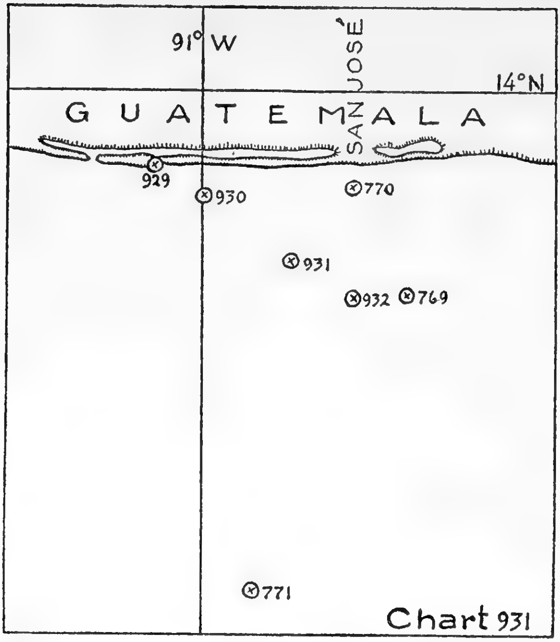

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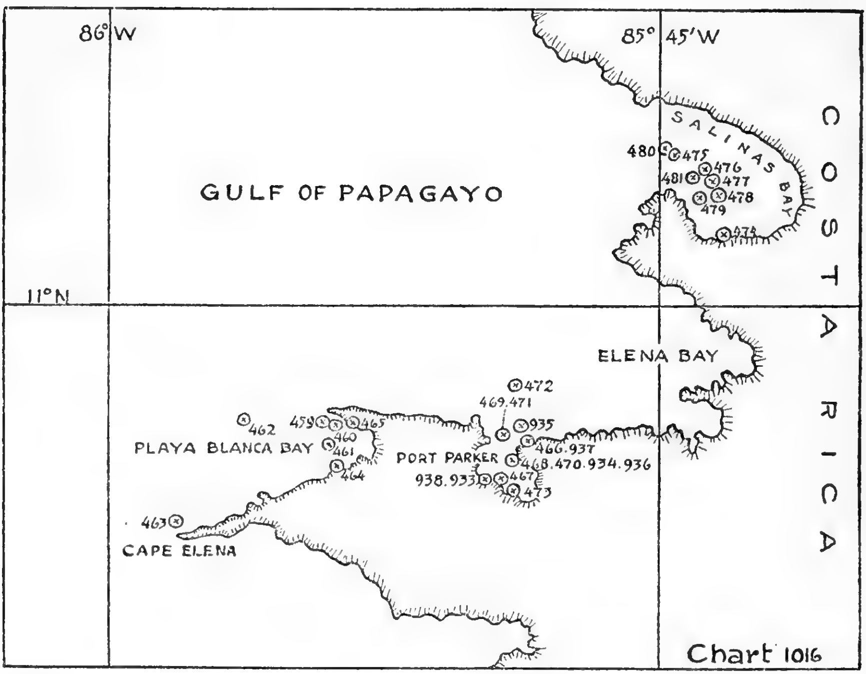

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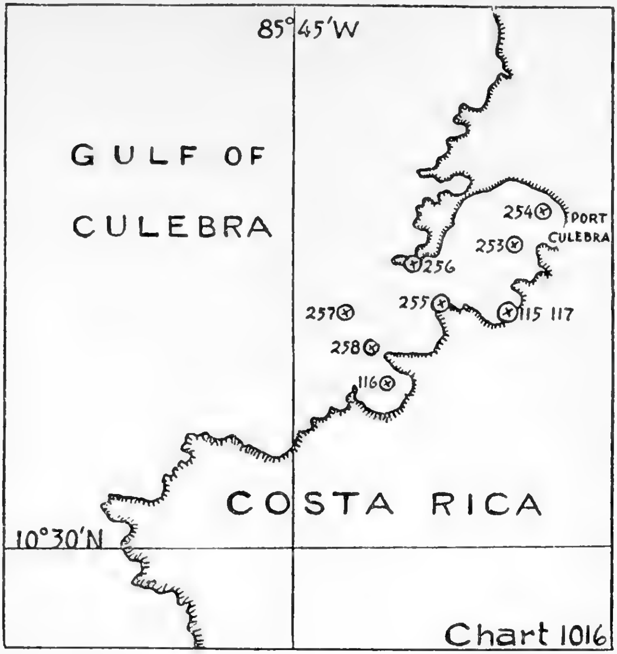

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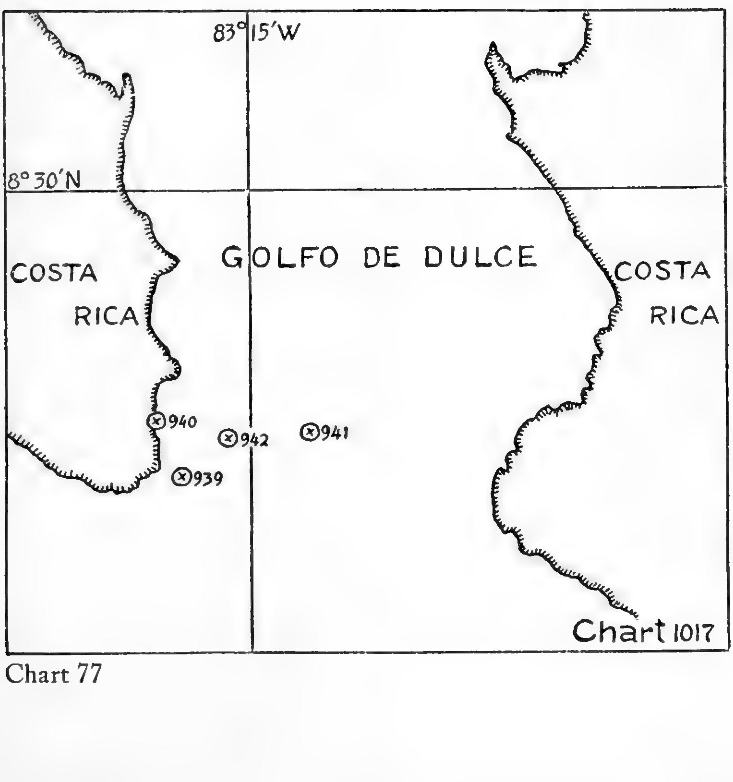

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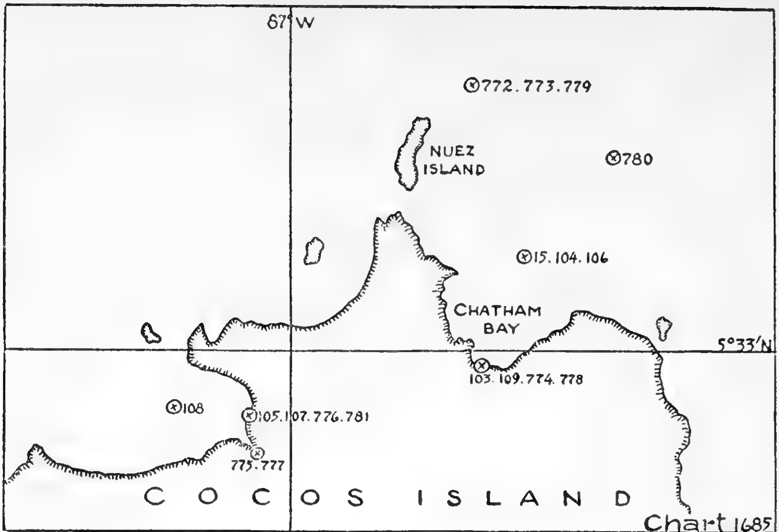

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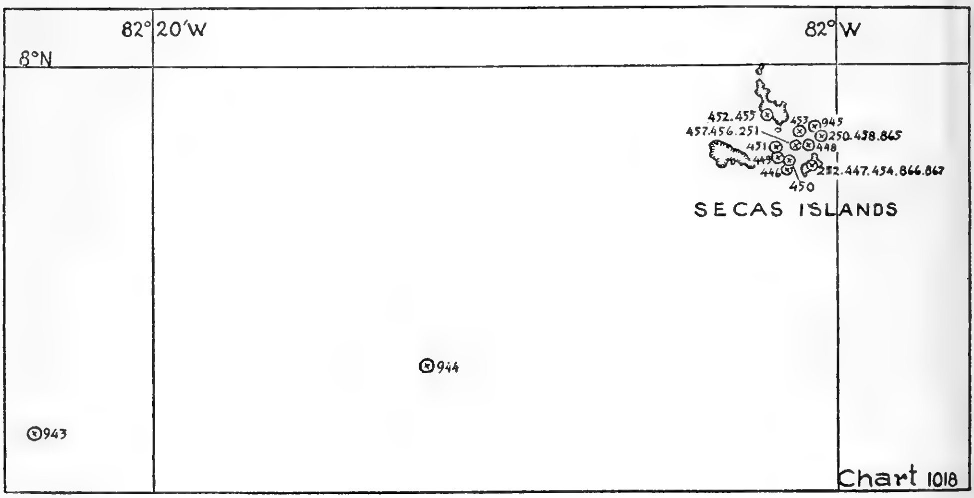

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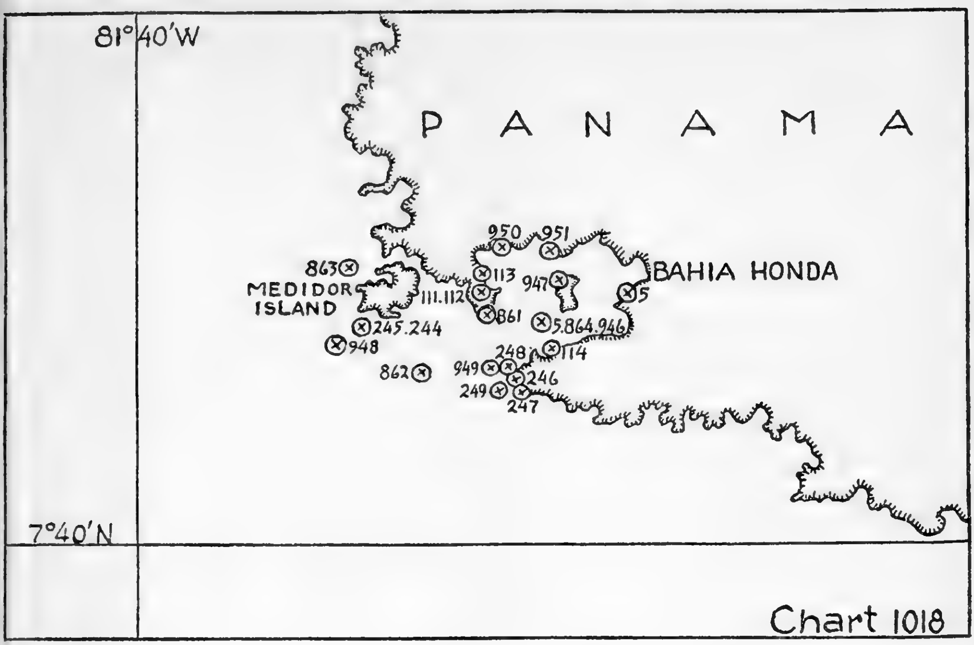

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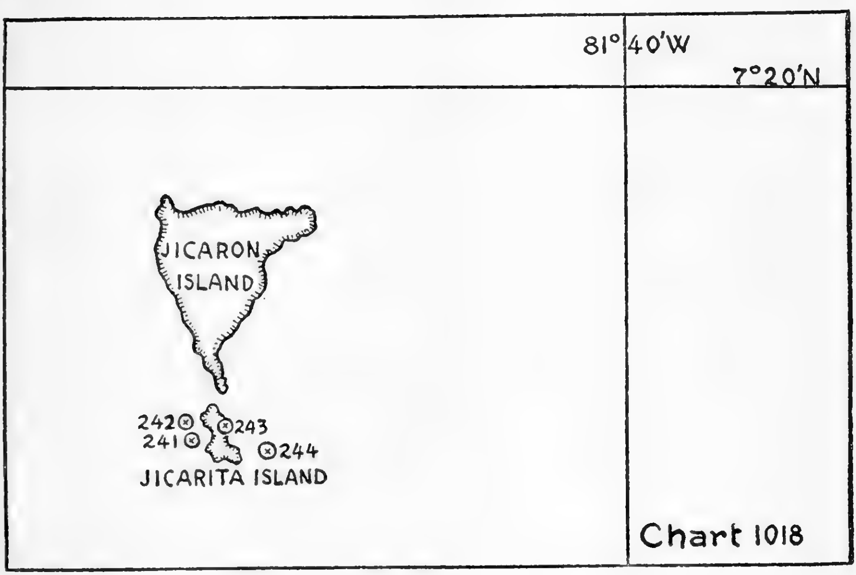

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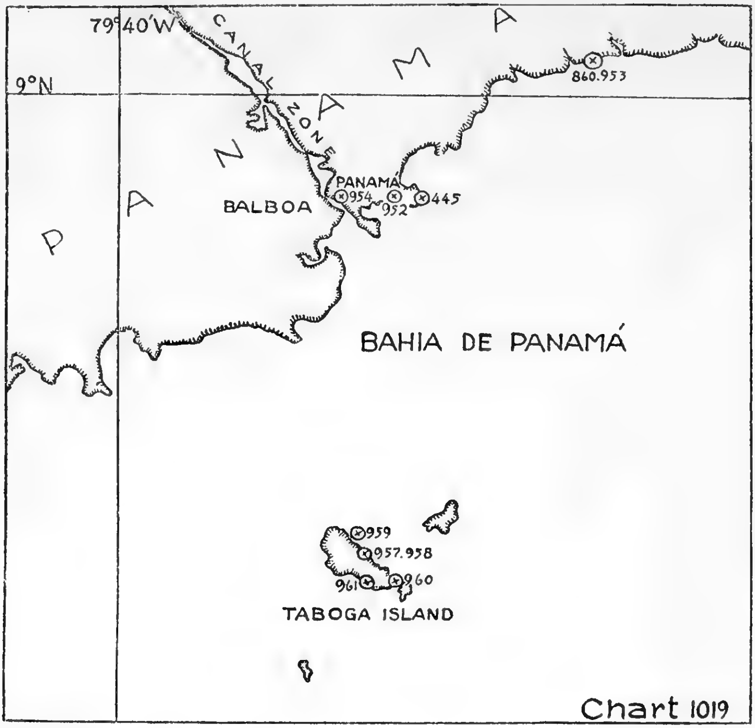

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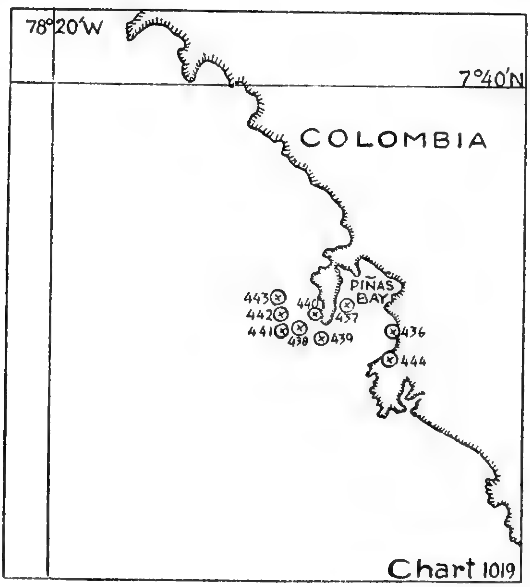

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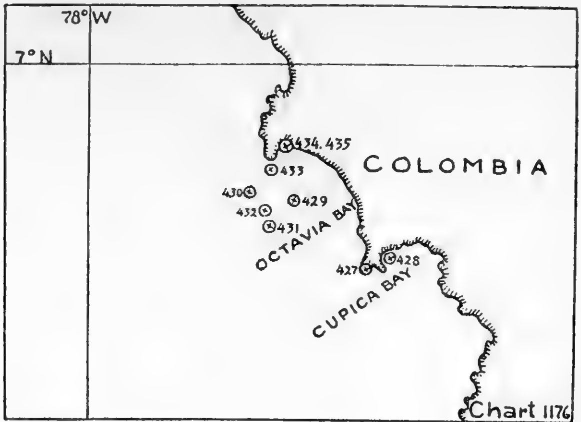

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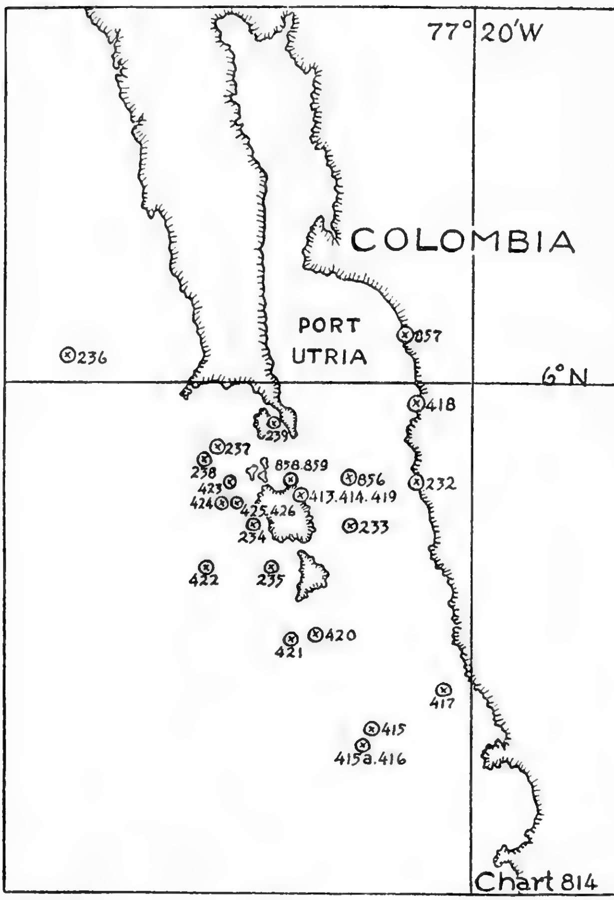

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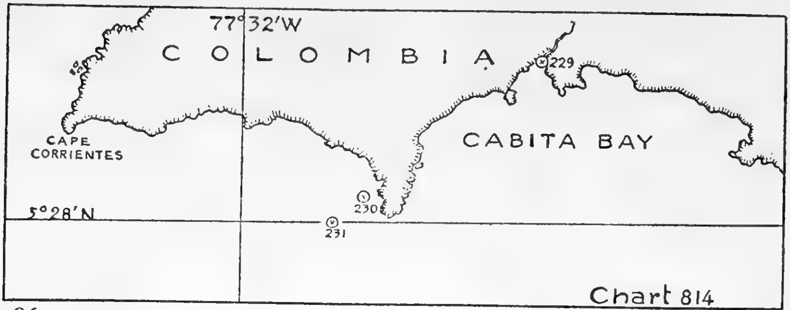

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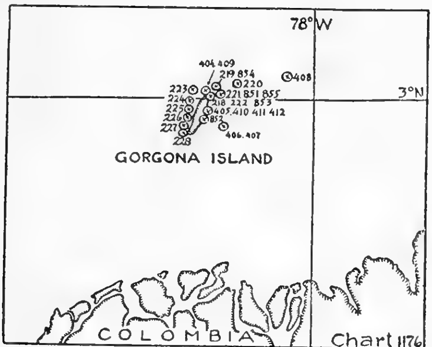

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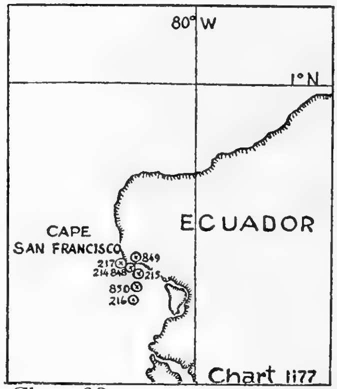

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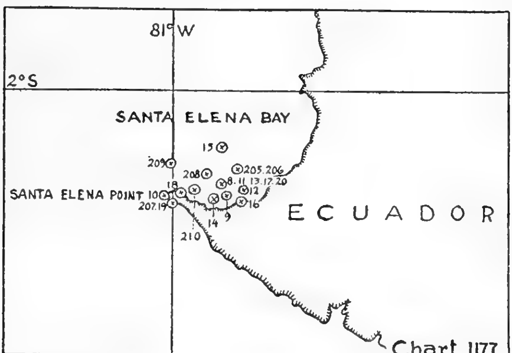

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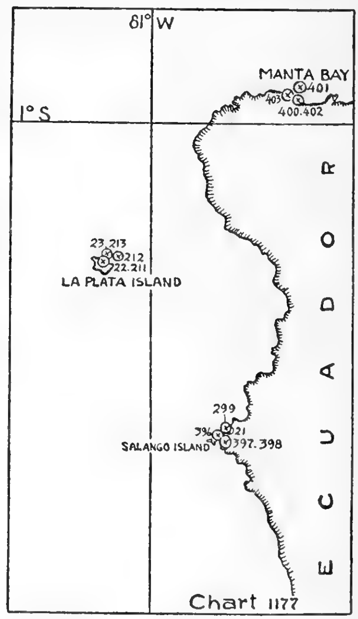

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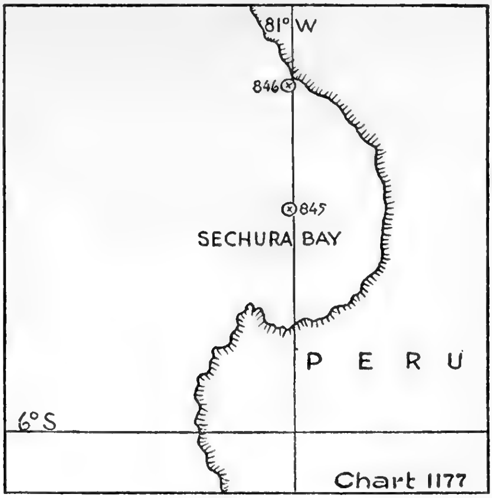

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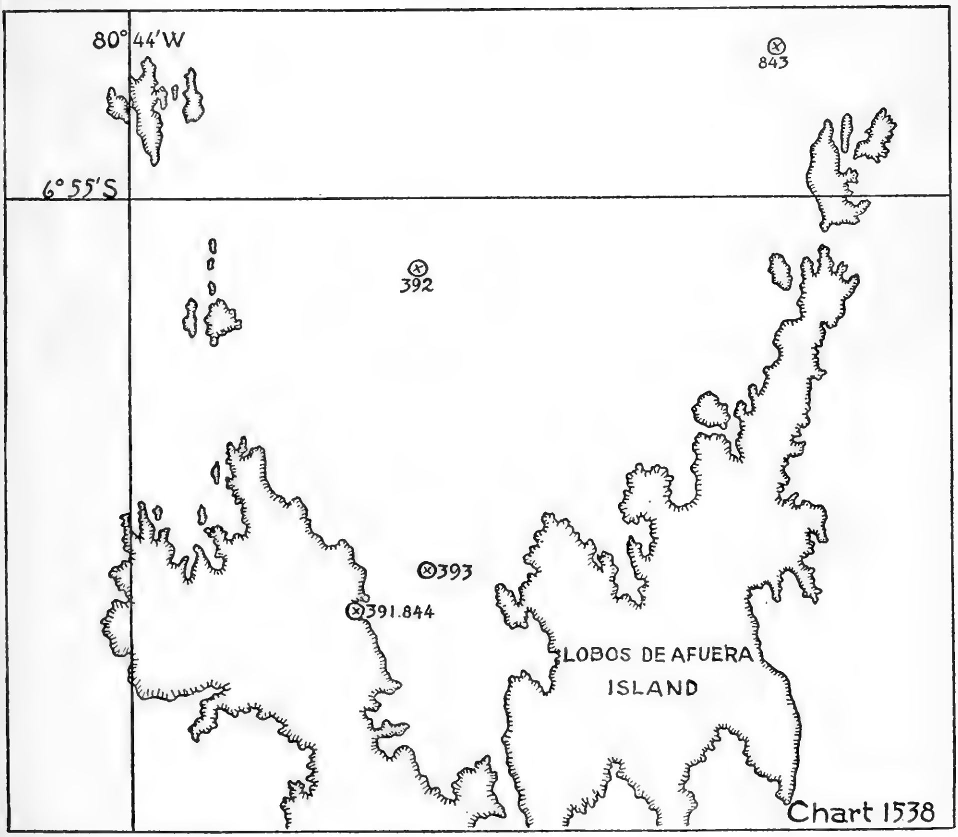

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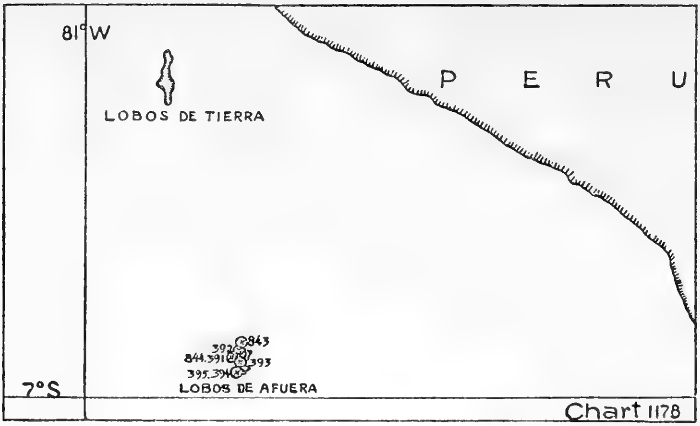

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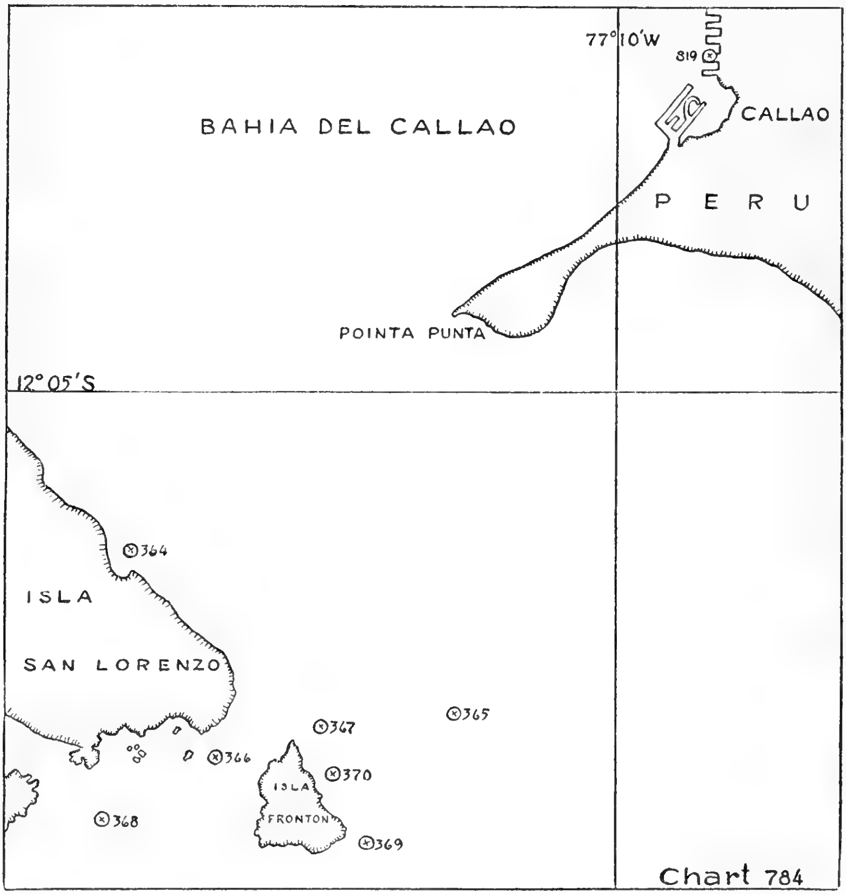

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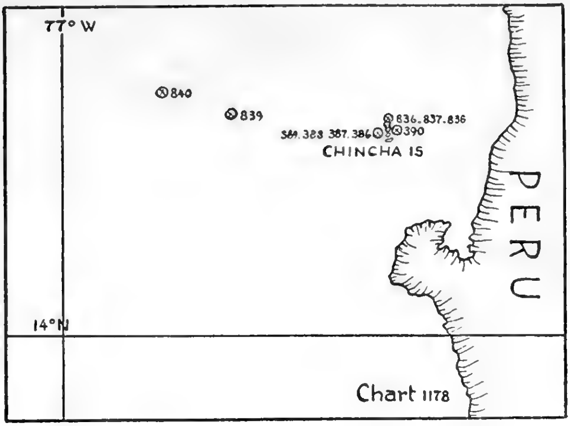

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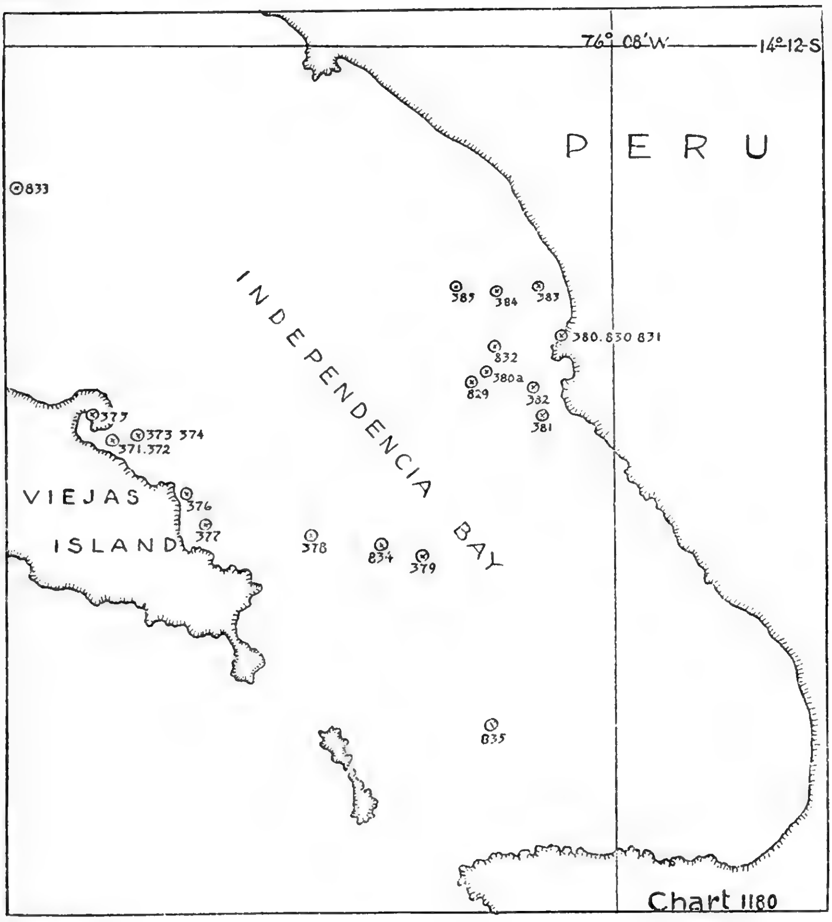

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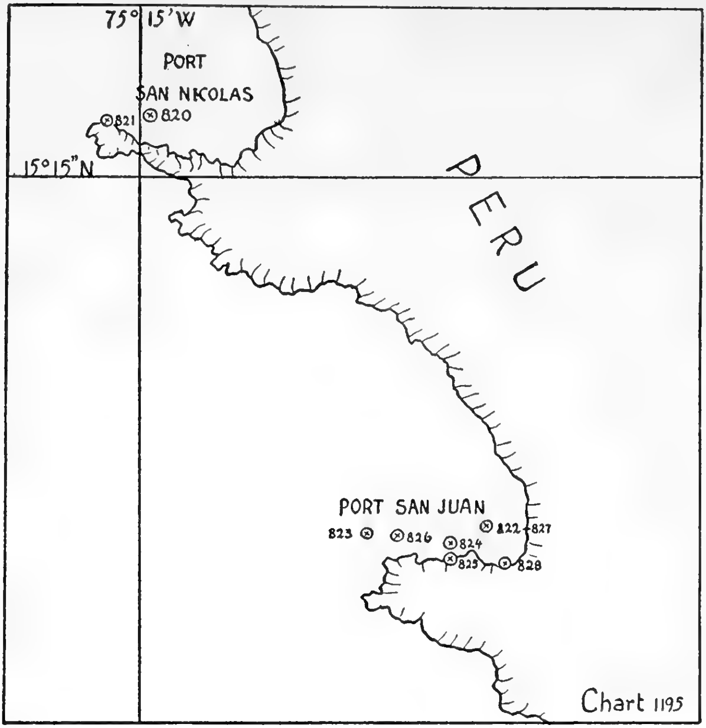

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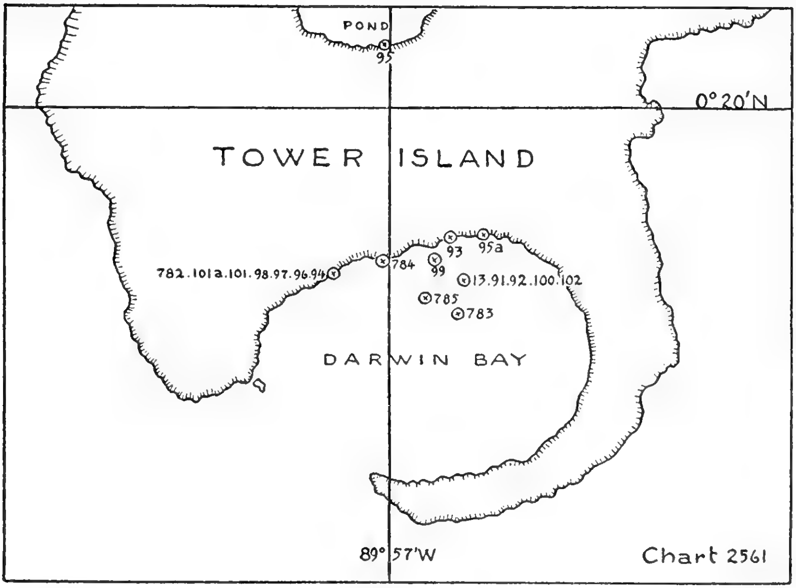

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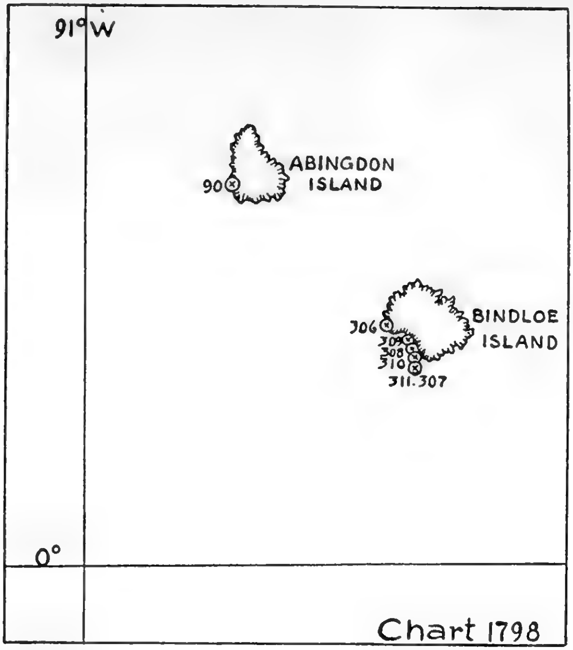

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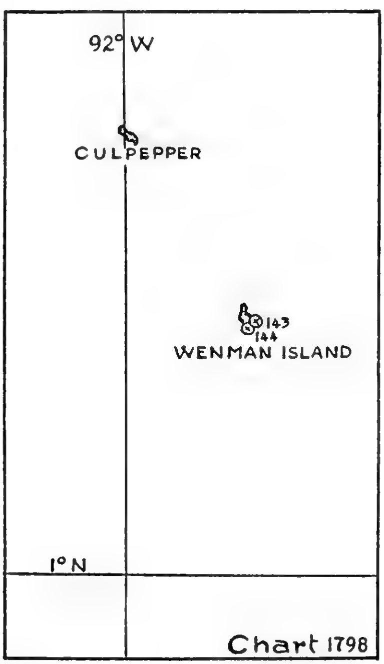

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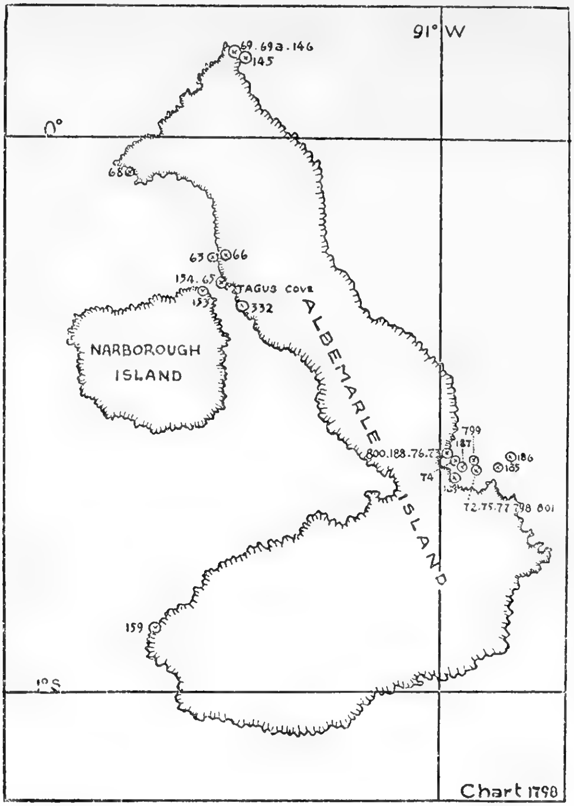

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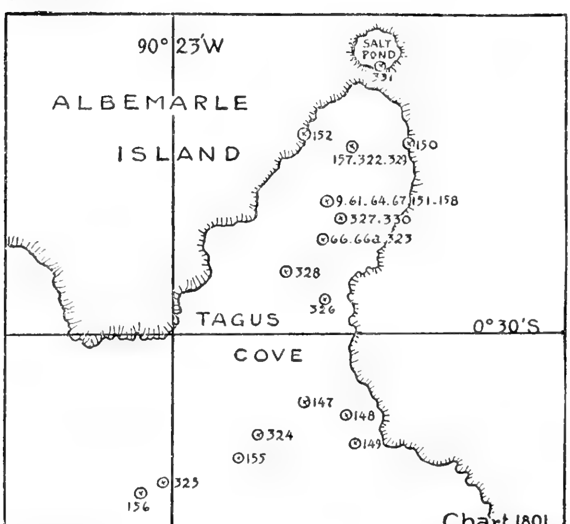

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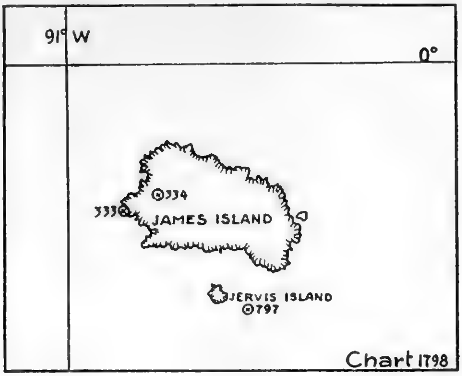

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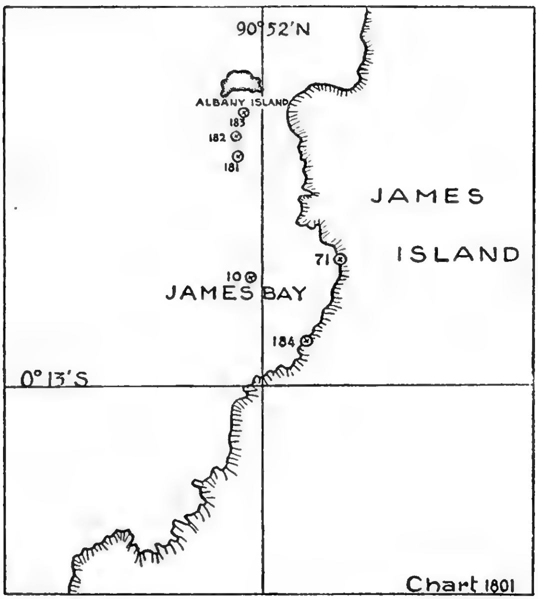

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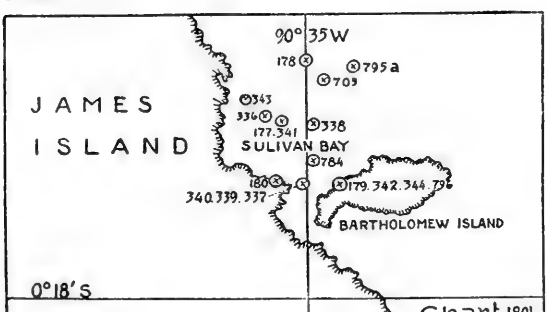

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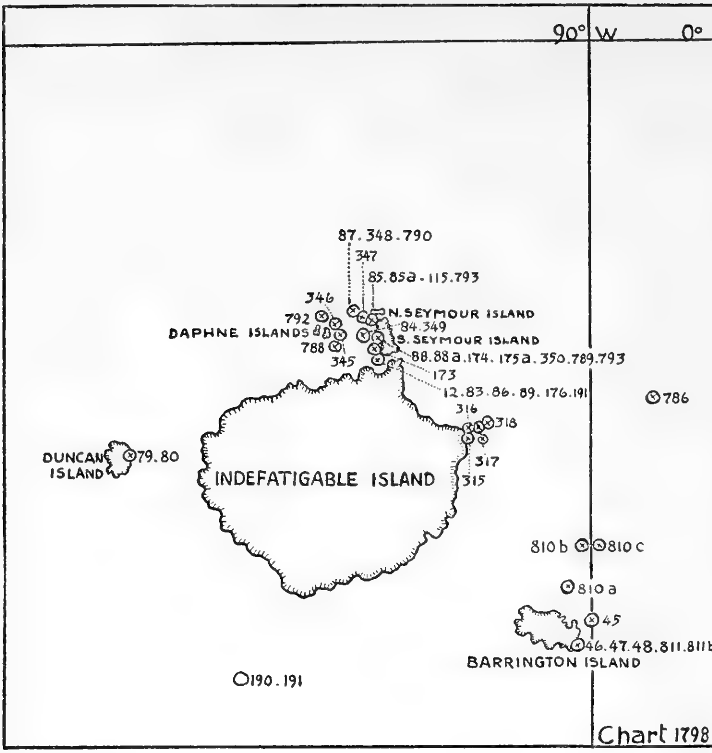

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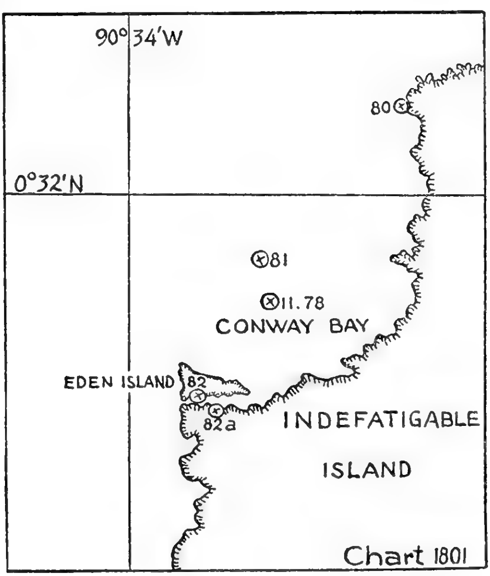

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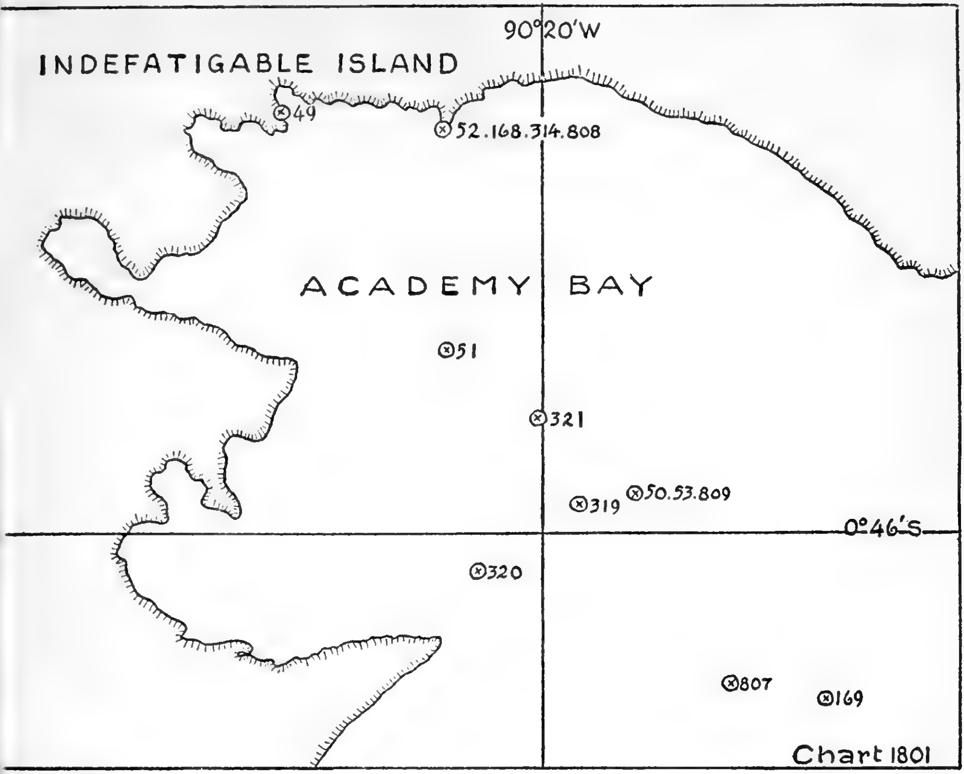

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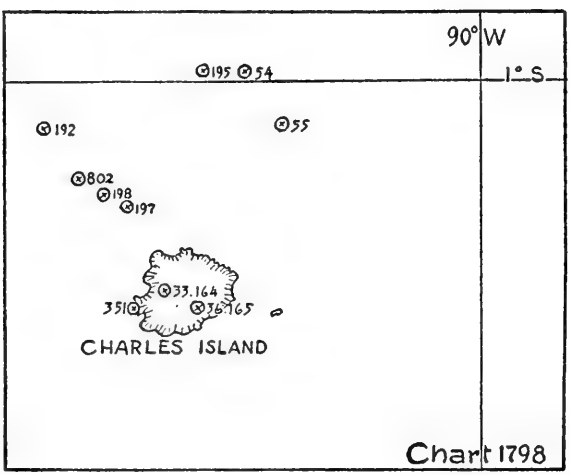

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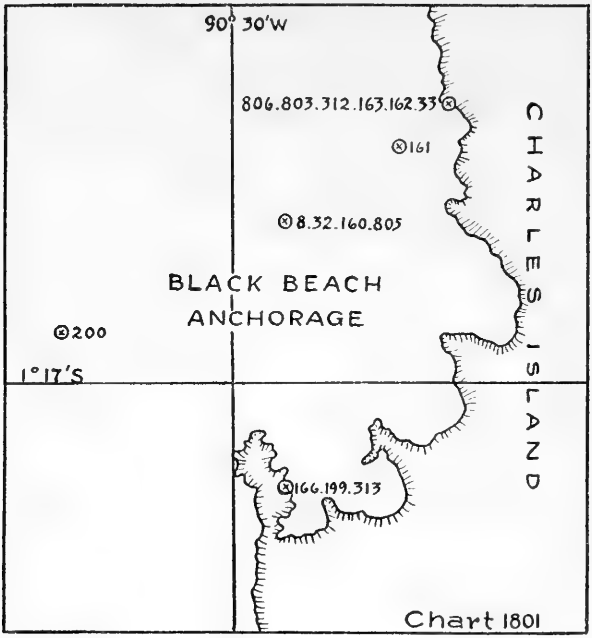

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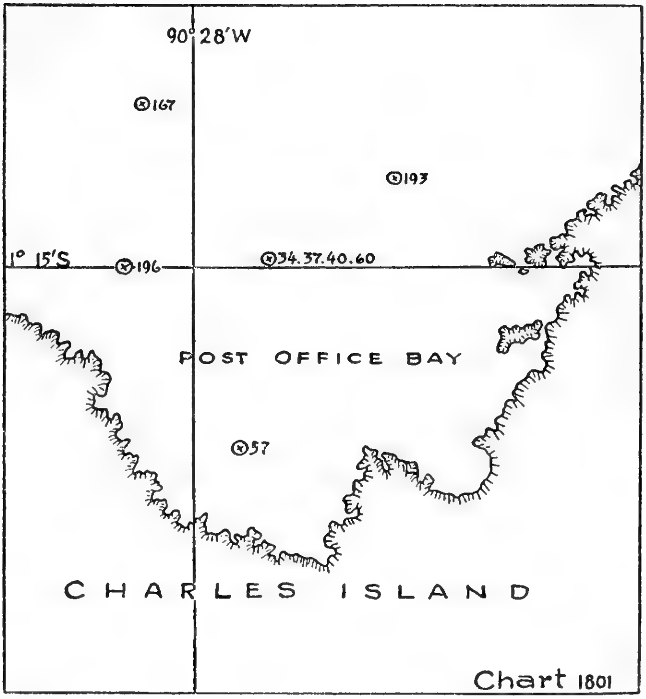

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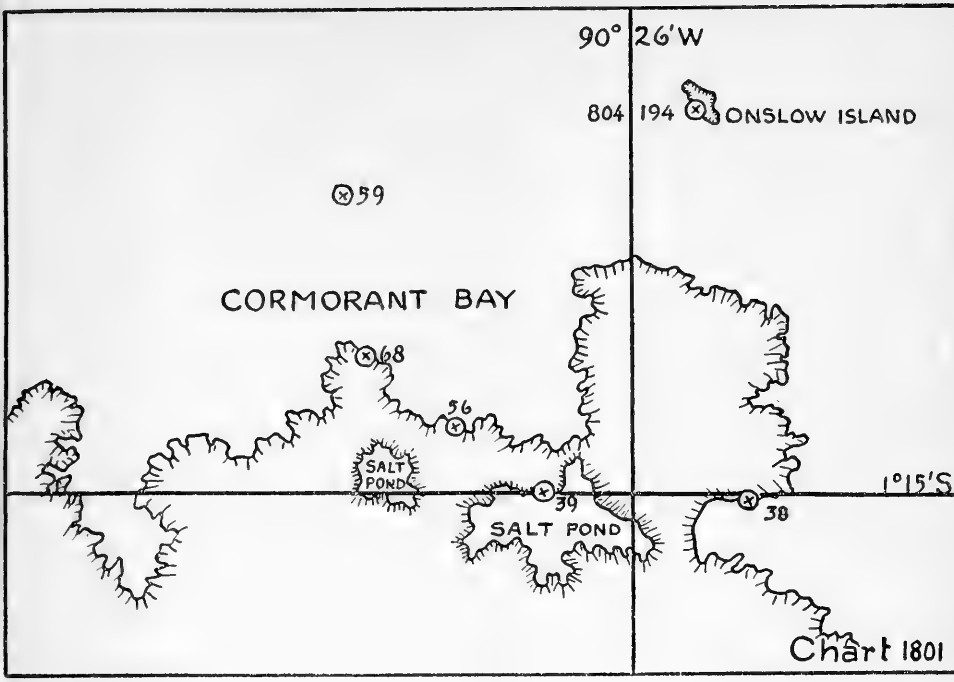

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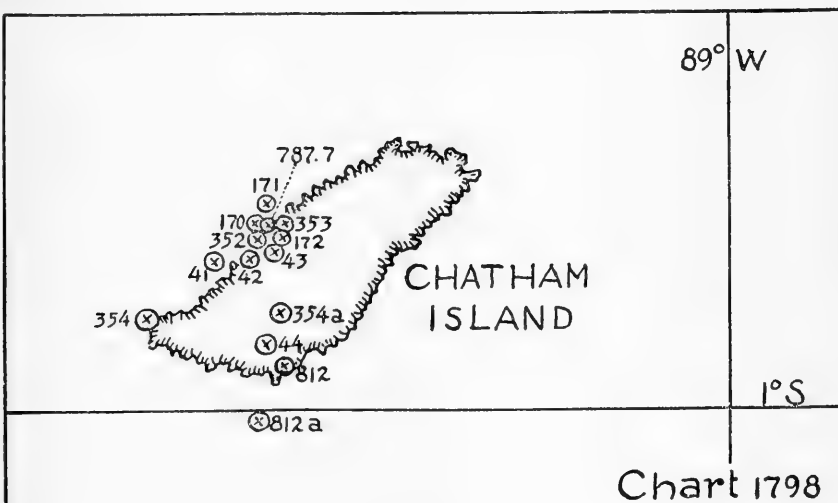

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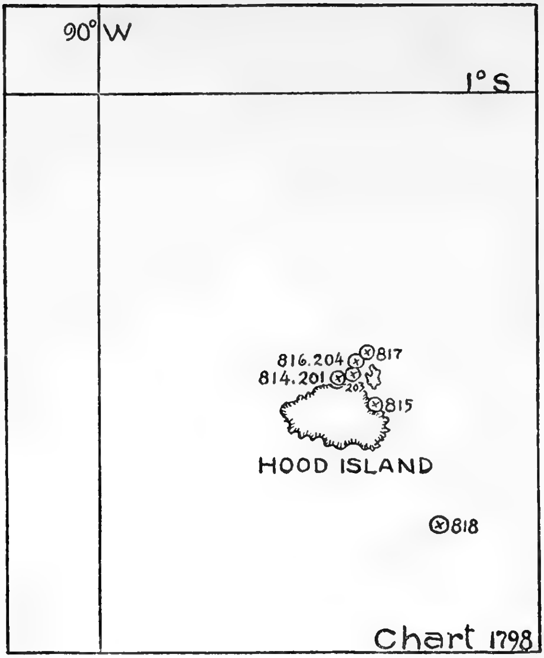

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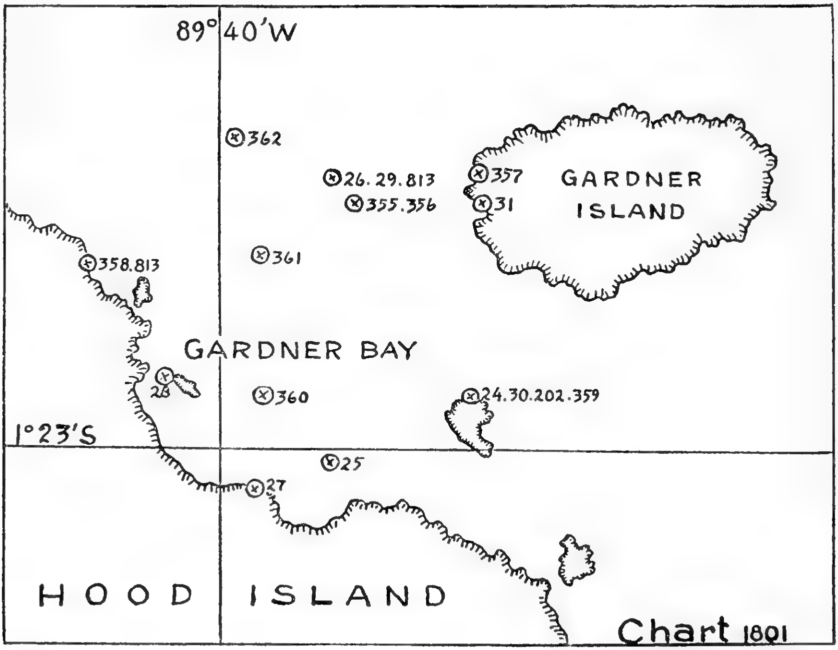

Chart 115

APPENDIX

COLLECTING STATIONS OF THE ALLAN HANCOCK FOUNDATION FOR THE YEAR 1942

Station	Date	General Locality	Dredge Down Position	Dredge Down Time	Fms.	Dir.	Dredge Up Position	Dredge Up Time	Fms.	Remarks
				California						
	Feb. 1942									
1444-42	1	Newport Bay, S. of Lido Island	33 36 36 N 117 55 16 W	10:00 AM	3		33 36 35 N 117 55 03 W	11:00 AM		Mud
1444a-42	1	S. of Balboa Island, Newport Bay	33 36 03 N 117 53 02 W	11:00 AM	2-3		33 36 09 N 117 53 13 W	12:00 M		
1445-42	12	Anaheim Landing, west shore	33 44 03 N 118 05 55 W	1:55 PM			33 44 09 N 118 05 11 W	4:20 PM	Intertidal -1.2′ tide	Eelgrass, mud, and sand
1446-42	13	Portuguese Bend	33 44 10 N 118 22 06 W	1:30 PM			33 43 49 N 118 21 19 W	5:00 PM	Intertidal -1.4′ tide	Rocky beach, tide pools
	Mar. 1942									
1447-42	13	Pt. Arguello, U.S.C.G. Life Boat Station, outside breakwater	34 33 35 N 120 38 10 W	1:30 PM	Intertidal -0.9′ tide			6:10 PM		Kelp-covered rocks, tide pools; excellent collecting
1448-42	14	Pt. Arguello, U.S.C.G. Life Boat Station, inside breakwater	34 33 35 N 120 38 00 W	2:00 PM	Intertidal -0.9′ tide			4:00 PM		Rocks, sand, kelp; stormy, heavy surf, rain, and hail; pool collecting, muddy water
1449-42	13	Newport Harbor, Balboa Peninsula, bay side, floats off Fred Lewis' Landing	33 35 47 N 117 52 55 W	1:00 PM	Intertidal -0.9′ tide		33 36 00 N 117 53 03 W	4:00 PM		Collecting off harbor floats and piles from a skiff
	June 1942									
1450-42	1	Corona Del Mar, Newport Harbor	33 36 04 N 117 52 48 W	4:30 AM	Intertidal -1.5′ tide			8:00 AM		Good collecting
1451-42	2	Newport Harbor, Corona Del Mar side	33 36 04 N 117 52 48 W	5:00 AM	Intertidal -1.2′ tide			9:00 AM		Rocks, sand flats, eelgrass beds

Station	Date	General Locality	Dredge Down Position	Dredge Down Time	Dredge Down Fms.	Dredge Down Dir.	Dredge Up Position	Dredge Up Time	Dredge Up Fms.	Remarks
	June 1942									
1452-42	14	Long Beach at City Yacht Anchorage			Surface					From bottom of tied-up boat and pier
1453-42	25	Off Newport Inlet, ocean side	33 35 18 N 117 52 38 W	9:00 AM	6-18		33 35 11 N 117 52 52 W	12:00 PM		Kerchoff Marine Laboratory boat
	Aug. 1942									
1454-42	6	Near Long Beach			Surface					Scraped from the side of a ship at City Yacht Anchorage
1455-42	25	Pacific Grove	36 37 18 N 121 54 10 W	5:05 AM	Intertidal -0.1′ tide			9:27 AM		From rocks, tide pools, and sand; shore in front of Hopkins Marine Station
1456-42	25	Monterey Bay	36 36 30 N 121 51 45 W		8					Dredged from Monterey Shale (Middle Miocene) off Del Monte
	Nov. 1942									
1457-42	9	Corona Del Mar			Intertidal -1.0′ tide					Shore collecting
1458-42	10	San Pedro Breakwater			Intertidal -0.9′ tide					Shore collecting
	Dec. 1942									
1459-42	7	Flat Rock Point, S. of Redondo			Intertidal -1.4′ tide					Shore collecting
	Oct. 1942									
1460-42	6	Newport Bay	33 35 47 N 117 52 53 W							From floats and buoys

Station	Date	General Locality	Dredge Down Position	Dredge Down Time	Fms. Dir.	Dredge Up Position	Dredge Up Time	Fms.	Remarks
Oregon Field Collecting Trip of 1942									
	June 1942								
1461-42	23	Hallmark Dock, Charleston	43 20 28 N 124 19 20 W	8:00 AM	Intertidal		10:00 AM		Scrapings, kelp, worm tubes; from piling and floats
1462-42	26	Oregon coast, Bandon to Cape Blanco	43 06 10 N 124 26 38 W	5:00 AM	7	42 53 15 N 124 32 30 W	8:30 PM		Fishboat *Rogue*, pulling a string of 185 crab pots; specimens from pots
1463-42	27	Old submerged jetty, Fossil Point, Coos Bay	43 21 23 N 124 18 12 W	5:00 AM	Intertidal -1.2′ tide		8:00 AM		Loose rock covered with dense brown kelp; rich collecting
1464-42	28	South side, Sunset Bay, Coos Co.	43 20 06 N 124 22 32 W	6:00 AM	Intertidal -1.6′ tide		9:00 AM		Loose rocks, sand, kelp holdfasts, tide pools
1465-42	28	Oregon Coast, Winchester Bay, south to Coos Bay	43 38 45 N 124 16 10 W	8:00 AM	40	43 24 00 N 124 23 40 W	1:00 PM		Otter trawler *Rio Janiero;* sand bottom; fish and invertebrates
1466-42	29	North side, Sunset Bay, Coos Co.	43 20 09 N 124 22 02 W	6:00 AM	Intertidal -1.6′ tide		9:00 AM		Mussel reefs, sandstone ledges, tide pools; sea urchin
1467-42	30	South Cove, Arago State Park, Coos Co.	43 28 18 N 124 23 50 W	7:30 AM	Intertidal -1.6′ tide		10:00 AM		Broken rock, tide pools
	July 1942								
1468-42	1	Middle Bay, Cape Arago State Park, Coos Co.	43 18 20 N 124 24 08 W	8:30 AM	Intertidal -1.2′ tide		10:00 AM		Rocks, kelp, tide pools
1469-42	2	Institute of Marine Biology, Charleston	42 20 43 N 124 19 29 W	9:00 AM	Intertidal -0.8′ tide		11:00 AM		Screening, sand flats in front of station
	June 1942								
1470-42	30	Off Coos Bay	43 24 45 N 124 22 18 W	5:00 AM	35	43 34 04 N 124 16 50 W	8:30 PM		6 hauls of otter trawl *Rio Janiero;* sand and mud bottom

Station	Date	General Locality	Dredge Down Position	Dredge Down Time	Fms.	Dir.	Dredge Up Position	Dredge Up Time	Fms.	Remarks
	July 1942									
1471-42	1	Off 10-mile Creek, S. of Winchester Bay	43 37 40 N 124 15 53 W	5:00 AM	20-40		43 34 30 N 124 14 58 W	9:00 PM		6 hauls, otter trawl *Rio Janiero* and triangular net; sand
1472-42	2	North of Winchester Bay	43 41 26 N 124 14 40 W	6:00 AM	58-26		43 46 20 N 124 19 17 W	9:00 PM		6 hauls, *Rio Janiero;* triangular dredge; sand, fine mud
1473-42	3	Off Siuslaw-Lane Co. line	43 50 55 N 124 12 30 W	6:00 AM	22-28		43 47 15 N 124 13 20 W	12:30 PM		2 hauls, *Rio Janiero;* sand; squid eggs
1474-42	8	Charleston, mud flats north of bridge, east side	43 20 25 N 124 19 00 W	2:00 PM	Intertidal +2.7′ tide			4:00 PM		Screening and digging in mud and sand flats
1475-42	10	South Slough, Charleston	43 20 24 N 124 18 59 W	2:15 PM	1-2			4:30 PM		Dredging with triangular dredge from rowboat; poor hauls
1476-42	12	Old submerged jetty, Coos Bay	43 21 23 N 124 18 12 W	6:15 AM	Intertidal -0.4′ tide			12:15 PM		Loose rocks, tide pools, kelp holdfasts
1477-42	13	Agate Beach under Yaquina Head Light	44 40 35 N 124 04 42 W	5:00 AM	Intertidal -0.6′ tide			11:00 AM		Rock reef, mussel bed, kelp, tide pools, loose rock
1478-42	13	Yaquina Bay off Yaquina	44 35 00 N 124 01 10 W	2:00 PM	2-5		44 37 00 N 124 00 55 W	4:30 PM		Mud, dead shells; poor bottom; mainly hydroids
1479-42	14	Boiler Bay, north of Depoe Bay	44 48 55 N 124 04 00 W	6:00 AM	Intertidal -0.6′ tide			11:00 AM		Flat rocks, large boulders; too many algae
1480-42	15	Old R.R. spur, pier, and loose rocks, mud flats, Yaquina Bay	44 37 25 N 124 00 15 W	9:00 AM	Intertidal -0.5′ tide			12:00 PM		Loose rock, mud banks; mainly crabs and mollusks

Station	Date	General Locality	Dredge Down Position	Dredge Down Time	Fms.	Dir.	Dredge Up Position	Dredge Up Time	Fms.	Remarks
1481-42	15	Off Ocean Park	44 50 45 N 124 21 35 W	6:00 AM	72-76		44 49 10 N 124 21 00 W	8:00 PM		Dragboat *Waseca*, much mud; fish and invertebrates washed out; along side Newport docks
1482-42	21	Railroad bridge, Coos Bay	43 25 38 N 124 14 20 W	10:30 AM	2-4		43 25 25 N 124 14 47 W	10:50 AM		Dredging from the *Rio Janiero* with triangular dredge; sand, bark, and wood chips
1483-42	21	South of Empire dock, Coos Bay	43 23 02 N 124 17 28 W	11:10 AM	2-4		43 23 18 N 124 17 22 W	11:30 AM		Dredging from *Rio Janiero;* sand, shells, sawdust, and bark
1484-42	21	W. of Fossil Point, Coos Bay	43 21 45 N 124 18 56 W	11:45 AM	4-6		43 21 23 N 124 19 08 W	12:15 PM		Dredging from *Rio Janiero;* fine sand, some animal life
1485-42	24	Hallmark dock, Charleston	43 20 28 N 124 19 20 W	6:00 PM	Intertidal +1.4′ tide			7:10 PM		Worm tubes from piles and floats
1486-42	25	Collecting off Coos Head, Coast Guard Sta., Coos Bay	43 20 02 N 124 19 12 W	5:00 AM	Intertidal -0.9′ tide			9:30 AM		Shore collecting; loose sandstone, algae covered with some sand
1487-42	26	Shore collecting, Middle Bay, Cape Arago State Park, Coos Co.	43 18 20 N 124 24 08 W	5:00 AM	Intertidal -1.3′ tide			10:00 AM		Shore; loose rocks, tide pools, and kelp
1488-42	27	Squaw Island, off Cape Arago Light, Coos Co.	43 20 19 N 124 22 35 W	6:15 AM	Intertidal -1.6′ tide			9:30 AM		Rocky reef, some loose rocks kelp covered
1489-42	28	North Bay, Cape Arago State Park, Coos Co.	43 19 00 N 124 24 15 W	7:00 AM	Intertidal -1.6′ tide			12:10 PM		Loose rocks, shale reef out beyond islands, kelp; good collecting

Station	Date	General Locality	Dredge Down Position	Dredge Down Time	Fms.	Dir.	Dredge Up Position	Dredge Up Time	Fms.	Remarks
1490-42	29	Cape Arago lighthouse, reef and bight, Coos Co.	43 20 26 N 124 22 24 W	7:30 AM	Intertidal -1.4′ tide			11:00 AM		Loose rock, shale ledges, heavy kelp; good algae grounds
1491-42	29	Cape Arago lighthouse, reef and bight, Coos Co.	43 20 26 N 124 22 24 W	7:30 AM	Intertidal -1.4′ tide			11:00 AM		Material from 5 gls. of eelgrass root masses
1492-42	30	South Bay, Cape Arago State Park, Coos Co.	43 28 18 N 124 23 50 W	8:30 AM	Intertidal -1.1′ tide			12:30 PM		Loose rock, tide pools, kelp
1493-42	31	North Beach, Cape Arago State Park, Coos Co.	43 19 00 N 124 24 15 W	9:45 AM	Intertidal -0.5′ tide			12:40 PM		Reefs, tide pools, loose rocks
1494-42	31	South Slough, beyond bridge ½ mile, Coos Bay	43 19 15 N 124 19 13 W	8:00 AM	Intertidal -0.5′ tide			11:40 AM		Mud and sand flats, digging and screening; mud clams, shrimp, and worms
	Aug. 1942									
1495-42	1	Mud flats, South Slough, above island, Coos Bay	43 18 30 N 124 18 40 W	8:00 AM	Intertidal +0.1′ tide			11:30 AM		Mud, sand flats, digging and screening
1496-42	2	South Slough, one mile beyond bridge, Coos Bay	43 19 26 N 124 19 02 W	10:00 AM	Intertidal +0.8′ tide			1:30 PM		Hard-packed sand and eelgrass; Empire clam bed
1497-42	7-10	35 miles W. of Depoe Bay	44 49 10 N 124 22 22 W	5:00 AM	60-74		44 46 30 N 124 25 00 W	8:00 PM		15 hauls with 120-foot mouth otter trawl on dragboat *Andrea*
1498-42	9	35 miles W. of Depoe Bay	44 49 10 N 124 22 22 W	7:35 AM	60-74		44 46 30 N 124 25 00 W	9:00 AM		Life taken from a water-logged maple stump full of holes; *Andrea*

Station	Date	General Locality	Dredge Down Position	Dredge Down Time	Fms.	Dir.	Dredge Up Position	Dredge Up Time	Fms.	Remarks
1499-42	9	35 miles W. of Depoe Bay	44 49 10 N 124 22 22 W	6:00 AM	Surface		44 46 30 N 124 25 00 W	7:00 AM		Material netted off surface of a tide rip; algae, driftwood, jelly-fish, barnacles
1500-42	13	Mud flats around Charleston dock and bridge, Coos Bay	43 20 26 N 124 19 20 W	6:20 AM	Intertidal -0.5′ tide			10:15 AM		Digging and screening mud, sand, some eelgrass
1501-42	14	Old breakwater jetty in Coos Bay, Fossil Point	43 21 23 N 124 18 12 W	8:00 AM	Intertidal -0.4′ tide			11:30 AM		Loose rocks, shale, algae beds
1502-42	15	¾ mile above bridge in South Slough, Coos Bay	43 19 33 N 124 19 10 W	7:00 AM	Intertidal -0.1′ tide			10:30 AM		Eelgrass, mud; Empire clams

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