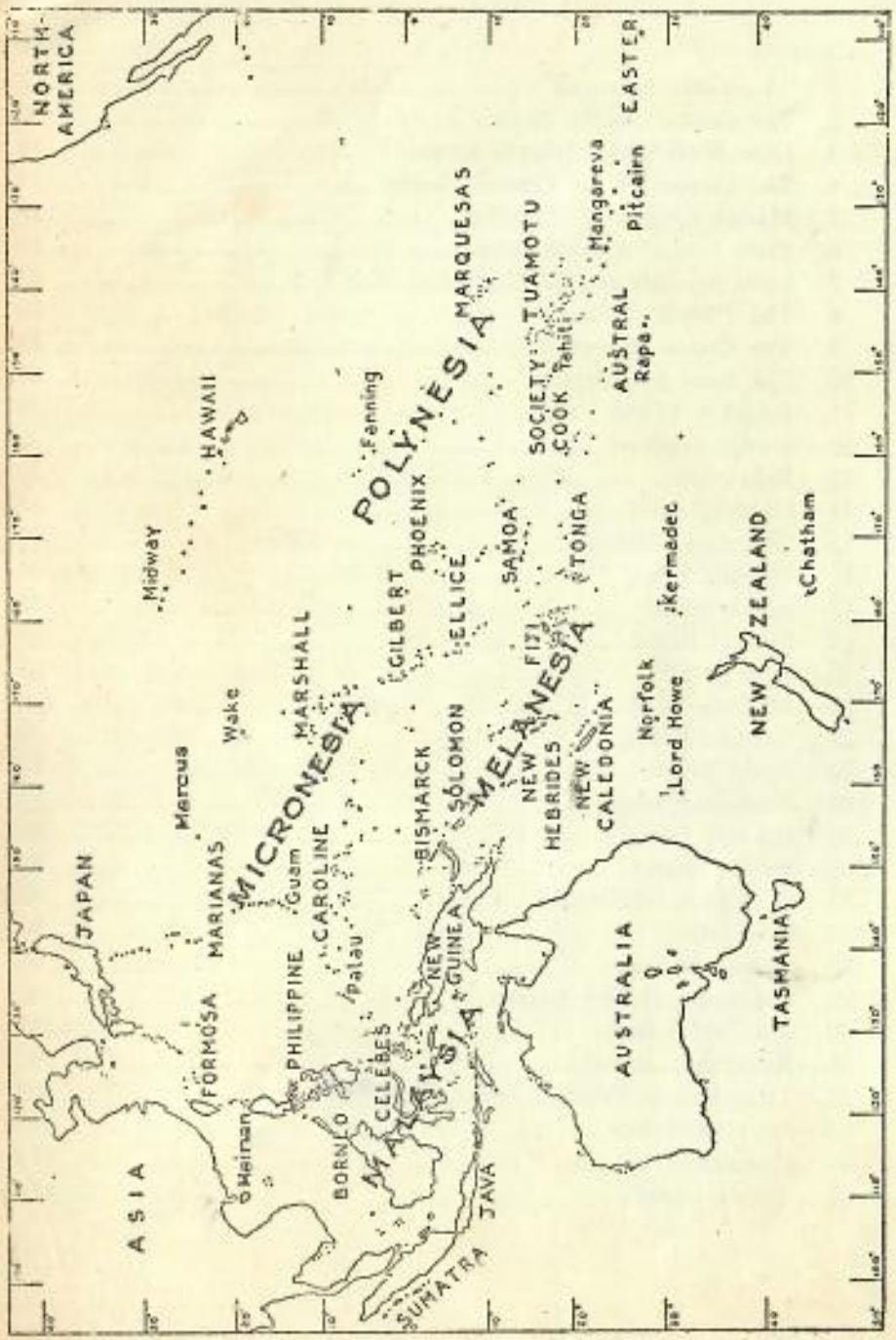
AMERICAN POLYNESIA AND THE HAWAIIAN CHAIN

by

Edwin H. Bryan

1942



Outline map of the Pacific

Courtesy of B. P. Bishop Museum

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and the

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By

EDWIN H. BRYAN, JR.

TONGG PUBLISHING COMPANY
HONOLULU, HAWAII
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PREFACE

The first edition of this book, published June 25, 1941, was a revised reprint of forty-five weekly installments which appeared in the Honolulu Advertiser, September 11, 1939 to July 15, 1940.

The title, American Polynesia, signified a definite geographical area in the central Pacific, as explained in the first chapter. The book confined its scope to this area. The term being geographical and not political, the author was not perturbed by those critics who pointed out that many of the islands discussed were not American (although they admitted that some of them should be) and also that some American islands in Polynesia had been omitted.

In this revised edition the author has been persuaded to add a dozen new chapters. Eleven of these, on the northwestern Hawaiian islands, have been adapted from articles which appeared in the Paradise of the Pacific. The author is grateful to the publishers of that magazine for permission to reprint these articles and also for the use of a cut of one of the maps. In order to record the inclusion of these chapters the title of the book has been expanded. A final chapter on Wake Island has been added because of popular interest in this atoll.

It has seemed best not to discuss the effect of the war on these islands, at the present time, although several of them are playing an important part in Pacific war strategy.

The bibliography has been revised and brought up to date and a second part has been added listing important articles dealing with the leeward Hawaiian islands and Wake.

The author is Curator of Collections at Bernice P. Bishop Museum, Honolulu. Other books by him include:

Hawaiian Nature Notes. Honolulu, 1933 and 1935.
Ancient Hawaiian Life. Honolulu, 1938.
Insects We See in Hawaii. Honolulu, 1940.

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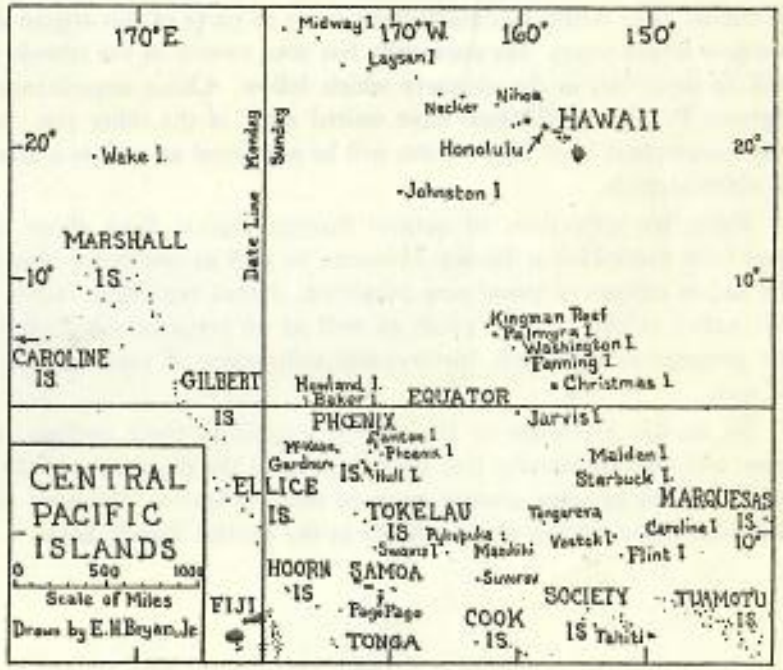
CHAPTER 1
"American Polynesia"



Sprinkled across the central Pacific Ocean, between Hawaii and Samoa, and east of the 180th meridian, are about thirty low coral islands. Eighty years ago most of these were claimed by American guano interests, and a number of them were the scene of busy enterprise. So generally accepted was the claim to them by citizens of the United States that a distinguished German geographer, E. Behm, writing in 1859, called the area "American Polynesia."

All but forgotten for half a century or more, these islands have come into sudden prominence through the recent rise of trans-Pacific aviation. Some of the islands are atolls, with spacious lagoons which would serve

as excellent seaplane ports—regular or emergency stepping stones along the air routes. Other coral islands have broad expanses of flat surface which would provide a resting place for land planes. Still others, not so well fitted as landing places, would provide spots at which weather observations, so necessary to safe air travel, could be made.

These islands comprise the Equatorial or Line group, the Phoenix group, the Tokelau or Union group, and several islands scattered to the southeast of these, most of which now have been placed under political control of the Cook group.

Accurate and up to date information concerning these islands is hard to obtain. The writer has made three visits to parts of this region during the past fifteen years. He personally has seen twenty of the islands which will be described in the chapters which follow. Other expeditions from Bernice P. Bishop Museum have visited most of the other ten. In this way recent, first hand information will be presented as well as a summary of older records.

Extensive collections of natural history objects from these islands have been assembled at Bishop Museum, as well as specimens illustrating the native culture of those now inhabited. Notes regarding fauna, flora, and native culture will be given as well as an accurate word picture of the geography, topograph, history, and utilization. A map will be given of each.

So similar are some of these coral islands in their geology, fauna, flora, and general history, that we will precede the discussion of the individual islands by some general notes on these subjects. The next chapter will discuss the setting of the islands in the central Pacific basin.

CHAPTER 2

The Central Pacific Basin

The Pacific Ocean occupies nearly one third of the earth's surfac One can sail across it along the equator, for a distance of 10,000 mile From the Aleutian Islands on the north to the Antarctic continent on th south is a distance almost as great. The surface of the ocean has an are of about 65,000,000 square miles.

This ocean contains more than half of all the earth's volume of wate 165,000,000 cubic miles of it. The average depth of the Pacific Ocean about 13,400 feet. The eastern half is of nearly uniform depth, averagin about 16,000 feet, and is rather free from islands. The western half ha areas which are comparatively shallow alternating with narrow areas very great depth, and there are numerous islands. One of the deep place

(troughs), off the N.E. corner of Mindanao, Philippine Islands, contains the greatest depth yet sounded, 35,400 feet.

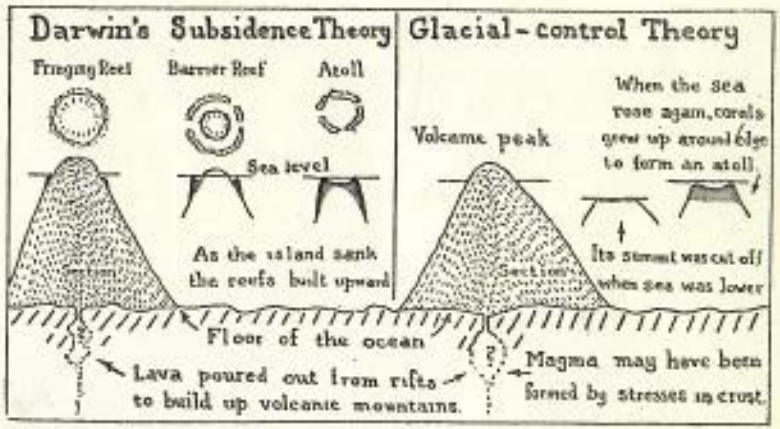
The central Pacific area (see map) contains ocean of rather uniform depth on its northeastern side, and the remains of the ancient "Melanesian Continent" on its southwestern side. Between are alternate ridges and troughs, most of which trend from northwest to southeast. Along the ridges are scattered chains of islands. Nearly parallel to each other, from north to south, we find: (1) the chain of Hawaiian Islands, (2) the Christmas-Palmyra chain, which may extend northwestward to Johnston Island, and to the southeast through the Marquesas Islands, (3) a ridge through Tongareva (Penrhyn) Island, which extends northwestward toward Baker and Howland Islands, and, after interruptions, is continued southeastward as the western Tuamotu Islands, (4) a ridge through Pukapuka and Nassau Islands, (after an interruption) through the Society Islands, and (after another break) through the eastern Tuamotu Islands, and (5) a ridge through the Samoan islands, and in line with it, one through the Cook and Austral Islands.

These ridges are great ranges of volcanic mountains rising from the bottom of the ocean. Where they protrude above the surface they form volcanic islands. In other places they have been carved off just below the surface and have been capped over with coral to form coral islands. Some of these form a ring around a central lagoon and are called atolls. Others have been pushed up to a height of several hundred, even a thousand feet, to form upraised coral islands. Coral reefs also may form around the margin of volcanic islands, or may surround them, at a little distance off shore to form barrier reefs.

Many millions of years ago perhaps hundreds of millions of years, a great mass of land extended southeastward from the southeast corner of Asia. This has been called the "Melanesian Continent," because now it has broken up to form the high, but scattered islands of Melanesia. The edge of this continent included Fiji, and may have extended out to parts of Tonga. Its eastern edge is marked on the map. East of this we find two especially deep troughs, known as the Tongan Deep and the Kermadec Deep, with depths of more than 28,000 feet. One place in the Kermadec trough, known as Aldrich Deep, has a sounding of 30,930 feet.

This is the setting in which are located the central Pacific islands. How might they have been formed?

CHAPTER 3
How Were These Islands Formed?



Diagrammatic comparison of two theories for the formation of coral reefs and atolls. The steepness of the slopes of the volcanic peaks is very greatly exaggerated.

The atolls and coral islands of the central Pacific are thought to be caps of reef rock upon the summits of volcanic mountains. These mountains rise steeply from the nearly level floor of the ocean, which lies more than three miles below the surface of the sea.

To explain how this has come about presents many problems to geologists. (1) What made the broad, flat expanse of ocean bottom? (2) How were volcanic mountains built up in nearly parallel ranges? (3) How did the peaks of these mountains become capped with rings of coral? (4) By what process did atolls and coral pancakes develop from these rings? Few geologic questions have aroused more controversy than these.

Geologists explain the depressed floor of the Pacific ocean by the theory of isostasy. This suggests that the earth's surface is made up of great blocks, some of which are of heavy material, others light. The

heaviest ones have sunk under the pull of the earth's gravity and form the ocean bottom; lighter blocks stand higher and form the continents.

Where these blocks push against each other, earthquakes and volcanic activity occur. The Pacific is surrounded by a belt characterized by earthquakes and volcanism. The chains of volcanic mountains across the Pacific are believed to have been built up by outpourings of lava from great rifts in the ocean bottom, which were, perhaps, the joints between huge surface blocks. The volcanic material could have been produced by the force of the blocks pushing against each other; or, if one believes there is molten lava beneath the earth's crust, it could have escaped through the cracks.

The two best of several theories as to how peaks of these mountains were capped with rings of coral reef are: the "subsidence theory" of Charles Darwin, and the "glacial-control theory" of R. A. Daly. These are illustrated by the diagrams.

Darwin suggested that coral, forming around a sinking island, would first form a fringing reef, then a barrier reef, and finally an atoll, when the peak had completely disappeared and only a shallow lagoon was left within the coral ring.

The other theory suggests that the rings of coral reef grew up around the edge of circular submarine platforms. Volcanic peaks are thought to have been cut off by sea erosion during the glacial period, at which time the surface of the sea stood a few hundred feet below its present level, because much water had been turned into ice which covered parts of the land. By the time the sea had become warm enough to allow the growth of corals, the sea-level had risen a little, and the cut-off platforms were at the right depth for corals and other marine organisms to grow upon them. They grew best around the margin of the platform, and as the sea-level rose, due to the melting of the glaciers, they grew upward, forming rings of coral reef.

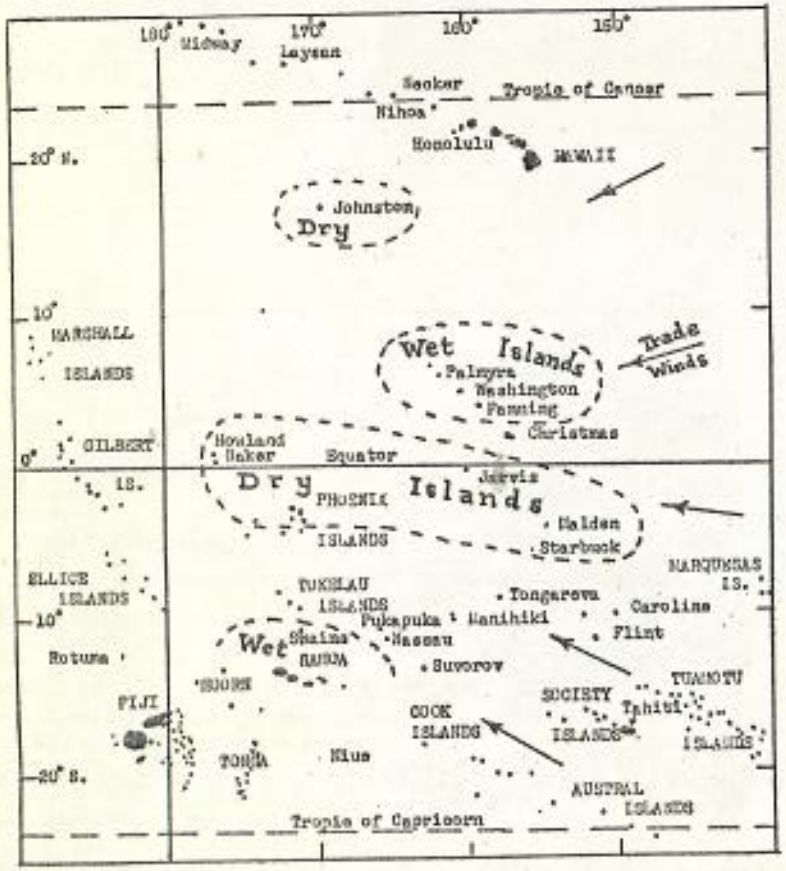
Reef-forming corals will not grow out of water or below about 150 feet. Dry land must be formed on the reefs in other ways. Reef rock is made up of all sorts of marine animal and plant remains, cemented together with lime (pulverized coral). Pieces of this rock from around the edge, in time, were piled up on the surface of the reef by the force of the waves. Sand, shells, and broken coral accumulated in the shelter of these, especially on the windward side, where the beach is almost always highest. The principal break in the atoll rim is usually on the lee side.

Other lagoon entrances might be formed by sea water flowing in and out with the tide.

The lagoons of some atolls became filled with sand and coral until only small pools remained, without connection with the sea, such as several of the Phoenix islands. On some of the coral islands, such as Howland, Baker, and Jarvis, the lagoons have entirely dried up, leaving large coral "pancakes." Small elevation of land or fluctuations in the ocean level may have helped also, but these are not to be confused with the great earth movements which pushed up coral islands to as much as 1000 feet in other parts of the Pacific.

CHAPTER 4

The Climate Of The Central Pacific



The principal feature of the climate of the Central Pacific is its extreme uniformity, except in rainfall. Being located entirely within the tropics and lacking elevation, the temperature never becomes cold. Being entirely

surrounded by great expanses of ocean and subjected to nearly continuous trade winds, the temperature never becomes very hot.

The annual mean temperature over this area is more than 75 degrees, but not more than 84 degrees Fahrenheit. Average maximum temperatures above 90 degrees are rare; and the thermometer falls below 70 only on cold winter days. The highest recorded temperature is 106 degrees on Christmas Island; on other islands it is seldom above 100, and then only for a few hours, with cooler nights.

The seasons are marked principally by the direction of shadows, as the sun passes overhead from south to north and back again, and by a tendency to more stormy weather between November and May, especially south of the equator. The mean barometric pressure is between 29.8 and 30.0 inches of mercury. On some islands this does not vary a tenth of an inch for month to month averages throughout the length of the record. That does not mean that there are not small ups and downs; but these are of short duration and tend to compensate each other in the course of a month.

Rainfall is the most variable factor in the island climate of this region. Not only does this vary from island to island, but on any one island it varies from year to year. The monthly averages are rather uniform, perhaps a little heavier during the period of storms. Records have been kept on only a few islands, such as Fanning, Malden, and Christmas, until recently, but they are representative of other islands. On Fanning the annual rainfall has varied from 47.4 to 208.8 inches; on Malden from 3.94 to 93.59 inches, in different years.

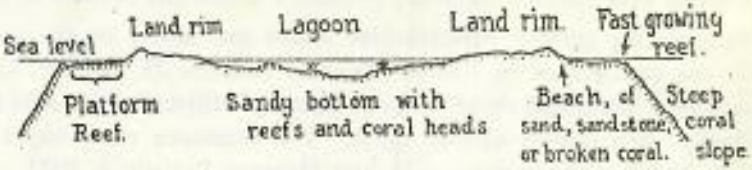
Although actual rainfall measurements are lacking, considerable can be told about the rainfall on these islands by the state of their vegetation. We can trace out zones of dry islands and zones of wet islands. The five northern Phoenix islands (Phoenix, Enderbury, Birnie, Canton and McKean), together with Baker, Howland, Jarvis, and Malden, are dry islands with an average rainfall probably not exceeding 25 inches a year. In contrast to this, Palmyra, Washington, Fanning, and Swains islands have a heavy rainfall, in many years approaching or even exceeding 100 inches. On Christmas Island, the three Tokelau islands, Pukapuka, Nassau, and the three southern Phoenix islands (Sydney, Hull, and Gardner) the rainfall is intermediate between these.

The climate of the Pacific has been summarized by the writer in the

Paradise of the Pacific magazine for May, 1939. What makes the trade winds blow and the course of the currents are suggested there.

The central Pacific islands north of the equator lie in the path of the northern equatorial current, which sweeps across the Pacific from east to west, and are crossed by trade winds from the northeast. Those that lie south of the equator are bathed by the south equatorial current, which also moves from east to west, and they have trade winds which blow from the east or southeast. The narrow equatorial counter-current flows from west to east just north of the equator and ordinarily does not touch any of these islands. Only in time of storm do winds blow from other quarters. There may be local tropical squalls, but severe storms are rare in the central Pacific.

CHAPTER 5
Marine Collector's Paradise



Section across an atoll, showing habitats for marine life.

Coral reefs of tropic seas are fertile spots for the growth and development of marine life. The reefs themselves are composed of the hard skeletons of many kinds of marine organisms, both plant and animal, which have become cemented together.

On most atolls, coral of various kinds is the chief component of the reefs. But coralline algae may form a considerable part of some reefs, such as Rose Atoll, where the entire surface is coated with a pink calcareous algae called lithothamnium. Added to these are the limy shells of all sorts of sea creatures, from minute, one-celled foraminifera to giant clams.

Each of several habitats develops its own association of marine life. The diagrammatic section through an atoll suggests some of these. Some organisms thrive in deep water on the steep coral slope, much of which has been formed by broken pieces of reef rock sliding down the face, coming to rest, and becoming cemented fast. Corals thrive at the lip of the reef, where the waves break, and where there is a continual supply of uncontaminated salt water. Here also one finds many kinds of mollusks.

Pools on the fringing platform reef contain many small fishes, sea urchins, starfish, seaweeds, rock crabs, mollusks, and the like. On the steep outer sandy beach, below the high beach ridge of broken coral and sand, live burrowing crabs, such as the small "ghost" crab.

Within the lagoon, especially if the lagoon entrances are few and small, live many forms of marine life not commonly found outside. These include many little creatures, found on or burrowing in the fine, soft sand, such as marine worms, eels, sea-cucumbers, burrowing crabs, and flatfishes. Another association is found among the reefs and coral heads,

the latter standing up like mushrooms or opened umbrellas, with many choice hiding-places for mollusks, eels, octopuses, crabs, and tiny fishes. Some forms even become voluntary prisoners within the cavities of coral.

Many of the marine invertebrates which are found in the central Pacific are enumerated in Bishop Museum Bulletin 27 and Dr. C. H. Edmondson's "Reef and shore fauna of Hawaii," although these deal more specifically with islands further north. The crustacea of Palmyra and Fanning islands are described in Bishop Museum Bulletin 5, 1923.

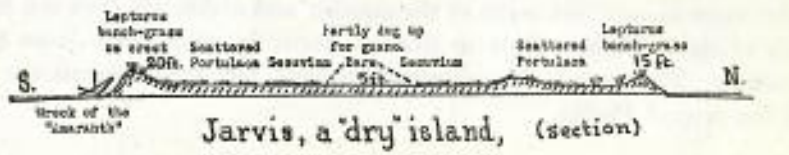
Over 100 species of marine shells from the central Pacific islands are preserved and classified in the Bishop Museum collections. These include long, pointed auger shells, ten kinds of cones, "purple" shells, tritons, whelks, helmet shells, partridge shells; twenty kinds of cowries, most common of which is the small, yellow money cowrie; turban shells, used as homes by large hermit crabs; periwinkles, sea snails, clams, and oysters. Largest is the giant clam (Tridacna), the gaping jaws of which stand open on the platform reef. Although not so large as its cousin in the western Pacific, its shells commonly measure a foot in length. Pearl oysters have been found in some of the lagoons.

Nearly 100 kinds of crustacea from these islands, in the Bishop Museum's collection, have been identified by Professor Edmondson. They range in size from the spiny lobster to little shrimp, crabs, and tiny water fleas. Swimming crabs have their hind legs flattened like oar blades. Rocky-shore crabs scurry over reefs and coral heads. Other species burrow in the sand. Some crabs even live on shore. Of these, the huge coconut crab is largest, with claws so powerful that it can tear the husk from coconuts. Hermit crabs, of many sizes, occupy the empty shells of mollusks. The large, red-legged hermit crabs occur in thousands, hiding in holes and under sandstone slabs by day, coming forth at night to serve as an efficient garbage department.

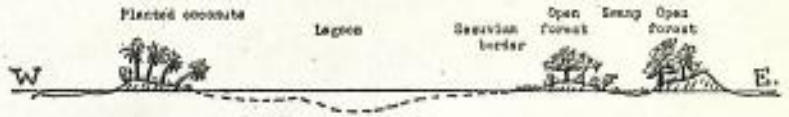
The fishes collected in 1924 by the Whippoorwill and Kaimiloa expeditions to these islands are described by Henry W. Fowler in Bishop Museum Bulletin 38. All of the known species are listed in his "Fishes of Oceania." Conspicuous are the black-finned, pale gray reef sharks, many kinds of moray eels, needle fishes, mullet, ulua, sea bass, snappers, surmullet, brilliant butterfly fishes and tangs, odd-shaped scorpion fishes, wrasses, highly-colored parrot fishes and drab little gobies and blennies, which scurry from pool to pool on the platform reefs.

A central Pacific atoll is indeed a marine collector's paradise.

CHAPTER 6
Plant Life On A Coral Island



Jarvis, a "dry" island, (section)



Sydney, a "medium" island, (section)

One of the "wet" islets of Palmyra.

The number of different kinds of plants to be found on the low coral islands of the central Pacific is limited. Some of the drier islands have fewer than a dozen species; Johnston Island has only three. On the most luxuriant islands there may not be more than fifty kinds, if we exclude the ornamental and food plants introduced by man.

In the articles concerning the individual islands, reference will be made to the vegetation of each. To save repetition of description, the principal plants found throughout the region are here listed in their systematic botanical order, with a word of description about each.

There are two kinds of ferns: *Polypodium scolopendria* has large, deeply lobed fronds, like giant oak leaves, with small cushion-like sori on the back; *Asplenium nidus* is the large birds-nest fern. These are found only on the wettest islands; abundant on Palmyra. *Psilotum nudum* is a low, erect, much branched, leafless fern ally, sparingly found.

Various species of *Pandanus* or screw-pine are found; two varieties are native to Palmyra.

The commonest grass is the wiry bunch grass, *Lepturus repens*, with one-flowered spikelets embedded in the spike. Another grass, *Digitaria pacifica*, has hairy leaves and the flower head divided into fingers. Bermuda grass (*Cynodon dactylon*), bur grass, and other species have followed man to islands. Sugar cane has been planted on a few islands.

A common sedge, *Fimbristylis cymosa* variety *microcephala*, grows on central flats and has a rosette of leaves and slender flower stalk ending in globular head. A species of *Cyperus* grows in marshy places.

Coconut palms (*Cocos nucifera*) have been planted; do well on all but the drier islands; and propagate themselves readily on the wet islands.

Taro (*Colocasia antiquorum* variety *esculenta*) and a related form with triangular leaves (*Cyrtosperma*) are cultivated on some of the more moist, inhabited islands. Bananas are sparingly grown in well-cared-for patches.

The dye fig or *mati* (*Ficus tinctoria*) is found on a few islands. Of the nettle family: *Pipturus velutinus* is a shrub or small tree; more common is *Fleurya ruderalis*, an erect herb with deep-green leaves and reddish flower stalks.

Low, branching herbs of the amaranth family are found. The four-o'clock family is represented by a low, vine-like herb, *Boerhaavia tetrandra*, and the tall *puka* or *huka* tree, *Pisonia grandis*, with massive trunks of soft wood.

Very common on dry islands are two kinds of purslane: *Portulaca lutea* with robust stems and large yellow flowers; *Portulaca oleracea* with slender purplish stems and smaller yellow flowers. Seaside purslane, *Sesuvium portulacastrum*, forms a tangled mat of fleshy stems and leaves along the edge of lagoons and on flats.

Dodder-like *Cassytha filiformis*, of the laurel family, spreads its slender orange-green stems over other plants, on which it is parasitic.

Hernandia ovigera is a tall tree, having peltate glossy leaves with red veins.

Pepper-weed, *Lepidium bidentoides*, is a tough, branching herb, with notched, spatulate leaves, and bottlebrush-shaped flower stalk.

Tribulus cistoides is a trailing herb with silky leaves and stem, yellow flowers, and thorny fruit, like sets of miniature cow's horns.

Suriana maritima and *Pemphis acidula* are two wiry shrubs with short, narrow leaves; the former has velvety stem and alternate, closely spaced

leaves, which hide the yellow flowers; the latter has opposite leaves and hairs only on young growth.

Some low *Euphorbia* herbs are of species considered wayside weeds in Hawaii.

Triumfetta procumbens, of the linden family, is a prostrate herb with runners, harsh leaves, yellow flowers, and spherical burs, common on beach flats.

The mallow family is represented by a common ilima, *Sida fallax*, and the larger, rarer *Abutilon indicum*; both have fuzzy leaves and stems, and yellow flowers.

The true kamani of Hawaii, *Calophyllum inophyllum*, with shining, leathery leaves, forms large trees on some islands. Another tree, called *pua*, *Fagraea berteriana*, has fragrant, tubular white flowers and scarlet fruit.

In wet places is a shrub, *Jussiaea erecta*, with long narrow leaves, and long-tubed yellow flowers.

Morning-glory vines include the beach or goat's-foot morning-glory, *Ipomoea pes-caprae*, with pinkish petals; and *Ipomoea grandiflora*, with white flowers.

The heliotrope family furnishes two common trees: the tree-heliotrope, *Tournefortia*, now called *Messerschmidia argentea*, with rosettes of leaves covered with silvery hairs; and the *kou* tree, *Cordia subcordata*, with orange flowers.

The coffee family is represented by three trees: *Gardenia tahitensis*, famous for its fragrant white blossoms; *Guettarda speciosa*, also with fragrant flowers; and the *noni*, *Morinda citrifolia*, with compound flower-heads and fruits.

The goodenia family presents *Scaevola frutescens*, a large, coarse, branching shrub, with large, thick glossy leaves, white half-trumpet flowers, and pithy white fruit.

The composite family is represented only by chance immigrant weeds.

These plants grow together in various associations, some of which are suggested in the diagrammatic cross-sections of dry, medium, and wet islands.

are found on dead birds. Lice, mites and hippoboscid flies are parasitic on live birds. Small spiders and a few kinds of insects are predacious. Only a few of the islands have mosquitoes. Silverfish are found under rocks, and roaches come out at night. The wettest of the islands have dragonflies and one or two species of butterflies.

* * *

Probably all of these thirty-three islands were known to the Polynesians. Seven of them, Atafu, Nukunono, Fakaofu, Pukapuka, Manihiki, Rakahanga, and Tongareva, have native inhabitants today. Rats, plants, and ruins give evidence of former human habitation on a dozen others. The rest were either too small or too dry to offer more than temporary shelter to voyagers, or else information about them is lacking.

Kenneth P. Emory, Bishop Museum ethnologist, has made a study of the archaeological remains on these islands, and can associate the former inhabitants with eastern and western Polynesia. The center of the eastern culture, from which voyagers sailed forth, was in the Society Islands. That of the western was in Samoa and Tonga.

The peoples of the Tokelau Islands and Pukapuka are related to the western culture. Those of Manihiki, Rakahanga, and Tongareva (Penrhyn) have affinity with the eastern. Archaeological remains on Malden and Swains Island (the present population on the latter dates from 1856), and an adz from Nassau, show eastern affinity. Ruins on Fanning indicate a Tongan settlement about the 15th century. The Phoenix group (especially Sydney and Hull Islands) and Christmas Island have ruins which suggest that they were visited by parties from both the east and the west.

With the exception of the occupation of Fanning Island by Tongans, it is not possible to date native visits. It is likely that adventurous Polynesian navigators have explored these islands and made them periodic stopping places and fishing bases for a dozen or more centuries.

Dr. A. Wetmore taking flashlight pictures of birds on Johnston Island, 1923.

The camp on Howland from the top of Amelia Earhart Light, 1938.

CHAPTER 8
The Period Of Discovery

The history of the central Pacific islands may be divided into four periods: that of the Polynesian migrations (which we have noted), the period of discovery, the period of guano digging, and the recent era.

The period of discovery again may be divided into three parts, dominated in turn by the early Spanish voyagers, the explorers of the 18th century, and the whalers.

Fernando Magellan is credited with having made the first voyage across this area. He saw only two small islands between South America and Guam: San Pablo, sighted January 24, 1521, and Tiburones (Shark Island) passed February 4, 1521. Neither furnished any refreshments to his starving men, so he called them Las Desadventuradas (the unfortunate islands). What islands these were is not positively known, but the second, at least, was within this area.

Alvaro de Mendana sailed westward from Callao, Peru, November 19, 1567, sighting an island in the Ellice group and discovering the Solomon Islands. On a second voyage, with Pedro Fernandez de Quiros as navigator, he discovered the Marquesas Islands. Again sailing westward, he sighted a group of four small islets on August 20, 1595, which he called San Bernardo. These are thought by some to have been the Danger Islands (Pukapuka), and by others Manihiki. On August 29, 1595 he saw a small, low island which he called La Solitaria.

Quiros headed another expedition across the Pacific in 1605. After sighting Ducie, Henderson, and various Tuamotu islands, he revisited San Bernardo on February 21, 1606, and on March 2, discovered an island which he called Peregrino. Quiros was so impressed by the inhabitants that he wrote of the spot as Gente Hermosa, the island of beautiful people, now believed to be Swains Island.

During the following 200 years there were many voyages across the Pacific, but none seems to have discovered new islands in this region. From 1566 on, there was a yearly Spanish galleon from New Spain (Mexico) to Manila; but these stopped only at Guam, travelling westward in a zone between 12 and 17 degrees north latitude, and returning farther to the north, where the westerly winds blew, thus avoiding the area of low coral islands.

The only voyage made during these two centuries which need be mentioned is that of the Dutch admiral, Jacob Roggeween, who sailed across the Pacific, 1721-1722. He reported discovering Baumans, Roggeween, Gronigen, and Tienhoven in the central Pacific. These were searched for unsuccessfully in their reported positions, and are now thought to be islands of the Samoan group.

In 1764 there began a series of voyages around the world, some of which discovered islands in the central Pacific region. The first was that of Commodore the Hon. John Byron, in the Dolphin, who discovered the

Danger Islands (Pukapuka) June 21, 1765, and Atafu (Duke of York) Island June 24.

Captain James Cook, on his third voyage, discovered Christmas Island December 24, 1777, just prior to his discovery of Hawaii. Captain Stavers, in the Lady Penrhyn, discovered Tongareva (Penrhyn) Island August 8, 1788.

Captain Edward Edwards, in H.M.S. Pandora, searching for mutineers of the Bounty, discovered Nukunono (Duke of Clarence) Island June 12, 1791, and also visited Atafu June 6. Captain William Robert Broughton, in the Providence, discovered Caroline Island December 16, 1795.

Captain Edmund Fanning, in the American ship Betsy, discovered Fanning Island June 11, 1798, Washington Island June 12, and nearly ran on a reef June 14, which may have been part of Palmyra or Kingman Reef.

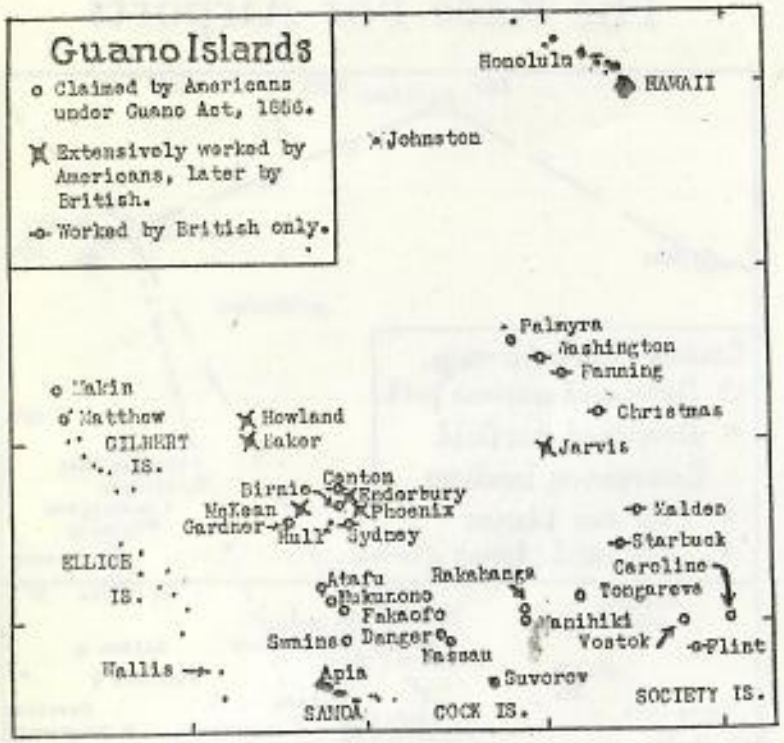
Louis de Freycinet in the Uranie, discovered Rose atoll October 21, 1819; and Captain F. von Bellingshausen, in the Wostock, discovered Vostok Island August 3, 1820, and Manihiki August 7, 1820.

These islands were repeatedly visited by whalers between 1820 and 1850. British whalers first entered the Pacific about 1787, and American whalers in 1791, but these stayed close to the coast of the Americas. Twenty years later important whaling grounds were found in the Central Pacific, and whalers flocked to this region, discovering most of the islands.

By 1820 Nantucket whalers led the field, and some of the smaller islands, such as Howland and Gardner, bear the names of intrepid captains whose homes were on this little island off the New England coast. Baker Island was also called New Nantucket.

It is difficult to determine positively who was the first discoverer of some of the islands. They were reported by many different names, and at positions which agree none too accurately with present day observations. Accurate maps and positions were provided by the U. S. Exploring Expedition (1838-1842) and other American naval vessels, sent to make the seas safe for whalers and merchantmen.

CHAPTER 9
The Guano Diggers



Guano is formed from the excrement of sea birds, where it has accumulated in dry regions, such as islands off the coast of Peru and in the mid-Pacific. The word comes from huanu, Peruvian for dung. This grayish, powdery material is high in phosphates and ammonium compounds which are readily assimilated by plants, and forms a valuable fertilizer.

American whalers and other visitors to islands in the central Pacific, landing in some instances to bury dead seamen, discovered guano on several of these islands, between 1830 and 1850.

There was immediate interest in this form of prospecting, and after considerable debate the United States Congress, on August 18, 1856, passed an act which allowed Americans to claim unoccupied islands in the name of the United States, for the purpose of removing the guano. Claims were made to about 48 islands under this Guano Act.

A list of these was published in the New York Tribune, March 5, 1858. It was reprinted in the Friend (Honolulu) for April 20, 1859, and in a German article by E. Behm, in 1859, already noted. In the American Journal of Science, September, 1862, J. D. Hague again lists these islands; and the author discusses their identity in the Paradise of the Pacific magazine for September and October, 1939.

Only 18 of the islands are now known by the names given. Twelve are known today by different names; three names are duplicate; and 15 are not known to exist at all.

In the spring following the passage of the Guano Act, representatives of the American Guano Co., of New York, arrived at central Pacific islands, via Honolulu. Alfred G. Benson of New York, and Charles H. Judd, of Honolulu, representing this company, took possession of Howland Island, February 5, 1857, and Baker, February 12. Jarvis was occupied by Mr. Judd and 24 Hawaiian laborers in March the same year.

Officially representing the government, the U.S.S. St. Marys, Captain Charles Henry Davis, visited Jarvis and Baker later the same year, surveying the islands, taking guano samples, and announcing formal possession in the name of the United States.

The Phoenix Guano Co. began activities on McKean island. A. M. Goddard with 29 Hawaiians left Honolulu for Phoenix Island on the brig Agate, Captain Long, on April 19, 1859, but ended up at McKean. The American schooner Modern Times was loaded there in 45 days, sailing August 15, 1859. Work was commenced on Phoenix Island in September, 1860.

Supplies were taken to the guano islands about four times a year from Honolulu by schooners, which also transported native laborers, and white overseers and chemists. Following the Agate, this run was made by the Helen, the Odd Fellow, and the Active, 1863 to 1864; the Hawaiian bark Kamehameha V, 1865 to 1869; and the C. M. Ward, 1870 to the end of activity in 1879.

A large number of schooners, barks, and clipper ships, flying various flags, called at the islands and carried the guano away to American and foreign ports. We have a record of those which touched at Honolulu; others went direct.

The loading of these vessels with thousands of tons of guano was an enormous task. The powder had to be sifted from the rocks, shovelled into bags, run on tram cars to the beach, loaded into small boats, and these run through the surf to the waiting ships; all hand work. There was little or no anchorage. Vessels had to make fast to buoys or lines leading out from shore, risking the danger of piling up on the reef should the wind shift. Many fine ships were wrecked. Navigation was difficult because of the swift currents which swept past the islands.

Enderbury was added to the guano islands in 1862, and reached the height of its enterprise between 1870 and 1873, under the management of Captain Elias Hempstead. During the summer of 1870, alone, four vessels were loaded there with more than 6,000 tons of guano.

McKean was the first to be worked out, no vessel being recorded as visiting it after 1870. Phoenix Island was abandoned in August, 1871. Activities continued on Enderbury until 1877, there having been four white persons and 55 Hawaiians there in 1876. Several of the superintendents were accompanied by their wives and families.

After the American guano diggers withdrew, nearly all of these islands were worked by John T. Arundel and Co., a British firm, between 1883 and 1891. Parties were supplied by schooner from Apia. The laborers were mainly from Niue and the Cook Islands.

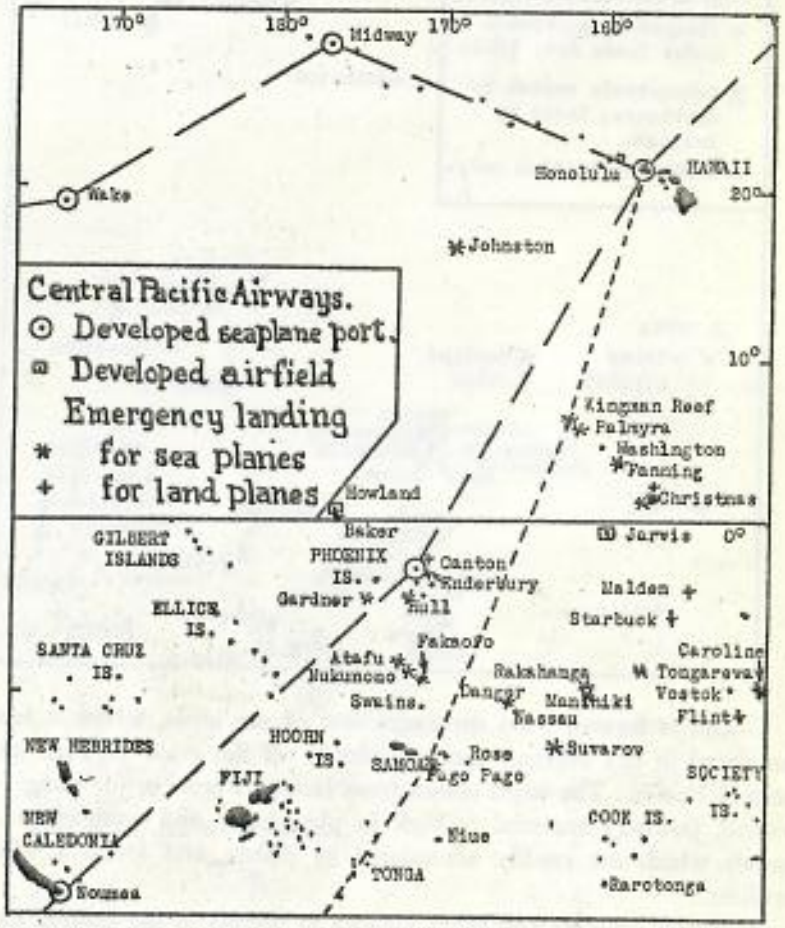
Other islands also were worked by this company, such as Sydney Island, 1884-5, Canton Island, 1885-6, Flint, and Starbuck. Gardner and Hull were planted to coconut palms. It was mainly at Mr. Arundel's request that the Phoenix Islands were annexed by Great Britain during June and July, 1889.

After 1891 this company turned its attention to phosphate deposits on islands off the coast of North Queensland. Later much richer deposits were found on Nauru and Ocean Islands.

Other guano companies were also active, most of them with headquarters in Australia. Guano deposits were found on Malden Island about 1848 by an American whaler, who sold his find to a company in Sydney, N.S.W. That island has been worked almost continuously to within the last few years.

CHAPTER 10

The Race For Airports



Following the period of guano digging, little was heard of the central Pacific islands, and several of them were all but forgotten for nearly half a century.

On seven islands native populations lived their peaceful lives, making a little copra from the abundantly present coconuts, and trading this or

pearl shell for such necessities of life as could not be made, grown, or caught.

On Swains Island the children and grandchildren of an American and his Samoan wife developed a patriarchal little domain, importing a hundred workmen from the Tokelau Islands and Samoa.

A cable relay station was established on Fanning Island, together with a copra plantation. Guano digging was continued on Malden Island.

Periodically there were colonies of copra harvesters on Hull, Sydney, Nassau, Palmyra, Washington, Christmas, Vostok, Caroline, and Flint. When profits were low these islands were abandoned. Pearl shell was cultured, especially on Suvarov Island.

The other islands, although most of them were "leased" to various concerns, were neither developed nor used, and they were seldom visited.

Then, with the rise of trans-Pacific aviation, there came a change. In 1928 Kingsford-Smith and party flew the Southern Cross from San Francisco to Sydney, by way of Honolulu, Kauai, Suva, and Brisbane. When he reached Honolulu he appealed for information about possible emergency landing-places on the long hop to Suva. The writer gave him maps, photographs, and descriptions, showing how he could alight on Canton and Enderbury.

Later, when possible routes from Honolulu to the antipodes were being mapped, much information was dispensed at Bishop Museum, whose scientists had thoroughly explored these little known islands in 1924.

In March, 1935, the first move was made to occupy equatorial islands for the purpose of gathering meteorological information and developing landing fields. At that time it was thought that land planes would be used, and Baker, Howland, and Jarvis were the islands selected.

Colonists, under the direction of William T. Miller, then superintendent of airways for the Department of Air Commerce, were landed from the U.S. Coast Guard cutter Itasca: on Jarvis, March 26, 1935; Howland, March 30; and Baker, April 3. Camps on these islands were established by men of the United States Army, in charge of Captain Harold A. Meyer, U.S.A.

Most of the colonists have been young men of Hawaiian or part-Hawaiian blood, the majority of them students of the Kamehameha Schools, Honolulu. They were carefully chosen, after thorough medical examination, and very few have suffered any ill-effects of the experience.

That they enjoyed the life is shown by the fact that many of the same boys volunteered over and over again.

The choice of colonists has been a good one, and in every respect these young men have measured up to their task of living happily on barren, isolated islands three to several months at a stretch.

The islands have been visited by U.S. Coast Guard cutters at intervals of about three months, with food, water, equipment and changes of personnel. In addition to the Itasca, the Duane, Shoshone and Taney have made these trips.

The camps have been improved steadily, from the initial tents to the present substantial wood and stone buildings. The colonists have been liberally paid and carefully provided for, each camp now having radio and refrigeration.

The colonists have been kept busy with routine duties, including the daily recording of meteorological data, the construction of airfields and lighthouses, cooking and housekeeping. Fishing has been good and worries few.

Proclamation by President Roosevelt, May 13, 1936, transferred jurisdiction over the islands from the U.S. Department of Commerce to the Division of Territories of the U.S. Department of the Interior. In July, 1936, Richard B. Black arrived in Honolulu as representative in charge.

Learning of these American activities, the British hastened to visit the equatorial islands and reassert their sovereignty, during 1936 and 1937.

An American party on the U.S.S. Avocet, and a New Zealand party on H.M.S. Wellington, both established camps on Canton Island to observe a total eclipse of the sun, June 8, 1937. Each party erected a concrete monument displaying the flag of its nation.

In August, 1937, H.M.S. Leith visited Canton and landed men, building material, and radio equipment. In March, 1938, the Taney placed parties of American colonists on both Canton and Enderbury. Contrary to news reports published at the time, there was no "armed resistance," and both parties have lived side by side with the best of relations. In April, 1939, final details were announced for the joint occupation and use of Canton and Enderbury by British and Americans for fifty years.

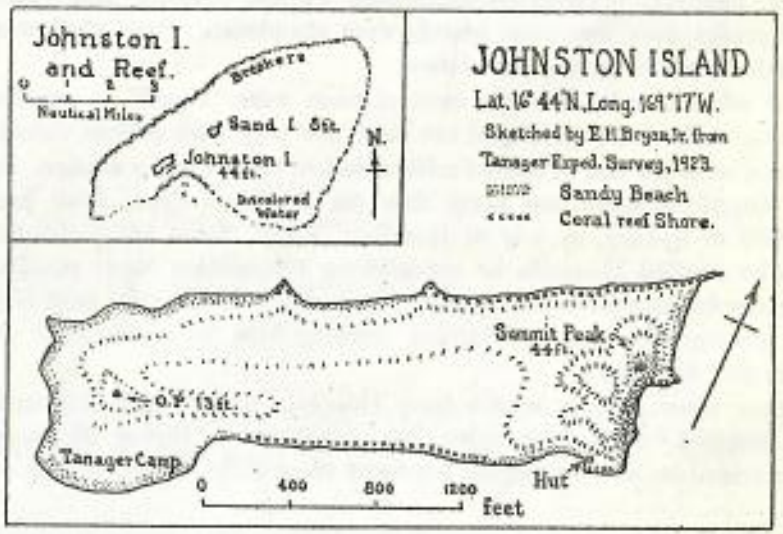
Pan-American Airways has pioneered the air route from Hawaii to New Zealand. During March and April, 1937, Captain Edwin C. Musick made a trial flight in the Sikorsky seaplane, Hong Kong Clipper, via

Kingman Reef and Pago Pago to Auckland, and return. In December, 1937, Captain Musick made a second trial flight over the same route, using the Samoan Clipper. On the next flight south, this plane burned near Pago Pago, on January 11, 1938, destroying the lives of this intrepid trans-Pacific flier and crew of six.

Pan-American has now constructed an airport on Canton Island, similar to those at Midway and Wake; and the present southern route, over which an initial flight was made with a 72-passenger Boeing Clipper in August, 1939, is via Honolulu, Canton Island, and Noumea, New Caledonia. Service temporarily is curtailed by war.

The British, under the joint agreement, have equal rights to use the Canton lagoon, but the war has held up their plan for an air route from Australia to Canada.

CHAPTER 11
Johnston Island



Johnston Island is a low sand and coral island, 717 miles W.S.W. of Honolulu. It is 1000 yards long, about 200 yards wide, and reaches a greatest height of 44 feet in "Summit Peak" near its eastern end.

A mile and a half to the northeast of the main island is a small pile of sand and coral reef known as Sand or Agnes Island, about 200 yards in diameter and 8 feet high. Both islands are enclosed by a semicircular reef, 7½ miles across, nearly continuous on the north, but open to the south. Much of the water within this semicircle is only 2 or 3 feet deep.

These islands are among the smallest, and certainly the most barren of all those which we will discuss. The vegetation consists of but three species of low herbs: *Lepturus* bunch grass, dry and brown over most of the surface, with scattered patches of *Tribulus* and *Boerhaavia*, both sprawling herbs.

The American brig Sally, of Boston, commanded by Joseph Pierpont, grounded on a shoal near Johnston Island September 2, 1796, but gave no name to the land.

H.B.M.S. Cornwallis is credited with its discovery, December 14, 1807, the name of her commanding officer, Captain Charles J. Johnston, being given to the larger island.

On March 19, 1858, the captain of the American schooner Palestine took possession of the islands in the name of the United States. Three months later, June 14 to 19, 1858, the Hawaiian schooner Kalama, Captain Watson, with Samuel C. Allen on board, visited Johnston, removed the American flag, and hoisted that of Hawaii. The larger island was renamed Kalama Island, and the nearby smaller island was called Cornwallis.

Returning on July 22, the captain of the Palestine again hoisted the American flag and reasserted the rights of the United States. This time he left two of his crew on the island to gather phosphate.

On July 27, 1858, and while these two men were still on the island, a proclamation of Kamehameha IV declared the annexation of this island to Hawaii, the attorney general of Hawaii stating that it was "derelict and abandoned."

Following this eventful year, the history of Johnston Island became very quiet until quite recently. An occasional vessel stopped, but generally one look was enough. The U.S.S. Fenimore Cooper, under command of Lieutenant J. M. Brooks, paid a visit in 1859. The Nettie Merrill, under Captain Cluney, sailed to the island from Honolulu, June 1, 1869, to investigate the guano deposits, returning on June 24. Occasionally, other vessels stopped to load guano.

In 1892, H.B.M.S. Champion made a survey and map, hoping that it might be suitable as a cable station. On January 16, 1893, the Hawaiian Legation at London reported a diplomatic conference over this temporary occupation of the island.

When Hawaii became an integral part of the United States in 1898, the name of Johnston Island was omitted from the list of Hawaiian Islands, but this did not keep the Territory from making use of it.

On September 11, 1909, Johnston was leased by the Territory of Hawaii to a private citizen for fifteen years. A board shed was built on the southeast side of the larger island, and a small tramline run up onto the slope of the low hill, to facilitate the removal of guano. Apparently neither the quantity nor the quality of the guano was sufficient to pay for gathering it, and although fish were abundant, the distance to market was too great, so that the project was soon abandoned.

The writer was a member of a scientific party, representing the U.S. Biological Survey and B. P. Bishop Museum, which visited Johnston Island July 10 to 20, 1923, on the U.S.S. Whippoorwill and U.S.S. Tanager. In the party were also Commander John Rodgers (famous for his seaplane flight from California to Hawaii) and two other aviators, who made a pioneer flight over Johnston, photographing it from the air.

Tents were pitched on the southwest beach of fine white sand, and a rather thorough biological survey was made of the island. Hundreds of sea birds, of a dozen kinds, were the principal inhabitants, together with lizards, insects, and hermit crabs. The reefs and shallow water abounded with fish and other marine life. Accounts of what was found appear in Bishop Museum publications.

The maps here presented are drawn from the survey made at that time. The shore is alternately white sand and rough, jagged coral reef, as indicated.

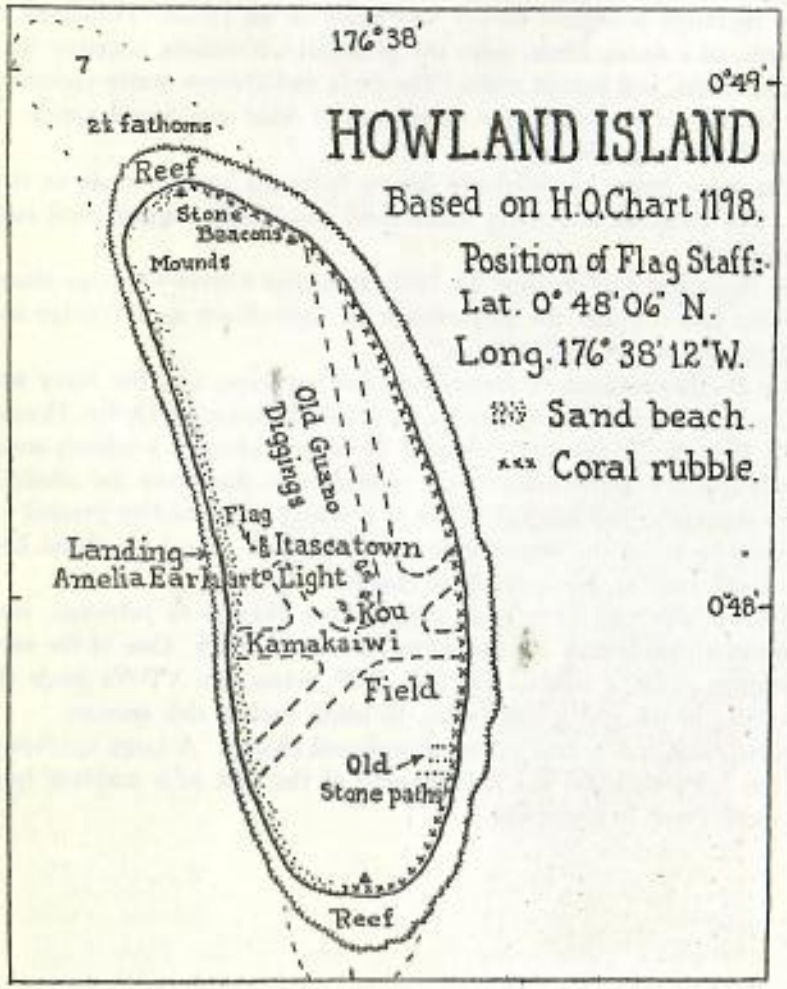
By Executive Order, June 29, 1926, President Calvin Coolidge placed Johnston Island under the Department of Agriculture as a "refuge and breeding ground for native birds."

But the Department of Agriculture had no ships, and the Navy was also interested for strategic reasons, so another Executive Order, December 29, 1934, by President Franklin D. Roosevelt, placed the islands under the "control and jurisdiction of the Secretary of the Navy for administrative purposes," but subject to use as a refuge and breeding ground for native birds, under the Department of Agriculture. The 14th Naval District, Pearl Harbor, has immediate charge.

Several seaplanes have made flights from Hawaii to Johnston, such as that of a squadron of six planes in November, 1935. One of the most spectacular of these was on April 8, 1937, when two VP-6's made the round trip in ten and a half hours, to bring back a sick seaman.

Now the island is undergoing a profound change. A large appropriation has been made for the development of the spot as a seaplane base, and work there is underway.

CHAPTER 12
Howland Island



Howland Island lies 1650 sea miles to the southwest of Honolulu, and 48 miles north of the equator. It and Baker Island, which lies about 35 miles to the south and a little east, are located northwest of the Phoenix group, and a 1000 miles west of Jarvis.

Howland is a low, flat, sand and coral island, shaped like a flattened "hot dog" or elongated bean. It is a little over a mile and a half long, by a half mile wide, with a maximum elevation of 18 to 20 feet, and a land area of about 400 acres. It is surrounded by a narrow fringing reef, just awash at low tide, off which the ocean deepens rapidly except at the north and south ends.

The entire western or lee beach is sandy and low; that on the eastern or weather side higher, more abrupt, and covered with coral rubble and sandstone slabs. There is no pronounced beach crest and no central basin (dried up lagoon) such as one usually finds on such flat coral islands. For this reason it was naturally adapted to development as an airfield. Part of the north central portion has been dug over for guano, and there are some artificial trenches near the kou thickets, but otherwise most of the surface is quite flat.

Only six species of plants were found on Howland, prior to its recent occupation. *Lepturus* bunchgrass, *Boerhaavia* herb, and two kinds of purslane or pig weed (*Portulaca lutea* and *oleracea*) dominate the surface. There are scattered patches of *Tribulus*, and a few small clumps of scrubby kou trees (*Cordia*), apparently more dead than alive, due to the dryness and nesting birds.

The climate is decidedly warm and dry, although not disagreeably hot, except in the noonday sun. Occasional light showers fall, especially in the early morning. The column of warm air, arising from the sandy flat, helps to prevent the formation of clouds over the island, and hence heavy tropical showers by day. The winds blow almost continually from the eastward, south of east in summer, north of east in winter.

The usual species of sea and migratory birds are found on Howland. A variety of the small, gray Polynesian rat has been so abundant as to cause much distress to persons living on the island. The presence of this rat, kou trees, and a few archaeological sites, such as stone paths and pits in which food plants might have been cultivated, suggest that the island was known and visited by Polynesians. There are the usual hermit crabs and insects, and marine life abounds.

Captain George E. Netcher of New Bedford, who visited Howland in the whale ship Isabella, September 9, 1842, is credited with naming the island, it is said, for the lookout who first sighted it. But there is no doubt that it was seen and perhaps even landed upon by several vessels prior to that, one of which was the American whaler Minerva Smyth,

Captain Daniel McKenzie, of New Bedford, December 1, 1828. Later many whalers stopped there, and on it many a fine ship was wrecked. It was called Worth Island after Capt. George B. Worth, who discovered it in the Nantucket whaleship Oeno, about 1822.

On February 5, 1857, Alfred G. Benson and Charles H. Judd landed on Howland from the Hawaiian schooner Liholiho (Captain John Paty), raised the American flag, and took formal possession in the name of the American Guano Company, of New York, by erecting a small house and "leaving various implements of business." They stayed until the 26th, taking a generous sample of the guano which they found in great abundance.

On the same cruise of the Liholiho, Jarvis and Baker islands likewise were claimed, and shortly thereafter guano digging operations were begun on them by the American Guano Co., under bonds 1 and 2, dated October 28, 1856. But strangely, claim was not made to Howland until December 3, 1858 (bond No. 4), and accounts of guano enterprise generally assign it to the United States Guano Co.

The reason for this was the competition between two guano companies for the use of the island. In June, 1859, representatives of the American Guano Co. were landed on Howland. The same month the ship Ivanhoe arrived, hoping to get possession for the United States Guano Co., but left, disappointed. However, the latter company somehow managed to get a toehold on the island, for in February, 1861, we learn that Captain Stone of the American Guano Company's brigantine Josephine landed on Howland and politely notified two agents of the United States Guano Co., whom he found there, to be ready to leave whenever the opportunity offered. Thereafter Howland was visited regularly by the American Guano Company's vessel which brought supplies to the guano islands.

The years 1870 to 1872 marked the peak of Howland guano digging. Between August and December, 1870, with Captain Ross as superintendent, seven ships (German, British, and American) were loaded with 7,600 tons of guano, in 109 working days, a record for this guano island. American guano digging enterprise seems to have come to an end on Howland in October, 1878, when "Capt. Jos. Spencer, wife, and 3 children, E. Wheeler, Chas. Hines, John MacWiggins, Gabriel Holmes, and 34 native laborers" returned to Honolulu aboard the Joseph Woolley.

John T. Arundel and Co. occupied Howland between 1886 and 1891, using 100 natives from Niue and the Cook group to perform the physical

"King-Doyle Park," Baker Island, 1938.

Lighthouse, camp, and remains of the stone house, Baker Island, 1938.

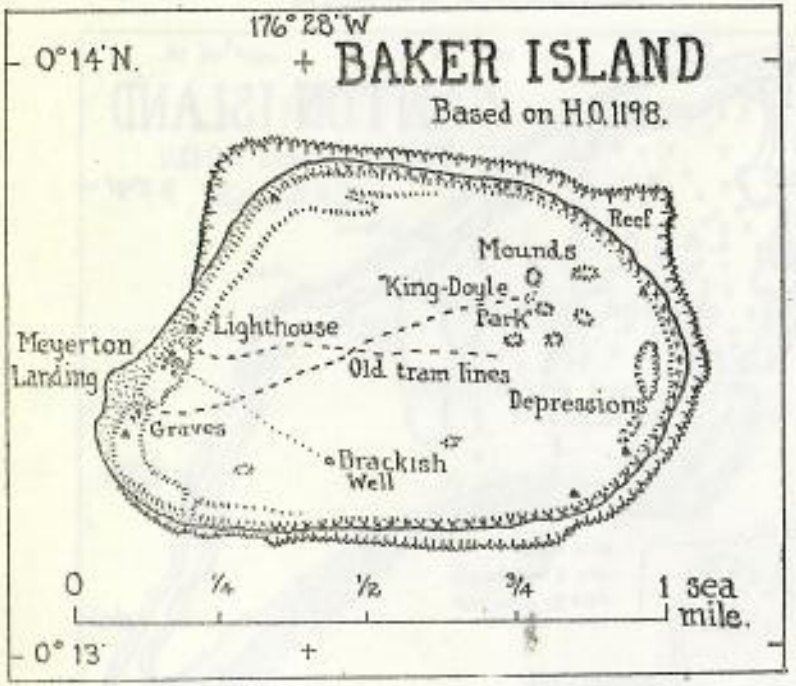
labor. Albert F. Ellis gives interesting notes concerning this period in "Adventuring in Coral Seas."

American colonists were established on Howland, March 30, 1935, from the U.S. Coast Guard Cutter Itasca. The airfield is called Kamakaiwi Field to do honor to a veteran colonist of this period.

Howland Island came into prominence in 1937, through the world flight attempted by Amelia Earhart and her navigator, Fred J. Noonan. In March the Shoshone hastened to Howland, where work was rushed to complete the airfield, under the supervision of Robert Campbell, so that the fliers might land there on the flight between Oahu and Lae, New Guinea. An accident during the take-off at Wheeler Field, March 19, prevented the flight at that time.

In June the fliers made a successful trip in the opposite direction as far as Lae, from which they took off for Howland on July 2, but did not arrive. During the next few weeks numerous vessels combed the area, but no trace of the fliers has been found. The lighthouse on Howland has been called Amelia Earhart Light.

CHAPTER 13
Baker Island



Baker Island lies 34 miles south and 10 miles east of Howland, a shore to shore distance of 36 miles; and like Howland, about 1650 miles southwest of Honolulu. It is 13 miles north of the equator. All distances are sea miles.

The island measures about a mile east and west, by 1260 yards wide. All around it, but especially on the west, the beach rises abruptly from the shore to a crest, 15 to 20 feet above sea level, forming a barrier which keeps the pounding surf out of the central basin. The west beach is sandy; that on the other three sides is largely composed of broken reef rock and sandstone shingle. A sandy point seems to be building out to the southwest, beyond the fringing reef.

Within the crest is a basin, formerly containing a thick deposit of guano, most of which now has been removed. The surface is flat, except for some small mounds on the northeast, which are probably piles of low-grade guano, as the former tram lines lead to them. The southwestern ridge is cut in three places, where the tracks led through. On the east are two small depressions, just behind the beach, the larger of which generally contains some water.

Meyerton, the present settlement, is located atop the western barrier ridge. It was named for Captain H. A. Meyer, U.S.A., who helped establish the camps for the colonists in 1935. Here in guano days were located several houses and four brick cisterns, into which rainwater was led. All have gone now, except one of the cisterns and part of one substantial house of sandstone slabs. Bricks and slabs were used in building the lighthouse.

Baker Island boasts of 16 species of plants, besides the ironwood trees, coconuts, and other species set out by the colonists. Five are obviously weeds which arrived with the guano diggers (two grasses, two spurge herbs, and a morning-glory vine), as they grow only near the former house sites. *Lepturus* bunchgrass grows best on the barrier ridge; another grass (*Digitoria*) and a low sedge are on the flat within; *Boerhaavia*, two kinds of purslane, and a few *Tribulus* and *Sida* bushes form scattered patches; and there is an occasional *Triumfetta* plant on the beach slope.

Bird life, in recent years, has been much less abundant on Baker than on other similar islands in the Central Pacific, due perhaps to the presence of large voracious Norway rats, which feed on small birds and eggs. The principal birds there now are frigates, boobies, and the migratory species. Hermit crabs and two kinds of widespread lizards are abundant; and marine life is plentiful and varied.

Baker is said to have been discovered by Michael Baker, of New Bedford, who visited it in 1832 and again on August 14, 1839, in the whaler Gideon Howland, to bury an American seaman. At the time of the latter visit he raised the American flag and claimed possession of the island. Later he sold his claim to the American Guano Co.

But this was not the first discovery of the island. It was known as New Nantucket before 1821. One account states that this name was given to it by Captain Elisha Folger, of Nantucket, who visited it in the whaler Equator in 1818. In December, 1828, Daniel McKenzie visited it in the American whaler Minerva Smyth. The ship Loper had been there in

1826, and Captain H. Forster, in the ship Jamaica, before that. It was reported as Phoebe Island by Henry Foster, in the bark Sussex in 1843.

Messers. Alfred G. Benson and Charles H. Judd, representing the American Guano Co., landed from the Hawaiian schooner Liholiho, February 12, 1857, to assert the company's claim to the island. The U.S.S. St. Marys (Commander Charles H. Davis) landed, surveyed the island, and took official possession in the name of the United States, in August 1857. They reported that ten whalers had touched at the island between June 21 and August 16, 1857. So frequently did whalers visit Baker during one period that it became the custom to leave messages and letters there, in a covered box, to be picked up and delivered.

J. D. Hague, chemist with the American Guano Co., in a lengthy report on the phosphate islands calls Baker's guano deposits the finest he had seen. They were worked continuously by the American Guano Co. from 1859 to 1878, many thousands of tons of guano having been dug, carted across to the landing on tram cars, and loaded with great difficulty through the pounding surf onto schooners and clipper ships, which were moored precariously to buoys on the lee side. We cannot attempt to detail the activities, adventures and hardships of this period; or to tell of the many shipwrecks, although a fairly complete history has been pieced together from scattered accounts.

John T. Arundel and Co., a British firm, made this island their headquarters for guano digging enterprise in the central Pacific between 1886 and 1891.

The American colonists were landed from the Itasca, April 3, 1935. They have built a lighthouse, substantial dwellings, and have attempted to grow various plants. One sad-looking clump of coconut palms was jokingly called by the writer "King-Doyle Park," after two well-known citizens of Hawaii, his ship companions on the Taney in 1938. The clump was the best on the island, planted near a water seep. The dry climate and sea birds, eager for anything upon which to perch, do not give trees or shrubs much chance to get started.

CHAPTER 14

Canton Island

Canton Island is the largest and most northern of the Phoenix group. It lies 1630 nautical miles in a direction 30 degrees west of south from Honolulu. Its northwestern point is 166 miles south of the equator.

The island is an atoll, made up of a low, narrow rim of land surrounding a large shallow lagoon. Its shape has been likened to that of a pork chop. It is four and a half miles wide on the west, from which it narrows to the southeast point, which is nine miles distant from the northwest point.

The rim of land varies in width from 50 to 600 yards, and in height from five to twenty feet. The ocean beach rises steeply from its fringing

reef to a crest, within which the surface is fairly level and smooth. The beach is composed alternately of coral sand and broken fragments of reef rock, as indicated on the map. On the lagoon side the beach is lower, in places with white sand running out onto the fringing reef.

Much of the rim is nearly bare or sparsely covered with low herbs and bunch grass. A stretch of about two miles on the south side supports a thick stand of *Scaevola* shrubs, eight to twelve feet high. There are also small patches of wiry *Suriana* shrubs near the lagoon shore at the northwest and southeast ends. Half a dozen small clumps of heliotrope and kou trees, and ten grown coconut palms make up the balance of the conspicuous vegetation, a dozen species in all.

Into the lagoon there are four entrances, all on the west side. The most northern, which ran in 1924, is now dry. The middle two are blocked by reefs and rocks. The southern entrance has deep water through the rim, but within it is blocked by coral heads, which with a network of reefs choke the entire western half of the lagoon. A boat of shallow draft can work eastward close to the southern side; and along this route guano was transported (1885-6) from a small stone pier on the northern side. Pan-American Airways has blasted a wide channel across the southern half of this part of the lagoon, to provide a safe landing basin for seaplanes.

The bird life has been described by two naturalists, J. J. Lister (in the Proceedings of the Zoological Society of Loudon, 1891) and Major G. A. Buddle, a member of the New Zealand 1937 eclipse expedition (Auckland Museum Record, November, 1938). They list 23 species, including 3 shearwaters, a petrel, the red-tailed tropic bird, 3 kinds of boobies, great and lesser frigate, 8 species of terns, curlew, golden plover, and wandering tattler. The Polynesian rat, lizards, hermit crabs, and marine life are as on the other islands, and turtles come up onto sandy beaches to lay their eggs.

Canton Island was discovered independently by several ships, most of them American whalers, for which it was a frequent haven, despite its lack of water and coconut groves, for there was fair anchorage off the southwestern lagoon entrance. The variety of names, including Mary, Swallow, and Mary Balcout, attest these "discoveries," the earliest of which must have been before 1820, as these names appear in early lists. The British claim a visit by H.M.S. Curacao, Capt. Gibson, during the 1850's.

The name Canton came late, but stuck because of dramatic circumstances. On March 4, 1854, the New Bedford whaleship Canton, Captain Andrew J. Wing, piled up on its reef. The captain and crew, after a brief stay, took to their open boats, and after 49 days arrived at Guam. In 1872, Commander R. W. Meade, of the U.S.S. Narragansett, who surveyed the island during one of his efforts to bring Capt. "Bully" Hayes to justice, named it Canton, to commemorate this adventure.

Although claimed by American guano diggers, Canton does not seem to have been worked by them. A little guano was dug by the John T. Arundel Co., 1885 to 1886. In 1899 the island was leased to Pacific Islands Co., but not developed. In 1916 it was among the islands leased to Captain Allen of the Samoan Shipping and Trading Co.; but aside from planting a few coconut palms, of which ten survived, that company made no use of the island. The writer visited Canton with a scientific expedition in March, 1924, and again July 25 and 27, 1938.

Canton broke into the news in 1937, when American and New Zealand eclipse expeditions chose it as a spot from which to view the total eclipse of the sun of July 8. Enough radio and other publicity was produced to put any spot on the map.

But more than the eclipse was observed. Both British and Americans noted, as had the writer, that here was a splendid lagoon in which seaplanes could settle, as well as a flat rim for land planes. British and American parties each made a monument displaying the flag of its nation.

Prior to this the British had taken pains to reassert their jurisdiction over the Phoenix Islands. Officials had landed on Canton from H.M.S. Leith August 6, 1936, and had posted a sign asserting sovereignty in the name of King Edward VIII. On June 3, 1937, H.M.S. Wellington stopped and a second sign was nailed up on the coconut palm, in the name of King George VI. Meanwhile, on April 8, 1937, the Phoenix Islands had been placed for safekeeping in charge of the Gilbert and Ellice Islands Colony, and its administrator had added his sign in October, 1937.

August 31, 1937, two British agents, with powerful radio equipment, were landed by H.M.S. Leith; one was replaced January 17, 1938, and another June 22, 1938. They received supplies also from the passing Canadian-Australian steamships.

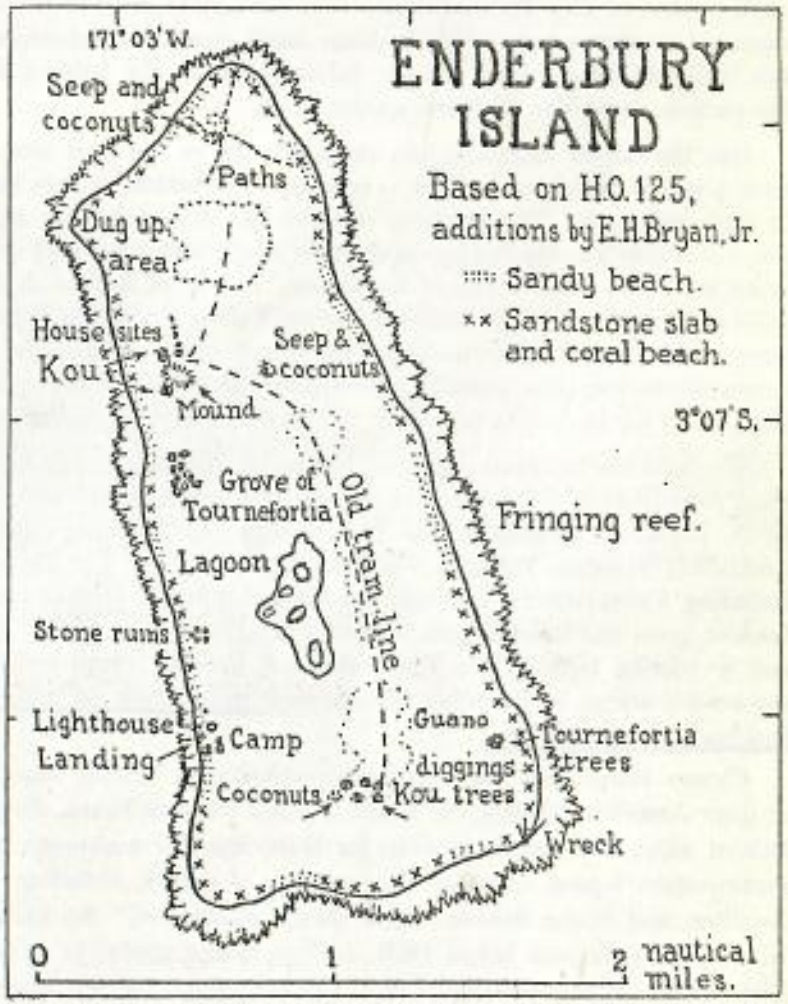
Despite all this British safeguarding, an American party of seven, including surveyors and radio engineer, besides four part Hawaiian colonists, landed from the Taney, at 9 a.m., March 7, 1938, and set up their camp alongside the British. This had followed an administrative order, signed

March 3 by President Franklin D. Roosevelt, placing Canton and Enderbury under jurisdiction of the Department of the Interior.

It was a friendly and bloodless invasion, each party sharing the other's hospitality. They knew that the settlement lay in Washington and London. This was finally reached in April, 1939, Canton and Enderbury being placed under joint British and American control for 50 years, and "thereafter until such time as it may be modified or terminated by mutual consent." Air companies of both nations have equal rights to such facilities as the islands may afford.

During 1938 and 1939 Pan American Airways laid out and developed an extensive airport, deepened and cleared the lagoon, and initiated flights to New Zealand using Canton as one of the ports of call. An insect "filter" has been established on the islands, to guard Hawaii and California against the importation by clipper planes of insect pests and plant diseases from the antipodes.

CHAPTER 15
Enderbury Island



Enderbury Island lies 37 nautical miles E.S.E. of Canton and 186 miles south of the equator. In contrast to Canton Island, which is largely lagoon, Enderbury is nearly solid land, with the lagoon reduced to a small,

shallow pond, a few hundred yards across, and dotted with sand islets, covered with a mat of *Sesuvium*, which also carpets the surrounding basin.

The island measures a little less than three miles north and south by about a mile wide. The elevation around much of the rim is between 15 and 22 feet, with a small mound of low-grade guano rising as high again on the northwest side. The central part is depressed toward the south, and to the north has been dug over for guano until it resembles a great mine dump.

Much of the surface is carpeted by herbs, bunchgrass, *Sida*, and morning-glory vines, and there are also several small clumps of trees. These include three groups of coconut palms, each surrounding a moist depression. Of these there were in 1924, from north to south, 22, 12, and 26 palms; in 1938 several of these were seen to have lost their crown of leaves, 14, 9, and 8 still growing.

Near the south end there are two large and six small clumps of kou trees; also one clump on each side of the mound, and a few scattered trees. A grove of tree heliotropes covers a few acres near the center of the west side, with a smaller thicket on the southeast rim, and a single tree which screens the camp from the sea.

Most of the beach is composed of sandstone slabs and coral rubble, alternating with short stretches of sand. The northern end is surfaced with jagged fragments of coral, which clink as one walks over them. No wonder natives at some period, guano diggers or before, built paths of smooth stones across this area. One can easily imagine that, at time of storms, waves may sweep across this low part of the island. The steep beach is fringed by reef 60 to 200 yards wide.

Birds are abundant on Enderbury, including great flocks of sooty terns and other species found also on Canton. The rat population is said to be large. The most astonishing insect discovery was a tiny beetle, hiding among the roots of herbs and bunch grass. Its relatives are bark beetles on native forest trees of Hawaii, Samoa, Fiji, and other high island groups.

Enderbury was discovered and named in 1823 by Captain James J. Coffin, of Nantucket, when in command of the British whale ship Transit. The name is a misspelling of Enderby, a London whaling merchant. We have no record of earlier visitors, although it certainly was known to the Polynesians.

The island was visited on two occasions and surveyed by vessels of the U. S. Exploring Expedition: the Vincennes, August 28, 1840, and the Peacock and Flying Fish, January 9, 1841. It was also examined by Lt. Hamphill of the U.S.S. Tuscarora.

Guano digging began about April 1860, but the start was not promising. Captain Lawton, of the American brig Agate, which supplied Phoenix and McKean Islands, reported: "Jan. 1, 1861, touched at Enderbury's I.; found two men confined to their berths with scurvy—had been on allowance about three months, and about five pounds of wormy bread left, plenty of water; neither of them was able to get out of the house; took one of them (John Brown) away; they had been nine months on the island, expecting relief."

But Enderbury developed into an important source of guano. The peak of activity there came in the early 1870's. Captain Elias Hempstead, with 60 Hawaiian laborers, arrived in June, 1870, to be superintendent for the Phoenix Guano Co. In 64 working days, the next four vessels were loaded with over 6,000 tons of guano. In 1872 we have another record of 4,822 tons being loaded onto three vessels in 33 working days. After three or four years, the shipments gradually fell off. The last guano ships were recorded as going there from Honolulu in February and March, 1877. The supply ship, Joseph Woolley, discontinued its call there in July, 1877.

There is no anchorage at Enderbury, and loading the cargo ships was a difficult and dangerous procedure. However, the mooring buoys must have been good, for the U.S.S. Narragansett (Comdr. R. W. Meade) did not hesitate to use them, March 27 to 29, 1872, while they mapped the island.

There were numerous wrecks on Enderbury, but comparatively few of the many guano vessels were wrecked. The British bark Golden Sunset (E. H. Tidmarsh) went ashore December 11, 1866, with 20 passengers and a cargo of coal. Captain, passengers, and crew were brought safely to Honolulu on the Hawaiian brig Kamehameha V, supply ship at the time. The C. M. Ward (G. W. Rickman) brought supplies, including water and firewood, during the 1870's.

The John T. Arundel Co. made use of Enderbury for a while during the 1880's. Albert F. Ellis relates that they found a horse and a mule which had been abandoned on the island by the American company, and used the mule to pull their tram cars. In 1899 the island was leased by

When the writer saw it, March 10, 1924, it was much smaller, and not over a foot deep.

The steep beach is fringed by a narrow reef, 30 to 100 yards wide. Through this there is a small break, apparently blasted, on the southwest side, where landing is comparatively easy in moderate weather. There is no anchorage, and the surf breaks heavily on the east side and off the N.W. and S.E. points.

There are no trees on the island, but in 1924 much of its surface was covered with herbs, except on the east side, where the waves had thrown up a ridge of broken coral, and at the north end of the lagoon, where there was an expanse of bare sand. The vegetation suggests a warm, dry climate.

Each of half a dozen species of plants dominates a different area: *Lepturus* bunchgrass at the N.W. point and along the west beach crest; *Boerhaavia* and *Portulaca* on the south and southwest; a mat of *Sesuvium* along the west border of the lagoon; and small areas of stunted *Sida* (ilima) and *Triumfetta* (beach runner) amid the rocks on the east side.

White, yellow, and brown, ex-domestic rabbits were fairly numerous, but did no apparent damage to the vegetation. Sea birds were very abundant, consisting of sooty, gray, and white terns; frigates nesting on the *Sesuvium*; four species of shearwaters and petrels, sharing holes with rabbits; boobies, and migratory plover and curlew.

No lizards or rats were noted, but turtles must occasionally come onto sandy portions of the beach to lay eggs, for a skull and some bones were found. Insects were abundant, but of few species, consisting principally of flies, moths, leafhoppers, green bugs, and spiders, all small.

No prehistoric ruins have been found; but Polynesian navigators might have visited the island in their travels, finding no inducement to stop.

We know from records in the U. S. Hydrographic office that Phoenix Island was discovered by an American vessel of that name, prior to 1828; but just which one or the date is not certain. One ship, Phoenix, under command of Captain Moore, was in this region in 1794. A whale ship out of Nantucket (Captain David Harris) was in the Pacific between 1821 and 1824. Another, from New Bedford, was whaling under Captain Worth in 1822, and under Captain Stetson in 1824, according to Starbuck's History of American Whale Fishing. The U. S. Exploring Expedition did not find the island.

On March 14, 1859, C. A. Williams and Co. (later the Phoenix Guano Co.) filed notice with the U. S. State Department of the discovery of Phoenix Island, Thomas Long, master of the schooner E. L. Frost, making affidavit that a landing had been made there February 19, 1859, (another account says Feb. 9, 1859), that possession had been taken in the name of the United States, a sign board erected, and a bottle, containing papers, buried. Claim to McKean, Enderbury, and Starbuck was made at this same time.

On April 19, 1859, the American brig Agate, under Captain Long, set out from Honolulu with A. M. Goddard and 29 native laborers, to establish a camp on Phoenix and commence digging operations. The American schooner Modern Times followed, on April 28th. But, apparently, landing was found too difficult on Phoenix, for the camp was made on McKean Island, and the Modern Times was loaded there.

We hear next of Phoenix Island on September 3, 1860, when the bark Zoe (Captain Bush) took Dr. Griswold and A. Mitchell there from Honolulu to examine the island. Thereafter the supply ship Agate (Captain Lawton) visited both Phoenix and McKean, and many vessels went there to load. During 1870 the visits became less frequent, and in August, 1871, the island was finally abandoned by the American guano diggers.

When the U.S.S. Narragansett visited Phoenix Island, March 27, 1872, Commander Richard W. Meade reported: "The buildings, flagstaff, and wharf of the Phoenix Guano Company are still standing, but the island has been worked out and was abandoned in August last. I saw no vegetation on the island, except a little grass here and there."

June 29, 1889, the British flag was hoisted and protectorate declared. At that same time a careful survey was made of the island.

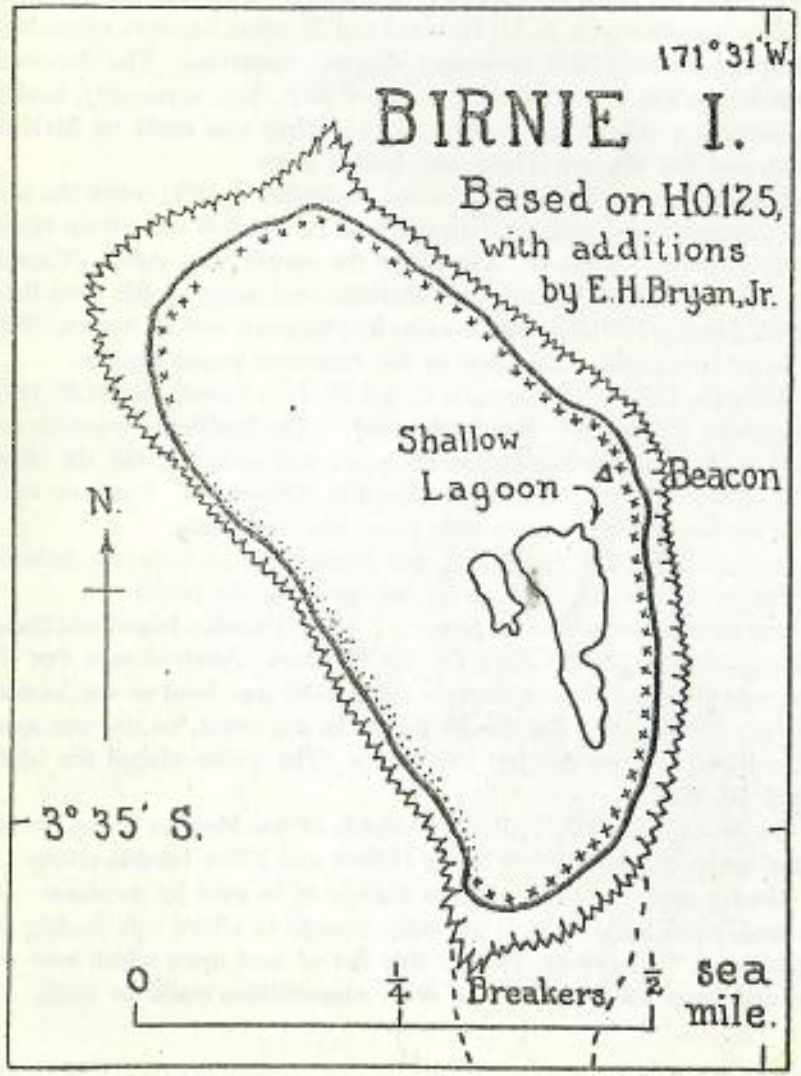
One account states that on January 1, 1914, Phoenix Island was leased to Burns, Philip (South Sea) Co. for 87 years. Another says that the lease was given in 1916 to Captain Allen, who was head of the Samoan Shipping and Trading Co., for 87 years. In any event, no use was made of the island, and no one has lived there. The writer visited the island March 10, 1924.

On March 18, 1937, with other islands of the Phoenix group, it was placed under the jurisdiction of the Gilbert and Ellice Islands colony.

The lagoon is too small and too shallow to be used by seaplanes; and the land, while fairly level, is not large enough to afford safe landing for airplanes. It is, however, another tiny dot of land upon which man can live, and from which weather or other observations could be made.

CHAPTER 17

Birnie Island



British and American camps on Canton Island, 1938.

Dedication of Canton Island lighthouse, July 27, 1938.

Birnie Island is the smallest of the Phoenix group. It is located 215 nautical miles south of the equator, near the center of a circle of five other Phoenix islands: 44 miles south of Canton, 42 miles S.W. of Enderbury, 50 miles west of Phoenix, 56 miles in a direction 20 degrees west of north from Sydney, and 66 miles N.E. of Hull. McKean Island lies 150 miles due west, and Gardner Island is 200 miles in a direction 20 degrees south of west.

The island measures less than ¾ mile long, N.W. and S.E., by 600 yards, greatest width. Its outline is nearly straight on the west side and convex on the east. Most of the east or weather side is rocky, with slabs of coral sandstone and broken fragment of coral piled up in a steep beach to a height of more than the "official" height of 6 feet, given to the island. James Dwight Dana, in 1841, estimated its height as 10 to 12 feet; J. T. Arundel, in 1883, thought the N.E. side fully 20 feet high. The beach crest is so high that even from a height of more than 30 feet on the bridge of the Taney, we could scarcely see the water in the small lagoon beyond it, as we sailed by on July 28, 1938. Most of the lee (west) shore seemed lower and sandy.

The northern half of the island appeared to be flat and fairly smooth, carpeted with low herbs, such as *Portulaca, Boerhaavia,* and bunchgrass. The very small, shallow lagoon occupied a depression, bordered by a mat of bright green plants, probably *Sesuvium.* The lagoon must vary considerably, as one account gives its depth as 6 feet, while another states that it was nearly dry.

There is a beacon, about 15 or 20 feet (the pilot book says 30 feet) high, located on the eastern curve of the island. Its lower part appeared through glasses to be composed of slabs of coral sandstone, above which there was a ladder-like structure of wood or metal.

The fringing reef is quite narrow, except for points at the north and south ends. Foul water extends several hundred yards south from the southern point.

There is no anchorage, but landing can be made on the sandy lee beach. The usual kinds of sea and migratory birds are probably to be found. There are said to be no signs of former inhabitants.

Birnie Island was discovered and named by Captain Emment in 1823. He also discovered Sydney Island the same year. Research so far has failed to give us any definite information about the discoverer or his vessel. His name does not appear in an extensive list of New England whaling masters. The most prominent person of that period, for whom the island

might have been named, was Richard Birnie (1760-1832), who took a leading part in business and official life in England.

The island was visited by the U.S. Exploring Expedition. On August 28, 1840, it was sighted by the Vincennes, 12 miles to the westward, in the early morning. After surveying Enderbury Island, this vessel tried to get back for a closer look; but night settling down, they pulled away to avoid piling up on its low, treacherous shore in the dark. By morning they had drifted so far to leeward that they deemed it a waste of time to try to beat back. On January 11, 1841, men from the Peacock and Flying Fish landed and surveyed the island, making its position 3 degrees 34 minutes 15 seconds south, longitude 171 degrees 33 minutes west.

Birnie was among the islands claimed by American guano interests. But nothing has been found to indicate that any amount of guano was actually dug. On December 6, 1867, the ship Kamehameha V (Captain Stone) reported sighting the island on its passage from Enderbury to McKean, but no regular stops are recorded as having been made by any of these supply ships.

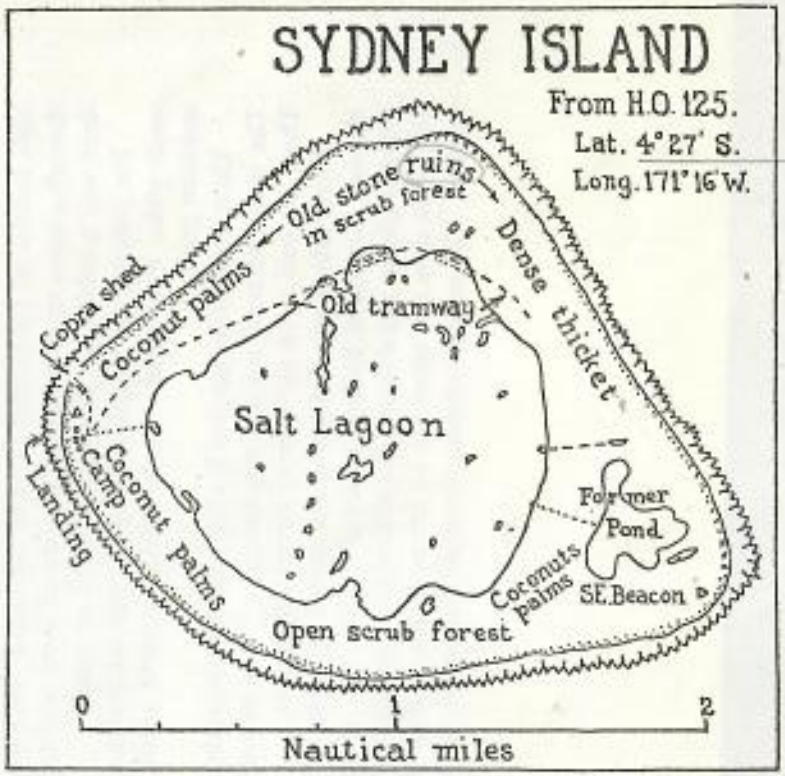
In giving sailing directions for the Phoenix group (published in The Friend, for August, 1871, page 61), Elias Hempstead, superintendent for the Phoenix Guano Co., on Enderbury Island, included Birnie, giving its position as latitude 3 degrees 34 minutes south, longitude 171 degrees 33 minutes west. The U. S. Hydrographic Office pilot book gives the position as a mile farther south and two miles to the east, the longitude being 171 degrees 31 minutes west.

Sir Albert F. Ellis, in his entertaining book, Adventuring in Coral Seas, intimates that guano was not dug on Birnie by John T. Arundel and Company.

July 10, 1889, the British flag was hoisted and a protectorate declared. In 1899 the island was leased to the Pacific Islands Co. In 1916 it was included among the islands leased for 87 years to Captain Allen of the Samoan Shipping and Trading Company. This lease was taken over by Burns, Philp (South Sea) Company. In April, 1937, with the rest of the Phoenix group, it was placed under the jurisdiction of the Gilbert and Ellice Islands Colony.

There is not much to tell about Birnie, for but few persons have landed there, and practically no use has been made of the island. Being so low and difficult to see, it is a menace to safe navigation, and most vessels have carefully avoided it.

CHAPTER 18
Sydney Island



Sydney is the southeastern island of the Phoenix group. It lies 267 nautical miles south of the equator, 600 miles north of Pago Pago, and 60 miles east of Hull Island. With our last three islands it forms, a kite-shape, like the Southern Cross, the upright (Sydney to Enderbury) measuring 82 miles, with Phoenix and Birnie on the two sides, each 55 miles away.

Sydney Island might be described as a triangle with rounded corners, the base being about 2 miles, east and west, and each side about 1¾ miles. In the center is a circular, very salty lagoon, about a mile in diameter and

up to 15 or 18 feet deep, without channel to the sea, and choked with small islets and shoals. At the southeast corner, an area where guano was dug 55 years ago, became a series of small, only slightly brackish ponds, which now have all but dried up.

The island is surrounded by a fringing reef, about 50 yards wide, behind which to a height of 15 or 20 feet rises a steep beach, partly sandy and partly covered with sandstone slabs and coral rubble. There is good anchorage on the west side, about 200 yards off the reef, in 10 to 14 fathoms, marked by a beacon on shore. Landing is not easy, and at times dangerous.

Behind the beach crest the land slopes gradually toward the lagoon. The western side has been planted to coconut palms, which form good groves, up to 70 feet high (80 to 90 feet above sea level). On the northeast side there is a dense, in places impenetrable, thicket of low forest, 15 to 20 feet high. Near the former ponds on the southeast, a small grove of coconut palms was planted, beginning about 1905. On the north and south sides of the lagoon there is open scrub forest. This is made up principally of *Tournefortia, Pisonia, Morinda, Cordia, Guettarda,* and *Scaevola,* with the usual low herbs, shrubs, and vines, found on the treeless island.

The bird life is similar to that on the other islands, but less abundant. Ducks used to be seen on the ponds, but now both are gone. Domestic pigs have run wild. There are the usual rats, lizards, and hermit crabs. Insects are abundant and of some variety, including a blue and white butterfly, several kinds of moths, dragonflies, ants, flies, leafhoppers, bugs, beetles, wasps, and spiders. There were formerly no mosquitoes, but these are said to have arrived on a ship from Tahiti about 1884.

Salt water has seeped into the lagoon, which stands a foot or so below the surrounding sea level, and has evaporated, leaving its salt behind, until this concentrated brine will no longer support marine life. Fish and mollusks formerly were abundant in the lagoon.

A great variety of marine life inhabits the fringing reef. Fish at Sydney have the reputation of being poisonous; but this applies only to some of the reef species, those which feed on seaweeds; the rest are excellent eating.

A most interesting feature of Sydney Island is found in the ancient ruins, which tell of Polynesian visitors of long ago. Hidden among the thickets, along the N.W. and N.E. sides are a dozen or more platforms

and enclosures of sandstone slabs. From a study of these, K. P. Emory, Bishop Museum ethnologist, concludes that there were at least two groups of early visitors. One built a marae or shrine typical of Eastern Polynesia. Another group built platforms which suggest that they came from Micronesia. There was a fish pond in the lagoon, several wells, and pits which might have been used for cooking.

Sydney was discovered and named in 1823 by Captain Emmett. While searching for it, the U. S. Exploring Expedition's ship Vincennes "discovered" Hull Island, Aug. 26, 1840. On shore they found a sick Frenchman and 11 Tahitians, who informed them that Sydney Island lay 60 miles to the east. Stormy weather and strong currents prevented them from finding the island.

Sydney was among the islands claimed by American guano interests, but apparently they made no use of the island. About 1882 or 1883 John T. Arundel obtained a lease to it from Her Britannic Majesty. The Friend, for Sept. 1883 (p. 77) gives notice to this. For possible guano-collecting ships it notes that the prevailing winds are from the east by north to east by south, regular from April to December. Captain Mann was the manager. "Guano will be brought alongside within reach of ship's tackles in boats provided by the shippers. It is shipped in bags, which are to be returned when empty."

Guano digging continued during 1884-5. There was a tram line around the north side of the lagoon, so well made that the roadbed forms an excellent level path today. Another short line ran from the S.E. guano digging to a stone pier on the lagoon. Here marks indicate that the water level has dropped two feet during the 50 years. The camp and landing was then, as now, on the west end. Shipping guano was very difficult, due to bad landing. The ship Lorenzo was wrecked while loading, and perhaps others suffered a similar fate.

The British flag was raised and protectorate declared, June 26, 1889. The island was used by Lever Brothers about 1905. In 1916 it was leased for 87 years to Captain Allen, representing the Samoan Shipping and Trading Co. They employed up to 16 natives to cut and dry copra and plant coconut palms. When the writer visited Sydney, March 21-23, 1924, there were 11 Samoans and Ellice Islanders in charge of Charles Jennings.

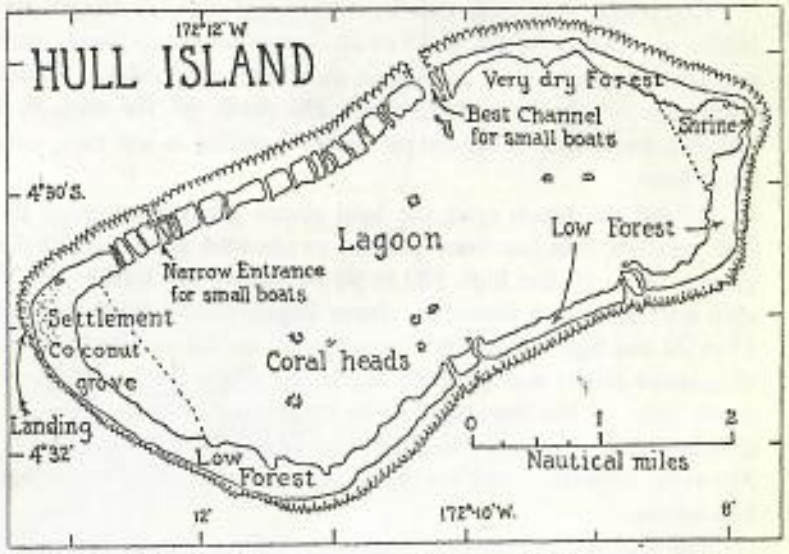
After the death of Captain Allen, 1925, Burns, Philp Co., took over the lease. With recently awakened interest in the central Pacific, the island was visited in January, 1937, by H.M.S. Leith (Capt. L. C. P. Tudway, R.N.) and claim was reasserted in the name of King George VI.

The same year the rights of Burns, Philp Co., were bought out, and the island was made part of the Gilbert and Ellice Islands Colony, whose Administrative Officer visited Sydney on H.M.C.S. Nimanoa in October, 1937.

Villages in the Gilbert and Ellice groups were becoming crowded, and here was an island in need of inhabitants. So in the fall of 1933, a colony of natives was taken to Sydney. The village now numbers 130 persons, with native magistrate, radio operator, and energetic supervisor of public works and acting administrator, Kina Jack Pedro, Tokelau-Caucasian, brother of Mrs. Alexander Jennings, wife of the owner of Swains Island.

A model village has been built; cement cistern, with a capacity of 31,000 gallons, constructed; and 15 wells developed. Unfortunately drought in 1939 made the cistern nearly dry, and the wells go brackish; but rains improved conditions. Each man and woman has been given 50 coconut palms, to use as food or to make copra, and each child, two unplanted sections, each 150 feet square. So popular has been this experiment in native habilitation that two men and a woman even traveled across from the Gilberts, against wind and current in a small canoe. The Gilbertese name for the island is Manra.

CHAPTER 19
Hull Island



Hull Island, in the Phoenix group, is located 249 nautical miles south of the equator, 60 miles west of Sydney Island, and 145 miles eastward of Gardner Island. It is 570 miles to the north of Apia, Samoa.

The Island is an atoll, consisting of a narrow rim of land, averaging less than ¼ mile wide, surrounding a lagoon with depths of 50 to 60 feet. The lagoon is a shoal at both ends and contains numerous coral heads, only a few of which come close to the surface. The atoll is shaped like a parallelogram, with sides 4½ by 2½ miles, but the eastern side is bulged outward to a point, so that the atoll's greatest length (E.N.E.-W.S.W.) is about 5½ miles and the average width is 2¼ miles.

The rim on the north and south sides is cut by narrow, shallow lagoon entrances, which vary in number and position as storms break through and shift the sand upon the coral rim. When the writer walked the 13½ miles around the rim in March, 1924, there were 17 channels on the north and 4 on the south, instead of the two on each side shown on the old hydrographic chart. Only two were more than waist deep. At present

there are 20 on the north side, of which only two will admit a small boat from ocean to lagoon. The best entrance has a depth of about 4 feet, in part cleared by blasting.

The entire atoll is surrounded by a fringing reef, 80 to 250 yards wide, which generally dries at low water. There is no harbor, but with prevailing trade wind, anchorage may be had about 100 yards off the west end, opposite a beacon on the shore. Landing near here is not very difficult in calm weather.

The western curve of the rim has been planted to coconut palms, several thousand having been planted during the late 1880's, and many more during the past two decades. The rest of the rim is covered by patches of scrubby forest, 10 to 20 feet high, less dense, but of the same kinds of trees and plants as are found on Sydney. Here and there *Pisonia* trees, up to 50 feet high, stand out. The tallest coconut palms raise their heads only 75 to 80 feet above the sea. In 1939 the forest at the northeast appeared nearly dead.

At the extreme eastern point the rim is very narrow and bare of trees. Here are located the ruins of an ancient stone marae or Polynesian shrine and there are small shelters, made of blocks of coral sandstone. At other places along the north rim are graves and platforms (Ellis reports finding a hundred), showing that Hull, like Sydney, was long ago a stopping-place for wandering Polynesians and other Pacific islanders.

Fish are abundant off the reef and in the lagoon. Turtles used to be caught frequently. There are the usual kinds of sea and migratory birds, about 17 species. Cats, dogs, pigs, ducks, and chickens are raised domestically. There are three kinds of lizards, Polynesian rats, land and hermit crabs. About 50 kinds of insects were collected, but insect life is less abundant than on the wetter Sydney Island.

The island was named by Commander Charles Wilkes for Commodore Isaac Hull, U.S.N. (1773-1843) on August 26, 1840, when the U.S.S. Vincennes visited the island. This party of the U.S. Exploring Expedition was surprised to find on the island a sick Frenchman and 11 Tahitians, who had been left there five months before to catch turtles, while their vessel went to Samoa to trade. American whalers had also visited the island, mistaking it for Sydney, as did Captain Hudson of the Peacock, January 17, 1841. It might have been due to this confusion that Hull was not claimed by American guano diggers, although Sydney and Gardner were, along with all the other islands of this region.

Sir Albert F. Ellis tells how, about the middle of 1887, he and his elder brother James (sons of the manager of Baker and Howland Islands for John T. Arundel and Co.) arrived at Hull, established a camp, and set out some 20,000 coconuts which they had brought with them. Many more were planted later.

The British flag was hoisted on Hull, July 11, 1889. In 1916 the island was among those leased for 87 years to Captain Allen and used by the Samoan Shipping and Trading Co. for the production of copra. In 1924, when the writer visited Hull, the 17 Tokelau native workmen were in charge of Wyllie Shafer, Yankee ex-marine, with Samoan wife and family. After the death of Captain Allen, 1925, the group nearly starved through failure to receive supplies. Mr. Shafer died on Hull, February 15, 1931.

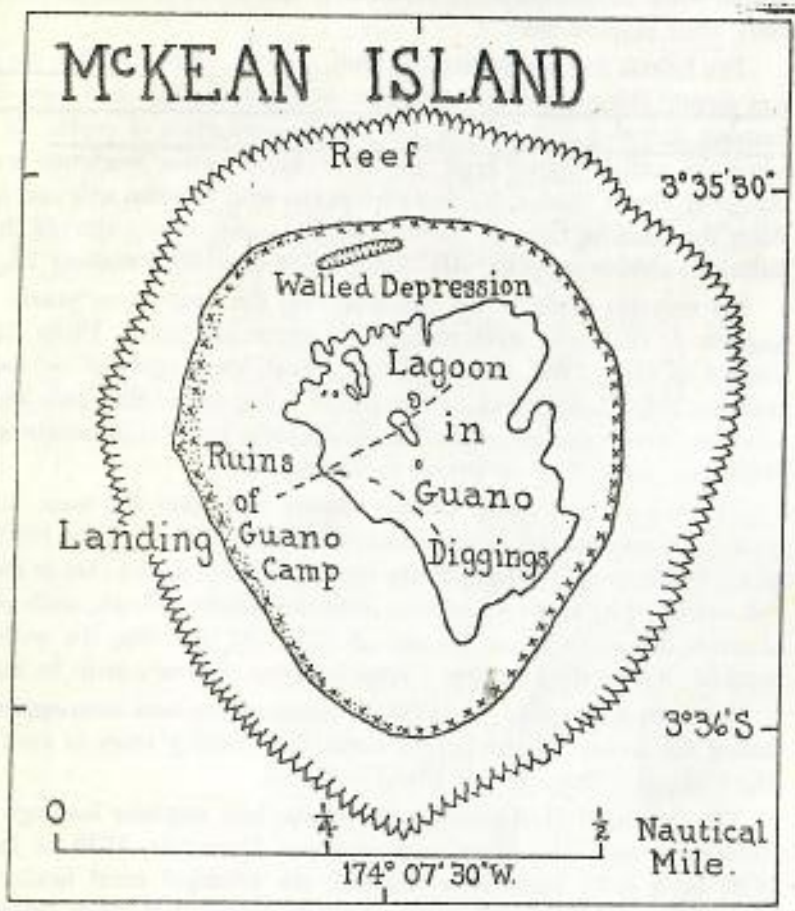
No use was made of the island during the next seven years. Then Captain J. W. Jones went there as manager for Burns, Philp Co. He arrived in May, 1937, on the Makoa, which went aground on the west point on May 22, the wreck, in two pieces, being still visible, July 28, 1938, when the writer passed on the Taney. Captain Jones is an amateur radio enthusiast, as well as an expert radio engineer.

The Gilbert and Ellice Islands Colony took over the lease in 1938, retaining Captain Jones as administrator of the island. In July, 1939, there was a well arranged village, where the copra camp used to be, at the west end, occupied by about 80 natives from the Gilbert Islands, with promise of about 200 more before the end of 1939. At that time the wells were brackish, due to drought, but a large concrete cistern was to be built.

As on Sydney Island, the 14,000 coconut palms have been apportioned among the settlers at the rate of about fifty bearing trees to each adult. The Gilbertese name of this island is Orona.

The lagoon at Hull presents one of the best seaplane landings in the Phoenix group. The island was surveyed December, 1938 to January, 1939, by a party from New Zealand, the principal coral heads in the lagoon being marked with empty gasoline drums, and claim being made for the British Pacific Airways. In July, 1939, the U.S.S. Bushnell also surveyed the island.

CHAPTER 20
McKean Island



McKean is the northwestern island of the Phoenix group. It lies 216 nautical miles south of the equator, 135 miles W.N.W. of Hull Island, 150 miles W.S.W. of Canton Island, and 70 miles N.N.E. of Gardner Island.

It is a flat sand and coral island with an oval outline, less than half a mile long (north and south), by 800 yards wide. Like other "pancake"

islands, the beach, which is largely composed of beach rock and coral shingle, rises steeply to a crest, 15 to 17 feet high (highest on the north). Within this rim the land is depressed.

On McKean this basin has been increased in depth by extensive guano digging (1859 to 1870), so that, as John T. Arundel so aptly described it, March 3, 1885, in a lecture before the Geographical Society of the Pacific, at San Francisco, it and Phoenix Island "now resemble empty plates."

The island is surrounded by a fringing reef, 100 to 200 yards wide, the inner 30 yards or so of which dries at low water. There is no harbor, but the guano diggers were agreeably surprised to find anchorage so good that they did not require the elaborate system of buoys and cables needed at most other guano islands. Landing is comparatively easy near the middle of the west side, best just after high tide.

There are no trees on McKean, the vegetation consisting of such low herbs as *Portulaca, Sesuvium,* and *Lepturus* bunchgrass.

The center of the island contains a salty lagoon, the size of which is variable, it having been reported at times as quite dry. It fluctuates even from hour to hour, with the tide, although there is no surface connection with the sea. It is obvious that this lagoon fills the area where the guano was dug, for traces of the tram roadbed can be seen across its basin.

The most conspicuous objects on the island are the ruins of the buildings built by the Phoenix Guano Company. These consist of numerous stone walls on the west side. The highest point is a wall about seven feet high, its top, perhaps, 22 feet above sea level.

Near the middle of the north side, just behind and parallel to the beach crest, there is a curious trough-like depression, about 160 yards long, with steep sides, looking as if it had been dug and faced by human hands; but for what purpose?

Bird life is very abundant, made up entirely of sea and migratory species, terns predominating. Hermit and other crabs, lizards, and small insects are common.

McKean was named by Commander Charles Wilkes, at the time of his visit on the U.S.S. Vincennes, of the U.S. Exploring Expedition, August 19, 1840. He states in his "Narrative" that he named it M'Kean for the man who first sighted it, but in the published list of officers and men we find only John M'Keen, ship's cook.

It is very likely that several whalers and perhaps other vessels had previously visited the island, for the position of an unnamed island in the

list of whalers' discoveries, tabulated by J. N. Reynolds in 1828, agrees closely with that of McKean.

On March 14, 1859, C. A. Williams and Co. (which became the Phoenix Guano Co.) filed claim to McKean with the U.S. State Department, under the Guano Act of 1856. Presumably the island had been visited and formally claimed the previous February by Captain Thomas Long, at the same time he visited Phoenix Island; but it is not known whether he left his copper plate, claiming the island for the Phoenix Guano Co., then or at the time of his next visit in May, 1859.

On April 19, 1859, the American brig Agate (Captain Long) left Honolulu for Phoenix Island, to start activities for the Phoenix Guano Co. followed, April 28, by the American schooner Modern Times to carry the first load of guano. As related before, the camp was established on McKean, where 29 Hawaiian laborers, under A. M. Goddard, loaded the Modern Times in 45 days, that vessel sailing for the States on August 15. It was followed by the ship White Swallow (Capt. Crosby) in August, and the American clipper ship Aspasia (Capt. Sisson) in September.

The supply ship Agate visited the island four or five times a year. Loading guano was so easy that even it carried away 30 to 100 tons during its early fleeting visits. The brig Josephine (Captain W. C. Stone), supply ship of the rival American Guano Co., also dropped in from time to time, to see what was going on. Thus we have extensive reports of guano activities during the next ten years. No wrecks are recorded.

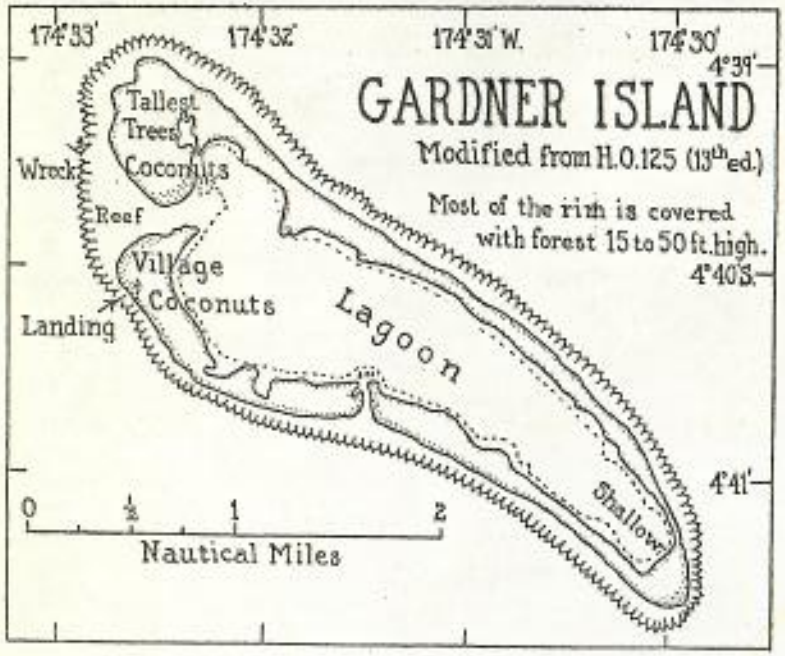
Guano digging ceased on McKean in 1870. The Kamehameha V, which succeeded the Agate as supply ship, stopped there February 20, 1870, and on its June and September trips arrived at Honolulu with many more laborers than she took out. The C. M. Ward (Capt. James W. Hatfield), which replaced the Kamehameha V, visited Phoenix, Enderbury, Baker and Howland on her August trip, but not McKean; and thereafter no further mention is made of stops at McKean.

The John T. Arundel Co. made no use of this island. It was leased to the Pacific Islands Co., but they also reported no guano left on it.

With the return of interest in the Phoenix group, it was visited by H.M.S. Leith, in August, 1936, sovereignty of King Edward VIII being asserted by Captain O. Bevir, R. N. It was also visited in October, 1937, by H.M.C.S. Nimanoa, with the Administrative Officer of the Gilbert and Ellice Islands Colony, under the charge of which it has now been placed.

It was surveyed by the U.S.S. Bushnell in December, 1939. Men of the Bushnell declared that fishing in the deep water off the reef at McKean was the best they had found anywhere. The fish were both numerous and large, including tuna, barracuda, wahoo (ono), and other gamey species.

CHAPTER 21
Gardner Island



Gardner is the southwestern island of the Phoenix group. It lies 280 nautical miles south of the equator, 70 miles S.S.W. of McKean, 315 miles S.S.E. of Baker, and 260 miles N.N.W. of Atafu. The nearest Ellice islands lie 450 miles to the W.S.W., and the nearest Gilbert island 530 miles to the W.N.W. with others 110 miles beyond.

Gardner Island is a triangular, wedge-shaped coral atoll, 3¾ miles long (N.N.W.-S.S.E.) by about a mile in greatest width, narrowing toward both ends. The rim is less than ¼ mile wide, in places scarcely 100 yards, except at the two ends of the lagoon. At the N.W. end is an oval mass of land half a mile wide by ¾ mile long. At the S.E. end is a triangular enlargement of the rim, about one-third mile on a side.

The rim is broken at two places by narrow entrances, one on the west and one near the middle of the south side; both are blocked on the ocean

side by the narrow fringing reef, 100 to 300 yards wide, which surrounds the island. The inner hundred yards of this reef dries at low water. Off the reef the water is deep. The only anchorage is off the west end, opposite the village, and is safe only with the prevailing S.E. trade wind. Landing is difficult, best a little south of the anchorage.

Most of the rim is covered by a low scrub forest. The most conspicuous trees are buka (*Pisonia*) and kanava (*Cordia*) known as kou in Hawaii, with scattered tree heliotrope (*Tournefortia*) and other species characteristic of central Pacific islands. The trees are highest at the N.W. end, some reaching a height of 90 feet above sea level. Two small clumps of coconut palms have been planted, one on each side of the western lagoon entrance.

A conspicuous object at present is the wreck of the steamer Norwich City, a vessel of about 3500 tons, which went ashore on the western reef in 1931.

Sea birds are numerous on the island, and also small Polynesian rats. There are the usual land, hermit, and coconut crabs. Fish and other marine life are abundant about the reef and in the lagoon.

Gardner Island is thought to have been discovered, about 1828, by Captain Joshua Coffin, of the ship Ganges, of Nantucket, and to have been named for Gideon Gardner, who was either owner of or agent for the vessel. It was also known as Kemins Island, and under that name it was claimed by Americans under the Guano Act of 1856. But there is no record of guano having been dug.

It was visited, August 19, 1840, by the U.S.S. Vincennes, of the U. S. Exploring Expedition. Commander Charles Wilkes says in his "Narrative":

"On the 19th, we made an island in the neighborhood of the position assigned to Kemins' or Gardner's Island . . . This is a low coral island, having a shallow lagoon in the center, into which there is no navigable passage; but the reef on the western side is so low that the tide can flow into the lagoon.

"When near enough to the island, the boats were lowered, and a number of officers and men landed, after passing for a considerable distance through a dangerous surf, breaking with violence over that part of the reef through which the tide flows into the shallow lagoon. The remainder of the reef, which forms the island, is white coral sand, about 300 feet wide, on which there is a vegetation that, unlike that of other low islands of Polynesia, is devoid of low shrubbery.

"Birds were numerous on the island, and very tame; the tropic-birds so much so that some of the sailors amused themselves by collecting their beautiful tail-feathers, which they twitched from the bird while it sat on its nests—an operation which the bird often bore without being disturbed.

"Besides birds, a large rat was found on this island.

"The flood here sets strong to the northward, and the rise and fall of the tide was four and a half feet. No coral blocks were seen on this island, and it is less elevated above the water than those further to the eastward. The soil, however, appeared to be better than upon those, the coral sand being finer, and mixed with a greater quantity of vegetable mould. To this may be ascribed the larger growth of the trees upon it, which, although of the same kinds as those which have been already mentioned as found growing on the coral islands, are forty or fifty feet in height. The island may be seen on a clear day at the distance of fifteen miles.

"Believing this to be the island discovered by Captain Gardner, I have retained his name."

According to Sir Albert F. Ellis, coconuts were planted on Gardner by John T. Arundel and Co., in the 1880's. Coconut crabs, he says, were so numerous there that Arundel's Niue workmen called it "Motu oonga," the island of coconut crabs.

The British flag was raised and protectorate established on Gardner, May 28, 1892. In 1916 it was leased to Captain Allen for 87 years, but remained uninhabited until 1938.

In October, 1937, a visit was paid on H.M.C.S. Nimanoa, by the Administrative Officer of the Gilbert and Ellice Islands Colony, under which the island has been placed. The island was surveyed by the New Zealand navy, 1935 or 1938, the coral heads and channels in the lagoon being marked, and a sign erected which says, "British Pacific Airways, Gardner Island Sea Aerodrome Reserve. Notice: The use of that portion of the lagoon marked off as an alighting area for marine aircraft is forbidden without prior permission from the Administrative Officer."

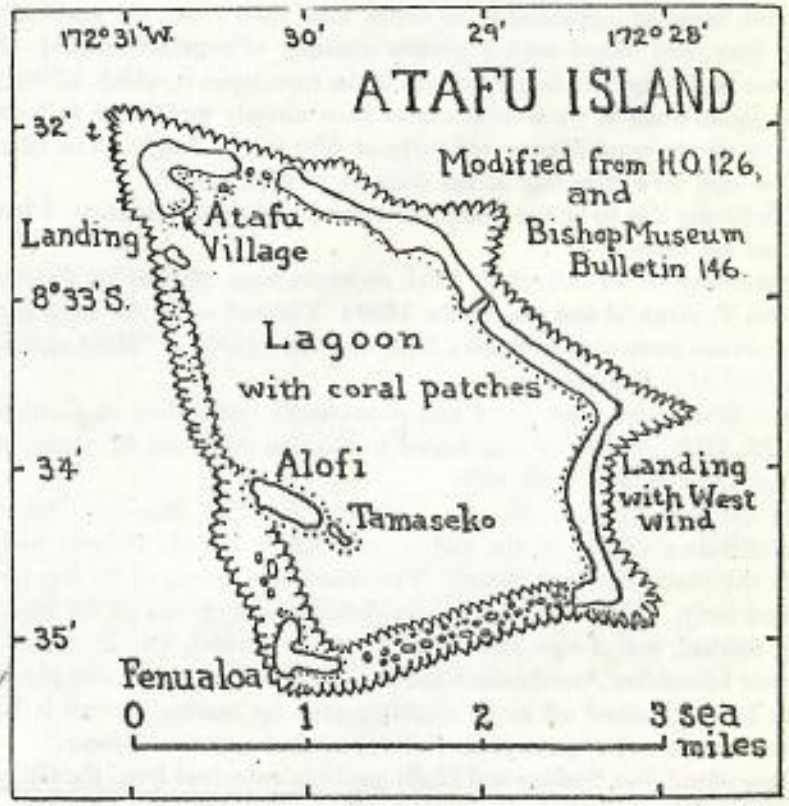
This island, like Sydney and Hull, has been colonized from the Gilbert and Ellice Islands. There were about 80 natives, but no white person, living on the island in the Fall of 1939. Their village is on the broadened part of the rim, just south of the western lagoon entrance. The Gilbertese name of this island is Nikumaroro.

Ruins of the guano camp on Enderbury Island, 1938.

Sickly coconut palms around a seep, north end of Enderbury Island, 1938.

CHAPTER 22

Atafu Island



Atafu or Duke of York Island is the northwestern atoll of the Tokelau or Union group. It lies 513 nautical miles south of the equator, 260 miles S.S.E. of Gardner Island, and 310 miles north of Savaii, western island of Samoa. The Ellice Islands are 500 miles to the west. Between Atafu and Gardner, and about 60 miles S.E. of the latter, is a horseshoe-shaped shoal, about 1500 yards across, known as Carondelet Reef, after the vessel which reported it.

Atafu is a low coral atoll, triangular in outline, about three miles north and south by two and a half wide. The land reaches a height of 12 to

15 feet, but it is covered with trees and coconut palms, and has an area of about 550 acres. The eastern side is nearly continuous land, about an eighth mile wide. It does not appear to have a name, but is divided by the native inhabitants into thirty sections, each of which has its own name. A partial break nearly divides this into two islets. The village is on the northwestern islet, Atafu. An L-shaped islet, Fenualoa ("long-island") marks the southwest corner. Two islets run out into the lagoon from the west reef. The south reef is dotted with 35 very small islets; and others are scattered along the west reef.

The reef is continuous around the atoll, from a quarter to half a mile wide, awash at low tide, so that it is possible to walk from one islet to another, and there is no boat passage into the lagoon. The natives use a small canoe passage just south of Atafu islet, or else drag their canoes across the reef. The lagoon contains numerous shoals and coral heads.

The sea drops away to great depth just off the reef, against much of which waves break with violence. With the prevailing southeast trades good anchorage may be had in sixty feet of water, 400 yards west of the northwest point of Atafu islet. Landing, opposite the south end of this islet, is best near high water.

Most of the islets are thickly covered with groves of coconut palms, among which are *Tournefortia, Pisonia, Pandanus, Morinda, Ficus,* and other trees, and the usual undergrowth found on moderately moist central Pacific islands. Rats, lizards, and the usual sea birds have been reported as common.

Atafu is in the hurricane belt. In January, 1914, an unusually severe storm demolished the church and most of the houses, and levelled many of the coconut palms.

The island is inhabited by about 380 persons (1932), all natives of the Tokelau islands. Concerning them and their culture Gordon Macgregor, a Yale-Bishop Museum fellow, who spent two months on the island, has written an interesting and informative bulletin. He believes that the island was inhabited by a fine race of Polynesian people, all of whom were killed or driven from the island by an invasion from Fakaofu in legendary times (about 1600). Some settled in Samoa, and others on islands to the west. Later Atafu was used periodically as a fishing base for expeditions from Fakaofu; and finally drought, hurricane, and over-population on the latter island brought about a new permanent settlement.

European contact came with the discovery of the island by Commodore John Byron, in the British ship Dolphin, June 24, 1765. He named it Duke of York Island, and reported no sign of inhabitants. When Captain Edwards reached it in H.M.S. Pandora June 6, 1791, in search for mutineers of the Bounty, he stated that, while there did not seem to be permanent inhabitants, there were signs of visits by fishing parties. Lieutenant Paulding, in command of the American ship Dolphin, arriving October 30, 1825, found the island inhabited.

The island was mapped and much information about it recorded by the U. S. Exploring Expedition, which visited it in the U.S.S. Peacock and Flying Fish, January 25, 1841. Horatio Hale, ethnologist with the expedition, describes the inhabitants and their culture, and gives a vocabulary and grammar. He found that Atafu was under the King of Fakaofu. The natives did little or no cultivation, but lived on fish and coconuts. Water was scarce and bad, rainwater being collected at the base of coconut palms. The natives were eager to trade then, even as we found them to be when we passed by the island on the Taney in July, 1938.

All of the natives on Atafu are Protestants, although all on the next island, Nukunono, are Catholics. This was due to the arrival of native teachers from Samoa on the London Missionary Society's ship John Williams, in 1858.

The Tokelau Islands suffered greatly between 1850 and 1870 from raids by South Americans in search of laborers. Many were kidnapped from Atafu, although not as many as from the other islands of the group.

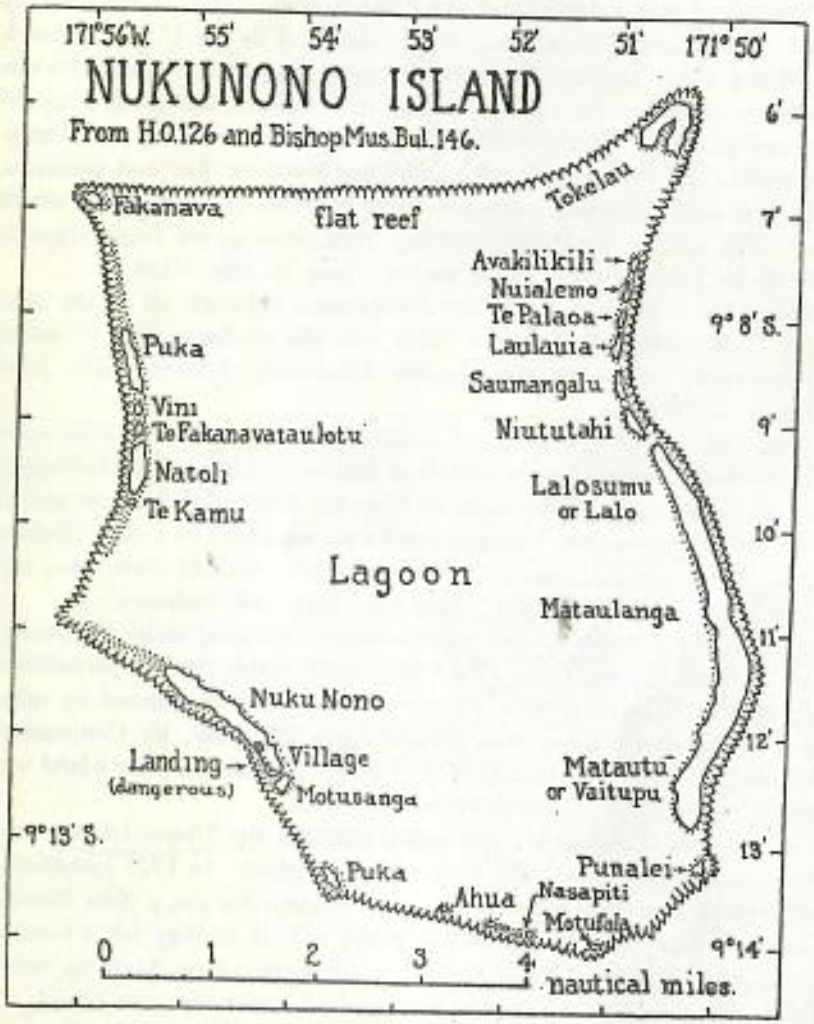
In 1880 there was one European resident, employed by a New Zealand firm to collect copra. Copra and native products, such as mats, fans, and carved wooden boxes (tuluma) have been their only industry.

In 1877 the Tokelau Islands were nominally included under the protectorate of Great Britain, by an Order in Council which claimed jurisdiction over all islands in the Pacific not previously ceded or claimed by other powers. The British flag was hoisted June 22, 1889, by Commander Oldham, R.N., landing from H.M.S. Egeria. A survey of the island was made by the British vessel Goldfinch in 1896.

In 1916 the Tokelau Islands, called officially the Union Islands were made a part of the Gilbert and Ellice Islands Colony. In 1925 jurisdiction was transferred to the Administration of Western Samoa, a New Zealand mandate. This was more acceptable to the natives as they felt a bond of kinship with Samoa. All government is administered on Atafu by native officials, the details of which will be discussed under the next island.

CHAPTER 23

Nukunono Island



Nukunono or Duke of Clarence Island is the center atoll of the Tokelau or Union group. According to the charts it lies 546 to 554 nautical

miles south of the equator, 45 miles southeast of Atafu, and 35 miles W.N.W. of Fakaofu. Gordon Macgregor states that it is 60 miles N.W. of Fakaofu, and that local ship captains say the map position is from 14 to 16 miles too far east, as they have to make a correction accordingly when laying a course for the island. However, this may be due to the swift and variable ocean currents in the vicinity, it being thought that the charts are correct.

The island is a low coral atoll, the reef of which is shaped like a conventional shield, measuring 8 miles north and south by 7 miles greatest width. Along this reef are scattered 24 islets. Nine of these, including the largest, which is nearly 4 miles long by ¼ to ⅓ mile wide, are on the eastern side; another 9 are on the west, and the remaining 6, all small, are on the south. There are no islets on the north, which is a bare reef, awash at low tide.

The atoll is said to have a land area of 1,350 acres. Most of the islets are covered with groves of coconut palms and low trees and shrubs, of kinds listed for Atafu. The sea birds, hermit crabs, rats, and insects are thought to be about the same as on other similar central Pacific islands; and there is abundant marine life about the fringing reef, and in the shallow lagoon, which contains reefs and coral heads.

In 1932 Macgregor obtained 92 place names on the atoll, 60 of which were on the largest islet, which does not have an individual name. The names on our map are from his list.

The village of Nukunono is on the southwest side, on the south end of the second largest islet of the atoll. There is only one well, and because of this lack of adequate water supply, the population has always been relatively small, in 1925 numbering 227. When the well dries up and there is no rain, the natives must rely on coconuts to drink. All of the inhabitants are Roman Catholics, and their church is a conspicuous structure just northwest of the village.

There is no anchorage, and no passage leads through the reef to the village. The sea here is not so rough, and the native canoes jump the reef. Formerly there was a passage through to the lagoon, but this was filled by a hurricane. In 1914 another hurricane made a deep cut through the southern end of Nukunono islet, forming the little islet of Motusanga.

The southeast trade winds blow over the Tokelau Islands for more than half the year, from March to October, keeping the temperature from becoming too high, despite the direct rays of the tropical sun. During the

balance of the year, which is their summer, the winds are from the north or variable, with calms, during which it is hot. The rainfall may exceed 100 inches some years, but is usually less. It comes from daily showers during the trade wind season, and occasional tropical storms. From the end of November to March the rainfall may be light, with periods of drought; but this is the hurricane season, and there may be torrential downpours in these months.

The ocean currents change with the seasonal winds. During the trade wind period the set is from east to west, with a drift which may reach several knots. In midsummer (December or January) the current changes, coming from the north, running southeastward, about parallel to the line of the three islands, turning eastward south of Fakaofu.

Nukunono was inhabited at an early date by a Polynesian people of fine physique, according to tradition, which states that they furnished the first settler of Fakaofu with a wife. All but a few of these early people were destroyed or driven away by conquerors from Fakaofu, under a chief named Te Vaka, about 1650. The rest became subject to Fakaofu, and were gradually absorbed by its people.

The first account of European contact was the discovery, June 12, 1791, by Captain Edward Edwards, of H.M.S. Pandora, British naval frigate in search of mutineers of the Bounty. He called the atoll Duke of Clarence Island. Lieutenant Paulding visited it on the American ship Dolphin, October 29, 1825. The Peacock and Flying Fish, of the U.S. Exploring Expedition, visited the atoll January 28, 1841; surveyed the coast, but did not land. All three of the Tokelau islands were claimed by American guano companies, but there is no record of their having made use of them.

The Roman Catholic religion was taken to Nukunono, before 1858, by a native convert, named Justin, who had been for some years with the Mission in Samoa. His simple teaching so inspired the natives that many went to Samoa to learn more and to be baptized. When the ship John Williams, of the London Missionary Society, visited the island in 1858, they found the people already converted to Catholicism, and went on to Atafu. In 1863, Father Ellory of Samoa visited Nukunono and found Justin virtually a chief, and the inhabitants Christians, but in great fear of raids by South American vessels, kidnapping natives as laborers. So many were taken that by 1868 only 80 of the inhabitants were left, most of them women.

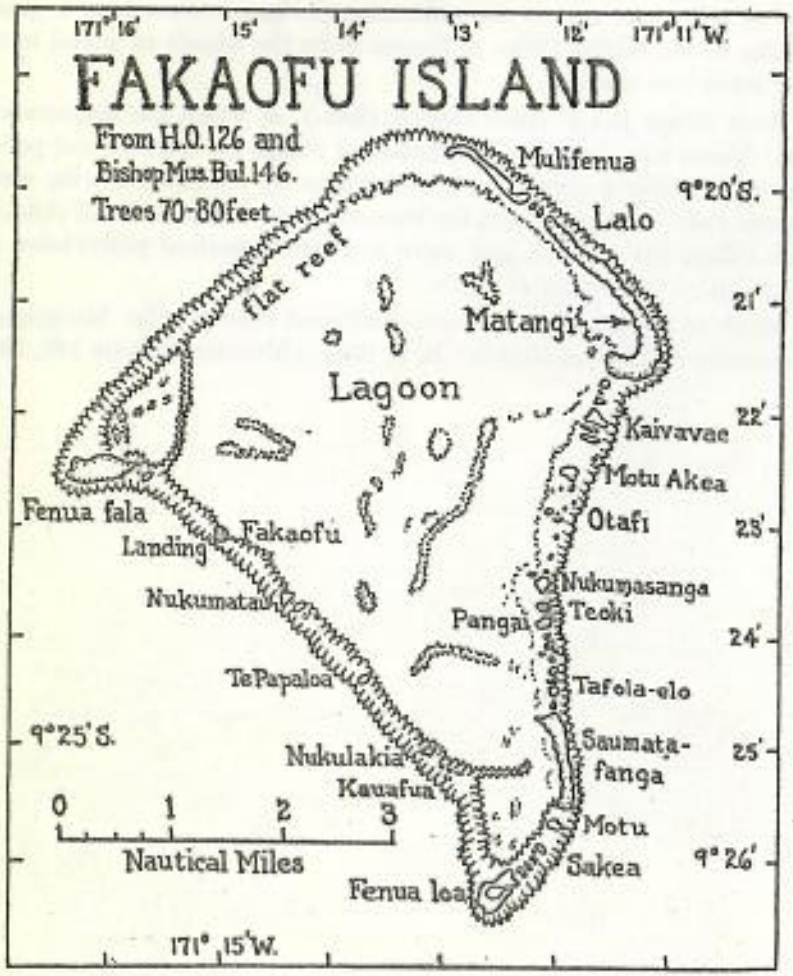
The British flag was hoisted and protectorate proclaimed June 21, 1889, by Commander Oldham, of H.M.S. Egeria. The island was mapped by the British vessel Goldfinch in 1896. From 1916 to 1925 it was administered from the Gilbert and Ellice Islands Colony. Since 1925 the Administration of Western Samoa, a New Zealand mandate, has had charge.

All of the government in the Tokelau Islands is handled by native officials. Each island has a magistrate (faipule), a mayor (pulenu'u), a chief of police and one or two policemen (leoleo). About once a year a member of the Native Office of Samoa visits the islands to attend to the most important matters.

Each village has a native council (fono), of which the magistrate is head. These men determine all matters of village government and policy. The women have a committee, presided over by the pastor's wife, which inspects daily the sanitation of the houses and the health of small children. Each village has a nurse, and there is a native medical practitioner for the group, with hospital at Atafu.

Much of this material has been condensed from Gordon Macgregor's "Ethnology of Tokelau Islands," B. P. Bishop Museum Bulletin 146, 1937.

CHAPTER 24
Fakaofu Island



Fakaofu or Bowditch Island is southeasternmost of the three atolls of the Tokelau or Union group. It lies between 560 and 566 nautical miles south of the equator, 35 (60?) miles E.S.E. of Nukunono, 100 miles

north of Swains Island, and 270 miles north and a little east of Apia, Samoa.

It is a coral atoll, consisting of a continuous flat reef, awash at low tide, along which are scattered about fifty small islets and five of somewhat larger size; the largest (Matangi), shaped like a hockey stick, is 2 miles long (including the bend) by less than ¼ mile wide.

The reef rim has the outline of a kite or arrowhead, and measures 7¼ miles north and south by 5½ miles greatest width. The islets are thickly strewn along the east side; fewer and more scattered along the west; and there are none on the northwest side, which is flat bare reef. The lagoon contains numerous reefs and coral heads. On its east side, the water is very clear, and one can look down into deep, jade and pale blue caverns, lined with coral formations of fantastic shape, among which flit schools of brilliantly colored, tropical fishes.

The islets average about ten feet high. Most of them are thickly covered with groves of coconut palms and low trees and shrubs, which give the islets a total height of 70 or 80 feet. Some beaches are gradual and sandy, others steep, with broken coral and sandstone slabs.

The village of Fakaofu is located on a small islet on the west side, scarcely large enough to house its population, which varies between 450 and 500 persons. The reason all of the inhabitants live crowded together on this one islet goes back to mutual protection against South American kidnapers; but it is also caused by the presence here of fresh water wells, lee-side shelter, and fairly good landing. The island has become so crowded that walls of coral sandstone, built to protect houses from high waves, have been pushed out into the lagoon, and the space behind them filled in to provide more land.

Visiting Fakaofu, April 2 to 5, 1924, the writer was impressed by the neatness and orderliness of the village, with gravel walks, edged with stones, between the substantial thatched houses, enclosing attractive but closely packed gardens of breadfruit, pandanus, banana, and fragrant-flowered trees and coconut palms. Their condition was the more remarkable in that houses are periodically demolished and trees stripped of branches by hurricanes.

Some of the islets are privately owned, such as Fenua fala, the N.W. islet, which is owned by the Pedro family. It has luxuriant vegetation, patches of bananas in banked terraces of rich humus, taro patches, and colorful gardens. The next islet is the Catholic cemetery, appropriately named Afua (God). Two islets south of Fakaofu is the Protestant

cemetery, and the next is occupied by its caretaker. In 1924 there were 350 Protestants and 80 Catholics.

Fenua loa, at the S.W. corner is about the most luxuriant of the atoll. Within a marginal fringe of *Scaevola* and *Tournefortia* is a tall stand of such trees as *Pisonia, Guettarda, Hernandia, Cordia, Ficus, Pipturus,* and *Pandanus,* beneath which are thickets of shrubs, herbs, giant taro, and vines. In the center is a brackish lake, with narrow, winding channel leading to the sea. Some islets are cultivated, with huts in which the natives rest. A few persons, such as Willi, the salt-maker, who boils down sea water to salt, and some aged natives, live on the east side; but nearly everyone lies on the one small islet. Transportation is by canoes across the lagoon, but one can walk between islets along the flat reef.

Bird life is not abundant, perhaps because of the many persons. Land and hermit crabs are plentiful. There are many small green-tailed lizards, and a few of larger size which change color from cream to black, according to their background. Insects are abundant, with such large species as dragonflies, two kinds of butterflies, reddish-brown sphinx moth, grasshoppers, crickets, long-horned beetles, ants, craneflies, spiders, and, sad to relate, day mosquitoes.

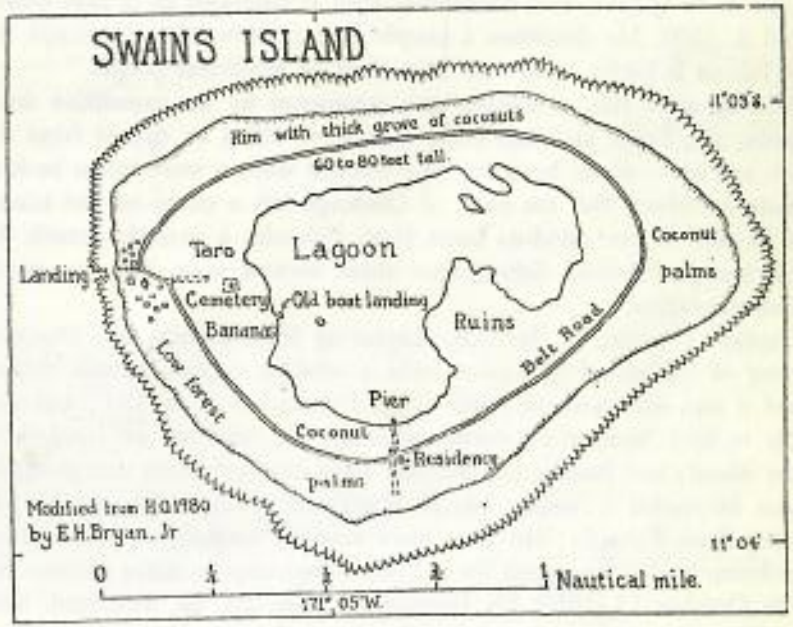
Although the last of the group to become inhabited, Fakaofu became the dominant island, due to conquests of Te Vaka, son of the powerful chief, Kava Vasefanua, in the 17th century. The earlier inhabitants on the other islands were destroyed, driven away, or absorbed, and the islands recolonized by the later comers.

White men discovered Fakaofu in January, 1841, with the arrival of the French ship Adolphe, Captain Morvan. Immediately after, on January 28, 1841, the Peacock and Flying Fish, of the U.S. Exploring Expedition, arrived, and named the atoll Bowditch Island. They considered it a new discovery until they found parts of a wrecked ship, which the natives said had been cast up two or three years earlier, and from which two men with Polynesian names had escaped, but had later died.

The British flag was hoisted and protectorate declared, June 20, 1889, by Captain Oldham of H.M.S. Egeria, whose officers surveyed the island. In 1916 the Tokelau Islands, under the name Union Group, were incorporated in the Gilbert and Ellice Islands Colony. In 1925 they were transferred to the Administration of Western Samoa.

The only trade is the export of a little copra and the making of native objects to sell to tourists, most characteristic of which are circular wooden boxes with tight covers, called tuluma, and fans trimmed with feathers.

CHAPTER 25
Swains Island



Swains Island lies 663 nautical miles south of the equator, 100 miles south of Fakaofu, 170 miles north and a little east of Apia, Samoa, 200 miles north and a little west of Pago Pago, and 310 miles west of Pukapuka (Danger Islands).

The island is a ring of sand and coral, a mile and a half east and west, a mile wide, and nowhere more than 20 feet high, surrounding a shallow lagoon, which is only slightly brackish, with no surface connection with the sea. Most of the land, from the crest of the narrow ocean beach to the very edge of the lagoon, is thickly covered with vegetation, about 800 acres of coconut palms and various trees and shrubs found widespread in the Pacific.

Besides the present official name of Swains Island, the island is also known by its native Tokelau name of Olosenga, and as Quiros Island,

Gente Hermosa, and Jennings Island. These names outline its long and varied history.

Its earliest history is a mixture of Tokelau legend and the sketchy account of the famous Portuguese navigator of Spanish vessels, Pedro Fernandes de Quiros, who discovered what is supposed to be this island, March 2, 1606. He describes a people so attractive that he named the place Isle de la Gente Hermosa, "the island of handsome people."

Shortly after this, Olosenga was conquered by an expedition from Fakaofu; the brave and handsome men were killed or driven from the island, and some of the beautiful, fair-skinned women were taken back to Fakaofu as wives. But the chief of Olosenga left a curse on the island, so it is said. When colonists came from Fakaofu, a drought struck the island, famine followed, fishing near shore became poor, and the people died of starvation.

Captain Hudson, of the U.S. Exploring Expedition's ship Peacock, learning of the island in Samoa from a whaling captain named Swain, visited it and surveyed the outer edge, February 1 to 4, 1841, but was unable to land because of stormy weather. He reported no inhabitants on the island; and finding the position quite different from that given by Quiros, he named it Swains Island. Shortly after this a new colony was founded from Fakaofu; but they were scarcely established before three Frenchmen landed, as agents for a French company, to make coconut oil.

On October 13, 1856, Eli Hutchinson Jennings, an American, born November 14, 1814, at Southampton, Long Island, N.Y., landed and founded a unique little community, now in its third generation. In Samoa he had married Malia, a native woman of rank. He claimed to have acquired title to the island from Captain Turnbull, an Englishman, who said he had discovered the island.

Eli, Jr. was born on the island, January 1, 1863, and inherited it after the death of his father, December 4, 1878, and his mother, October 25, 1891. Under his management the coconut plantation prospered. So much so, that in September, 1909, the Resident Commissioner of the Gilbert and Ellice Islands Colony visited Swains Island and demanded $85.00 tax. Jennings paid the money, but appealed to the American Consul at Apia, who in turn took the matter up with the U.S. State Department. The tax money was returned. This was the first of several international episodes involving Swains Island.

Upon the death of Eli, Jr., October 24, 1920, the island was left jointly to his daughter Ann Eliza and son Alexander. The daughter had married a British subject, Irving H. Carruthers, who had been named executor and trustee, and they lived in Apia. In 1921, Mr. Carruthers was unable to probate the will, as Apia no longer had an American Consul, and the British court would not handle the matter. The situation was further complicated by the death of his wife in August, 1921.

In order to settle the matter of ownership, Alexander Jennings appealed to the Naval government at Pago Pago, and later through them to the U. S. Secretary of State and the President of the United States. On March 4, 1925, by Joint Resolution of the U. S. Congress, American sovereignty was officially extended to the island, and it was placed under jurisdiction of the government of American Samoa.

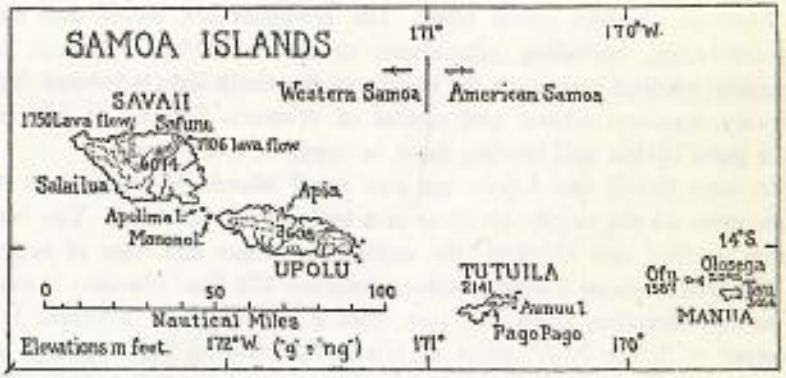
Alexander Jennings, present managing owner, is a robust, kindly man of middle age, quite well educated and capable. He is half Caucasian and half Samoan. He married Margaret Pedro, a quiet, attractive, intelligent woman, part Spanish and Portuguese and part Tokelau, born on Fakaofu. Through the relationship with American Samoa, Mr. Jennings has been able to market his copra in Pago Pago, where a fair price is paid for it. His chief worry is over transportation; for there is no safe anchorage at Swains Island for a vessel.

The native population of the island is limited to about 100, although many more would like to come there from Tokelau group. It consists of plantation workmen and their families. They live in a neat little village at the west end, called Taulanga, where copra is dried and shipped, a landing having been blasted through the reef. Here is a large village meeting house, and a church, the pastor also being the school teacher. The men work five days a week, go fishing or tend their own gardens, or play cricket on Saturday; and there are two church services on Sunday. There are about 500 pigs and numerous chickens at large on the island, but these are killed only by permission of Mr. Jennings.

A belt road circles the island, about half way between sea and lagoon. Along this runs an ancient Ford truck, collecting coconuts and carrying workmen and supplies. The Jennings family live in a frame house about ¾ mile down the road from the village, on the south side. The spot is called "Etena" (Eden), but it is more generally referred to as "The Residency." A power-driven generator supplies electricity for lights and radio. Swimming in the lagoon is available from a short pier. The edge of the lagoon is shallow, but parts of it reach a depth of 8 fathoms (48 feet).

Periodic visits are paid by the station ship from Pago Pago; and of recent years U. S. coast guard and naval vessels have stopped on their routine trips south. The lagoon may be too small for seaplanes; but the island is certainly one of the most beautiful and picturesque under the American flag. Were it not for the mosquitoes and small flies, it would be quite an island paradise.

CHAPTER 26
A Glimpse Of Samoa



The main island of the Samoan group rightfully should not be included in this discussion of the coral islands of the central Pacific. They mark the southern boundary of the region, but, like the Hawaiian group, they are high islands, the summits of a great range of volcanic mountains. In order to round out the series, and especially as part of the group flies the American flag, a brief summary will be given.

The distance from Rose Atoll, on the east, to the west end of Savaii is about 290 nautical miles. To the westward of Savaii there are shoals, of which Pasco Bank, about 90 miles W.N.W. of Savaii, has 50 feet of water over it. On both sides of this mountain range there is deep water, soundings showing depths of 15,000 to 18,000 feet. Between Upolu and Tutuila there is a small gap with a depth of nearly 6,000 feet.

Savaii, at the west end of the main chain, is the largest, highest, and geologically youngest island. It measures 47 land miles east and west, with a greatest width of 27 miles. The area is given as 703 square miles. On top of a 6,000 foot dome there are several small peaks or cones, the highest elevation being about 6,094 feet. There has been recent volcanic activity, an extensive flow having descended the north side in 1750; a smaller one in 1902; and another crater on the N.E. was active from 1905-1911. When the writer climbed down into Matavanu crater in 1924, steam was still issuing from cracks. The slopes of Savaii are well forested.

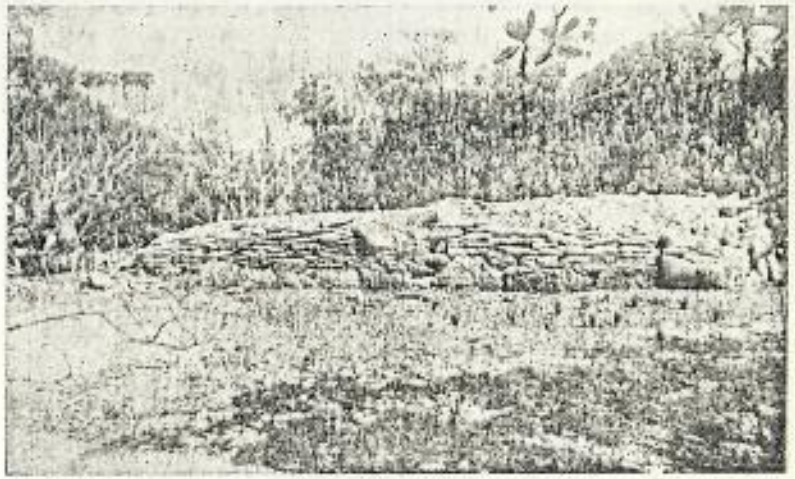
Upolu measures 47 by 8 to 12, maximum 15, land miles, area 430 square miles. The length of the island is traversed by a range of mountains of rather uniform height and uniform slope with highest elevation about 3,608 feet. Along the ridge are numerous craters, some of which, like Lanutoo, contain crater lakes. The lowlands are fertile and have been cultivated, including plantations of cacao, rubber, bananas, but principally coconut palms. At the middle of the north side is located Apia, chief city, business center, and capitol of Western Samoa. It does not have a good harbor and landing must be made in small boats.

Between Savaii and Upolu are two small islands. Apolima is a tuff crater, open on the north; its floor is a little above sea level. The inner slope is gradual and forested; the outer precipitous and bare of vegetation. Its area is about 2 square miles, elevation 472 feet. Manono is lower and sandy, elevation about 200 feet, with a few volcanic outcrops. It is connected with the N.W. coast of Upolu by fringing reef. Springs are brackish, and the few inhabitants must catch rain water in concrete tanks. Off the east end of Upolu are four small islets, one of which, Nuutele, is a breached tuff crater, like Apolima, about 400 feet high, the flat floor of which has been cultivated.

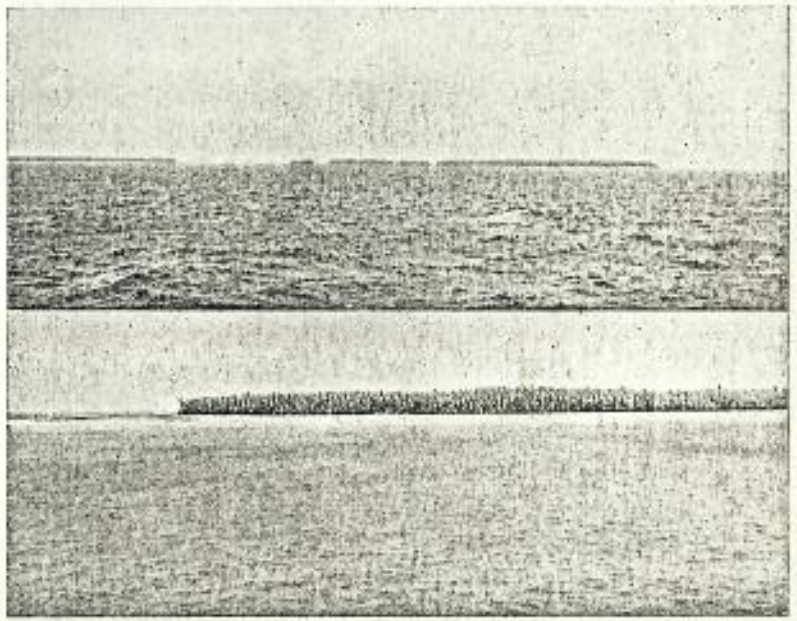
Tutuila is about 18 miles long by 5 or 6 miles wide, with a land area of 40.2 square miles. A mountainous ridge extends nearly the length of the island, with spurs on both sides; highest elevation, Matafao Peak, 2,141 feet. A drowned valley on the south side forms Pago Pago Bay, the best harbor in the South Seas. South of the eastern end is a circular tuff crater islet, Aunuu, about 275 feet high.

Between 60 and 70 miles eastward of Tutuila are three small islands, together called the Manua Group, and with a combined area of 18 square miles. The largest is Tau, 14 square miles; steep, forested slopes; greatest elevation, 3,056 feet. The other two islands, Ofu and Olosega, (pronounced o-lo-seng-a, for the "g" in Samoa is pronounced "ng") are separated by only shallow water. The elevation of Ofu is given as 1,587; of Olosega 2,095. All three are covered with trees and shrubs, and large areas have been planted to coconut palms. Rose Atoll lies 78 nautical miles eastward from Tau.

The climate of Samoa is tropical, moderated by strong S.E. trade winds from May to November. During the balance of the year (Samoan summer and fall) the winds are variable, with severe storms and occasional hurricanes. This is called the wet season, although in places, like Pago Pago, where mountains intercept the trade winds, it may rain



Ancient stone marae on Sydney Island, 1924.



Atafu atoll from the north; and a closer view of the northwest point, 1938.

throughout the year. Yearly rainfall: Apia 108 inches (from 69 to 173); Pago Pago, 197 inches (130 to 284). Greatest monthly average during January or February (Apia 16; Pago Pago 21.7); least in July or August (Apia 2.8, Pago Pago 7.8). February is the warmest month at Pago Pago, average 88.28°; July the coolest, average 80.21°F. Relative humidity is high: 70 to 90 per cent during the wet season; 40 to 60 per cent during the dry.

The land fauna and flora are oceanic in character, derived from the west, and, like Hawaii, with little or no American affinity. There are no native mammals except a rat and some bats. There are only 34 species of land birds, of which 14 are endemic, including such forms as the famous tooth-billed pigeon, fruit doves, kingfishers, and a white-eye. The usual species of sea birds are present. Of reptiles there are one land and four sea snakes, and ten or a dozen kinds of lizards. There are some 800 species of flowering plants, of which one-third are endemic; 260 species of ferns, 400 species of mosses, 200 fungi, and 180 lichens.

The Samoans are a Polynesian people of fine physical type. In culture they are closely related to the people of Tonga and the Ellice and Tokelau islands. They differ in some respects from the Tahitians, Marquesans, Maoris and Hawaiians; but all are thought to have come from common stock which migrated eastward from southeastern Asia. An extensive account of their material culture, by Dr. Peter H. Buck, has been published by B. P. Bishop Museum.

Their food consists of fish, bananas, breadfruit, taro, yams, pigs, chickens, various marine animals; and of recent years they have developed a liking for such foreign foods as canned salmon and beef, rice, tea, and biscuits. Agriculture is carried on by natives in small clearings on the edge of the forest.

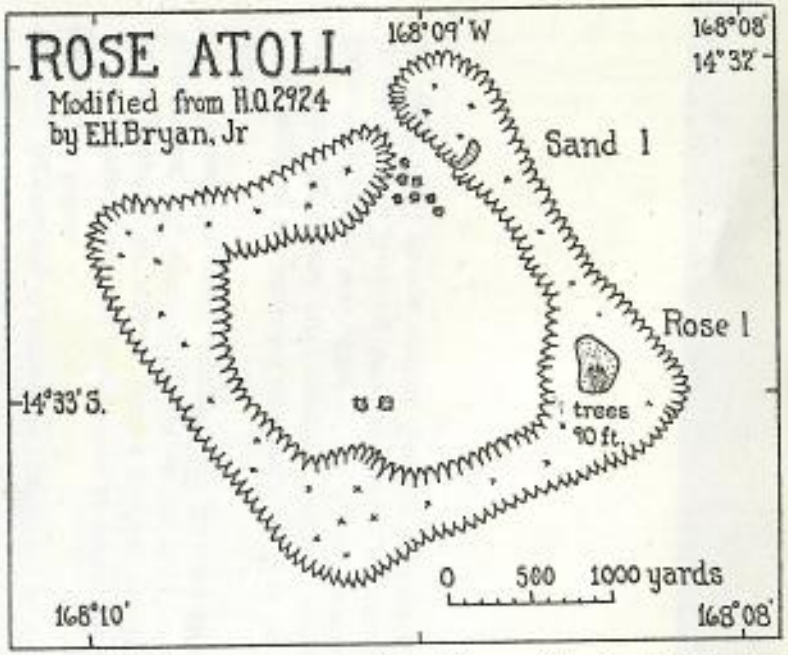
All Samoans, old and young, love to dance; their siva being accompanied generally by singing. Native clothing consists of a lava-lava or wrap-around kilt, formerly of tapa or fine mats; in addition the women wear a smock-like upper garment, and the men an undershirt, when in public.

Brought to the attention of Europe in 1722 by Roggeween, Samoa was visited by several early voyagers, and later traders and missionaries. Pago Pago harbor was ceded to the United States as a naval coaling station in 1872. A treaty between Britain, Germany, and U.S.A., June 14, 1889, made Samoa neutral. Trouble between rival chiefs made nec-

essary another treaty, November 14, 1899, by which kingship was abolished, islands west of 171 degrees were given to Germany, and those east to the United States. Western Samoa was occupied by a British expeditionary force, August 29, 1914; and it was made a mandate of New Zealand by the Treaty of Versailles.

Samoan government takes the form of meetings of chiefs and heads of families, accompanied by ceremonial kava drinking. The American Naval Government wisely has left this local government, under three native district governors. Naval doctors have greatly improved health conditions in American Samoa, and also British trained native practitioners guard the health of Western Samoa, so that the native population is on the increase, and despite tropical diseases, health conditions are quite good. The 1937-1938 population is given as: Western Samoa, 54,160 natives and 3,600 others; American Samoa, 11,906.

CHAPTER 27
Rose Atoll



Rose Atoll is the easternmost of the Samoan islands. It is located 7 nautical miles eastward of the island of Tau, and 872 miles south o the equator.

It consists of a squarish ring of marine deposit, the surface of whic is a pink coralline algae known as lithothamnium, surrounding a lagoo with depths up to about 50 feet. The square, which is about 1¼ nautica miles on a side, is set obliquely so that the longest axis, about 1⅜ miles is almost east and west. Just west of the north point there is a narrow entrance into the lagoon, with depths of six feet or more, so that whal boats or small launches can enter. This passage is partly blocked on th inside by coral heads, but it is clear on the east side, close to Sand Islet

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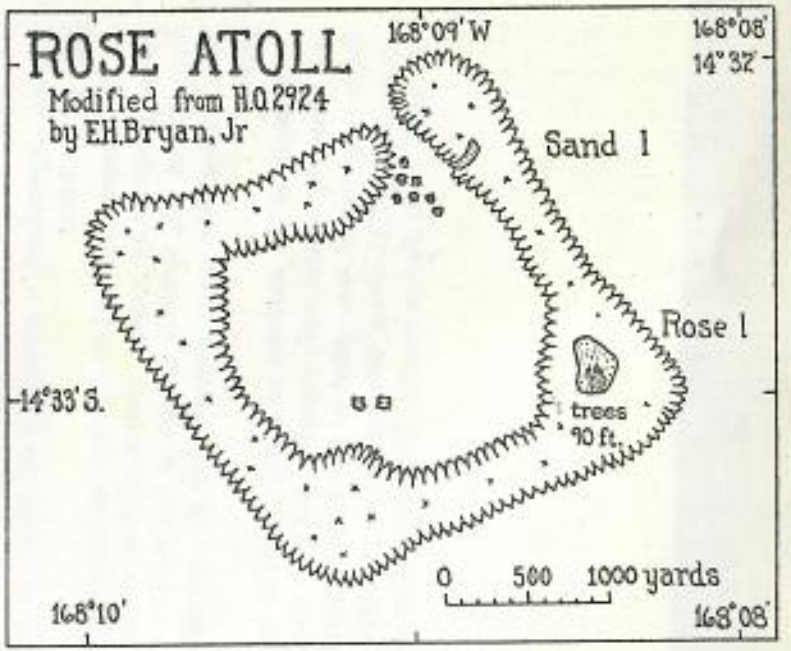

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On the east rim of the atoll there are two tiny dots of land. Comparison of maps drawn during the past century shows that these have

changed in size and shape. At present Sand Islet, on the north, is a crescent-shaped ridge of bare sand and coral, about 200 yards long by 50 yards wide. Rose Islet, to the south, is oval, about 350 yards north and south, by 250 yards wide. Its southern half is largely covered by a continuous pure stand of buka trees (*Pisonia grandis*). The northern half is flat, covered with broken chunks of reef material and shells with scattered herbs of *Boerhaavia* and *Portulaca*. In 1938 there were about twenty coconut palms, eight large and a dozen small, which had been planted.

There is a fair anchorage on the north side, near the entrance, in 6 fathoms, safe as long as the S.E. trade winds blow. The coudition of the vegetation suggests that the rainfall is moderately heavy, although there is no fresh water on the island.

All that can be seen from a distance are the tops of the buka trees, looking like a rounded loaf of bread on the horizon.

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The surface of the reef is nearly flat, and it is scarcely awash at low tide. Hundreds of boulders are scattered over its surface. Dr. Alfred G. Mayor, who visited the atoll in June, 1920, thinks that these indicate that the reef was laid down at a time when the sea stood about ten feet higher, since eroded away; but other geologists do not all agree. The grove of *Pisonia* trees grows on raised reef rock or coquina, reaching a height of about eleven feet above sea level. Beneath the trees the upper soil is rich in humus from fallen leaves and rotten branches, with considerable phosphate from the droppings of sea birds.

Rose Atoll was discovered by Louis de Freycinet on October 21, 1819, on his voyage around the world in the Uranie and Physicienne. He named it for his wife, who made the voyage with him. In his journal he describes the appearance of the island and gives a chart, the deficiencies of which are readily explained by the fact that he did not come closer than a mile and a half.

Otto von Kotzebue made the next recorded observations, having passed the island in 1824. Not knowing of its prior discovery, he named it Kordinkoff Island, in honor of his first lieutenant.

Dumont D'Urville passed it on September 23, 1838, in the corvette l'Astrolabe. He described it as a heap of sand covered with a bouquet of green, very fresh and pleasant. He estimated the circumference of the reef as between six and seven miles, and noted the break in the northwest curve of the reef.

The first recorded landing on Rose Islet was made by the U. S. Exploring Expedition, under Commodore Charles Wilkes, October 7, 1839. Part of a day was spent in making a survey and observing the geology and natural history. Even then there were but three kinds of plants.

About twenty-five years later, Captain Rantzau, making explorations for German interests, made several expeditions to Rose Atoll, on one of which he took his little schooner through the shallow entrance and anchored in the lagoon. He produced a chart of the atoll and his observations are given by Eduard Graeffe in a German article on Samoa, published in 1873.

In January, 1920, Commander W. J. Terhune, then naval governor of American Samoa, visited Rose Atoll and erected a concrete monument with inscription: "Rose Island, American Samoa, Trespassing prohibited, Warren J. Terhune, Governor, Jan. 10, 1920." He revisited the atoll in June, 1920, planting the first of the coconut palms. Periodic visits are paid by American naval vessels.

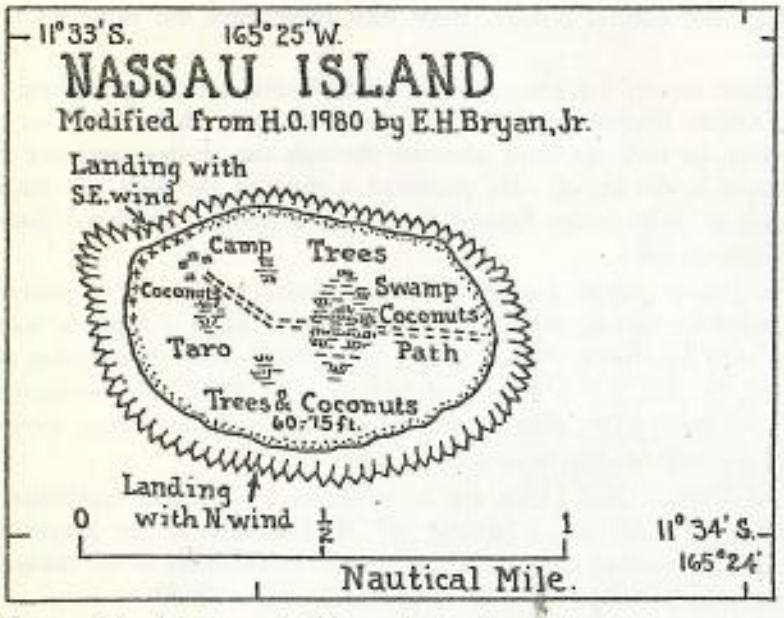
Accounts of Rose Atoll are to be found in Carnegie Institution of Washington Publications 340 and 341, 1924, written by Dr. Mayor, Dr. William A. Setchell and others; and in the Proceedings of the American Philosophical Society for 1921, volume LX, pages 62-70.

Rose Atoll was made a Naval defense area by Executive order of President Franklin D. Roosevelt, dated February 14, 1941. Foreign planes and surface craft are prohibited from visiting the atoll.

It may be questionable whether the lagoon is sufficiently large to serve the interests of trans-Pacific aviation, but in any event, the lagoon would serve as an emergency landing place, and the dots of land would provide another observation spot for America's far-flung interests in the Pacific.

CHAPTER 28

Nassau Island



Nassau Island is located 693 nautical miles south of the equator, 45 miles S.E. by S. of Pukapuka, 175 miles N.W. of Suvarov, and 290 miles N.E. of Tau Island, American Samoa, (240 from Rose Atoll and 350 from Pago Pago).

The island is oval in outline, a little less than a mile long, east and west, by a half a mile wide. The land is flat, with a few low dunes and shallow depressions, nowhere more than 35 feet high. The tops of the trees and coconut palms reach a height of 60 to 75 feet.

The island is surrounded by a fringing reef, 100 to 150 yards wide on the east, south, and west, but narrower on the north. Off the reef the water is deep, with no anchorage. Place of landing depends upon the wind. During the period of the southeast trade winds, April to September, landing is best on the northwest curve; from October to May the winds come from the west and northeast, and then landing is better on the south shore. It can be bad at both places.

Most of the beach is narrow and sandy, except at the northwest curve, where there is sandstone and reef rock, which dips to the north. Nearly all of the area behind the beach is thickly covered with arboreal vegetation. This consists of a marginal fringe of *Scaevola, Tournefortia, Pandanus,* and *Guettarda.* Behind this groves of coconut palms have been planted, replacing much of the original vegetation. Among these are scattered such trees as *Pisonia, Cordia,* and *Calophyllum,* with herbs and bird's nest and polypodium ferns. In several low swampy places are sedges; grass; *Hernandia Pipturus,* and other trees; and planted taro and bananas. Pools of water standing in these swamps are covered with dirty scum, but the water is fresh and drinkable. A moderate rainfall and warm but agreeable climate is suggested.

There are no land birds, and the usual species of sea and migratory birds, although present, are not common. Pigs and chickens, imported by copra harvesters, run wild. Land and hermit crabs, and at least three species of lizards are common. Insects, unfortunately, include both day and night mosquitoes and annoying house flies; there are moths, dragonflies, and usual species, but no butterflies were seen. Marine life is abundant off the reef, including numerous edible fishes.

In early times Nassau was occupied by people from Pukapuka (Danger Islands). There are definite lengendary accounts of intercourse between the two islands during about the 17th century. The people of Pukapuka believed that they owned Nassau, which they called Te Nuku-o-Ngalewu, after a chief who defended the island against invasion by a warrior from Aitutaki named Tima. His name has been attached to a reef lying between Nassau and Pukapuka, now spelled Tema.

According to Pukapuka accounts, contact between the two islands stopped "at the time when the great conflict between the gods made sea travel dangerous," and the island received the name Te Motu-ngaongao (deserted island). Occasional fishing trips were made to Nassau up to the time of white contact, but the permanent settlement died out. The finding of shell adzes and pearl-shell breast ornaments of Pukapuka design in an old grave on Nassau, uncovered by the tidal wave of 1914, helps to substantiate the traditions.

The island was named for the American whale ship Nassau, of New Bedford, Captain John D. Sampson, which sighted it in March, 1835. At least two other vessels had sighted it previously: the London whale ship Ranger (date not known), and the American whale ship Mary Mitchell, of Nantucket, Captain Elihu Coffin, who reported calling it Mitchell

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Otto von Kotzebue made the next recorded observations, having passed the island in 1824. Not knowing of its prior discovery, he named it Kordinkoff Island, in honor of his first lieutenant.

Dumont D'Urville passed it on September 23, 1838, in the corvette l'Astrolabe. He described it as a heap of sand covered with a bouquet of green, very fresh and pleasant. He estimated the circumference of the reef as between six and seven miles, and noted the break in the northwest curve of the reef.

The first recorded landing on Rose Islet was made by the U. S. Exploring Expedition, under Commodore Charles Wilkes, October 7, 1839. Part of a day was spent in making a survey and observing the geology and natural history. Even then there were but three kinds of plants.

About twenty-five years later, Captain Rantzau, making explorations for German interests, made several expeditions to Rose Atoll, on one of which he took his little schooner through the shallow entrance and anchored in the lagoon. He produced a chart of the atoll and his observations are given by Eduard Graeffe in a German article on Samoa, published in 1873.

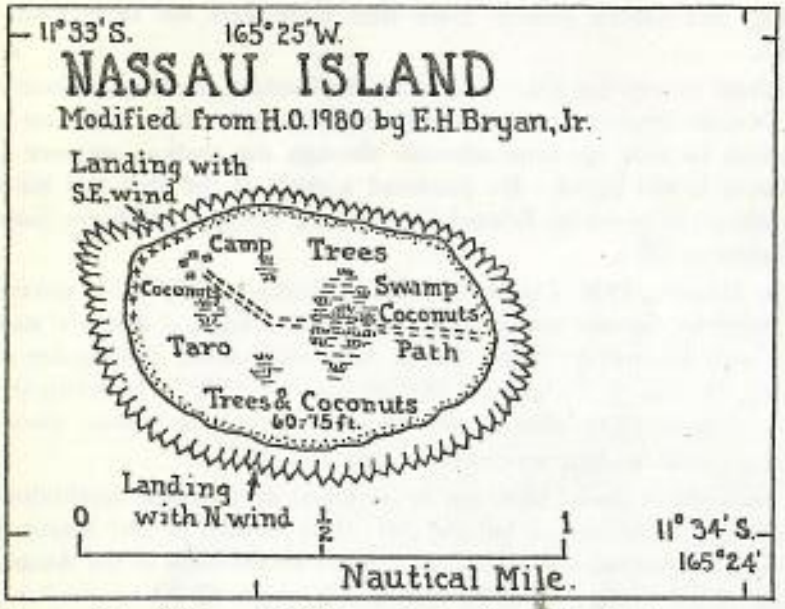
In January, 1920, Commander W. J. Terhune, then naval governor of American Samoa, visited Rose Atoll and erected a concrete monument with inscription: "Rose Island, American Samoa. Trespassing prohibited, Warren J. Terhune, Governor, Jan. 10, 1920." He revisited the atoll in June, 1920, planting the first of the coconut palms. Periodic visits are paid by American naval vessels.

Accounts of Rose Atoll are to be found in Carnegie Institution of Washington Publications 340 and 341, 1924, written by Dr. Mayor, Dr. William A. Setchell and others; and in the Proceedings of the American Philosophical Society for 1921, volume LX, pages 62-70.

Rose Atoll was made a Naval defense area by Executive order of President Franklin D. Roosevelt, dated February 14, 1941. Foreign planes and surface craft are prohibited from visiting the atoll.

It may be questionable whether the lagoon is sufficiently large to serve the interests of trans-Pacific aviation, but in any event, the lagoon would serve as an emergency landing place, and the dots of land would provide another observation spot for America's far-flung interests in the Pacific.

CHAPTER 28
Nassau Island



Nassau Island is located 693 nautical miles south of the equator, 45 miles S.E. by S. of Pukapuka, 175 miles N.W. of Suvarov, and 290 miles N.E. of Tau Island, American Samoa, (240 from Rose Atoll and 350 from Pago Pago).

The island is oval in outline, a little less than a mile long, east and west, by a half a mile wide. The land is flat, with a few low dunes and shallow depressions, nowhere more than 35 feet high. The tops of the trees and coconut palms reach a height of 60 to 75 feet.

The island is surrounded by a fringing reef, 100 to 150 yards wide on the east, south, and west, but narrower on the north. Off the reef the water is deep, with no anchorage. Place of landing depends upon the wind. During the period of the southeast trade winds, April to September, landing is best on the northwest curve; from October to May the winds come from the west and northeast, and then landing is better on the south shore. It can be bad at both places.

Most of the beach is narrow and sandy, except at the northwest curve, where there is sandstone and reef rock, which dips to the north. Nearly all of the area behind the beach is thickly covered with arboreal vegetation. This consists of a marginal fringe of *Scaevola, Tournefortia, Pandanus,* and *Guettarda.* Behind this groves of coconut palms have been planted, replacing much of the original vegetation. Among these are scattered such trees as *Pisonia, Cordia,* and *Calophyllum,* with herbs and bird's nest and polypodium ferns. In several low swampy places are sedges; grass; *Hernandia Pipturus,* and other trees; and planted taro and bananas. Pools of water standing in these swamps are covered with dirty scum, but the water is fresh and drinkable. A moderate rainfall and warm but agreeable climate is suggested.

There are no land birds, and the usual species of sea and migratory birds, although present, are not common. Pigs and chickens, imported by copra harvesters, run wild. Land and hermit crabs, and at least three species of lizards are common. Insects, unfortunately, include both day and night mosquitoes and annoying house flies; there are moths, dragonflies, and usual species, but no butterflies were seen. Marine life is abundant off the reef, including numerous edible fishes.

In early times Nassau was occupied by people from Pukapuka (Danger Islands). There are definite lengendary accounts of intercourse between the two islands during about the 17th century. The people of Pukapuka believed that they owned Nassau, which they called Te Nuku-o-Ngalewu, after a chief who defended the island against invasion by a warrior from Aitutaki named Tima. His name has been attached to a reef lying between Nassau and Pukapuka, now spelled Tema.

According to Pukapuka accounts, contact between the two islands stopped "at the time when the great conflict between the gods made sea travel dangerous," and the island received the name Te Motu-ngaongao (deserted island). Occasional fishing trips were made to Nassau up to the time of white contact, but the permanent settlement died out. The finding of shell adzes and pearl-shell breast ornaments of Pukapuka design in an old grave on Nassau, uncovered by the tidal wave of 1914, helps to substantiate the traditions.

The island was named for the American whale ship Nassau, of New Bedford, Captain John D. Sampson, which sighted it in March, 1835. At least two other vessels had sighted it previously: the London whale ship Ranger (date not known), and the American whale ship Mary Mitchell, of Nantucket, Captain Elihu Coffin, who reported calling it Mitchell

Island in 1834. Some authorities believe this to be the Peregrino Island of Quiros, 1606.

The whale ship Audley Clark, of Newport, Rhode Island, Captain Joseph Paddack, sighted the island December 28, 1836, and called it New-Port Island. It was described as thickly wooded, with no sign of inhabitants. Two of these American discoveries were recorded by Edmund Fanning, 1838.

Six men and a woman, in a sailing canoe from Manihiki, were shipwrecked on Nassau about 1859 or 1860, and lived two years on the island until picked up by a passing ship. The account of them is given by Rev. W. W. Gill, who found traces of them when he landed in 1862. He planted several coconut palms, of which there previously had been only one.

The missionary ship John Williams touched there April 18, 1863, and again in 1875, when Captain Turpie planted 100 more coconuts. Revisiting Nassau in 1881, Rev. Gill found an American captain in possession. He had planted 14,000 coconuts, as well as sweet potatoes, taro, bananas, and breadfruit, and employed natives from Pukapuka.

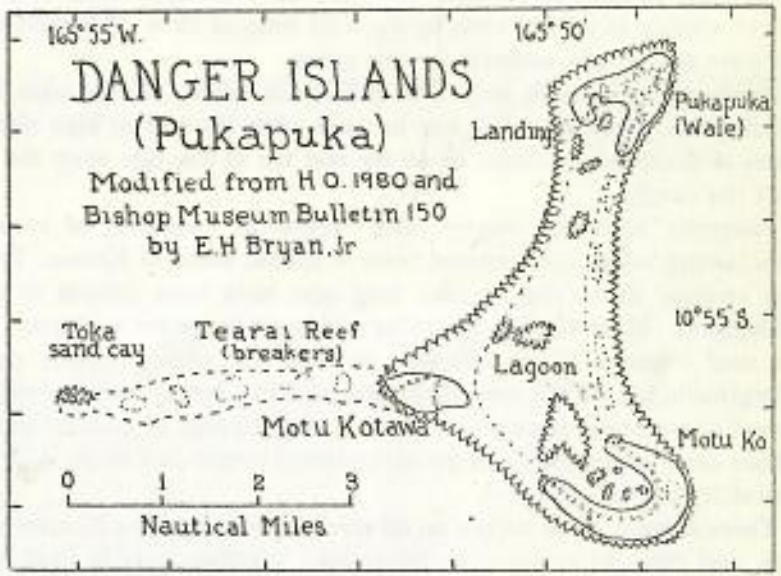
A sketch survey of the island was made by a British ship in 1880, and the island was formally annexed to Great Britain in 1892.

Nassau was leased to the Samoan Shipping and Trading Co. about 1916, and was used for the production of copra. F. L. McFall was manager from 1921 to about 1926, when the company ceased activities. He entertained the writer on the island, February 26 to 28, 1924. He had 22 natives (including 16 men—Ellice, Gilbert and Samoan) working for him, as well as a Samoan wife and three children.

After being abandoned for some years, the camp was again occupied, there having been 30 Tokelau natives under a Captain Williams on the island in 1938.

CHAPTER 29

Pukapuka, Danger Islands



The Danger Islands consist of a group of three small islets, connected by reefs, of which Pukapuka, northernmost, is located 652 nautical miles south of the equator. They are about 715 miles from Rarotonga, Cook islands, their seat of government; 360 miles from Pago Pago; and 45 miles N.W. by N. from Nassau Island.

The land area of the group is 1250 acres; the elevation is nowhere more than 40 feet, much of it low. Pukapuka, at the north, is shaped like a Y, with arms extending southwestward, about a mile across. The entire population lives on this island. At the southeast is a somewhat larger, but lower and less luxuriant, U-shaped island, Motu Ko; at the southwest a smaller, elliptical island, Motu Kotawa.

The islands are connected by broad barrier reefs, which on south and west are always awash; sandbanks come and go on the eastern reef, upon which the surf breaks. They enclose a triangular lagoon, 5 miles north and south by 1 to 2 miles wide, much choked toward each end by

reefs and coral heads, but with the central portion clear, with depths up to 50 feet. The natives navigate their small canoes freely in the lagoon, by paddle or sail, and also walk along the reefs. From Motu Kotawa, Tearai Reef extends three miles westward to Toka sand cay, the sand bank of which was washed away by the tidal wave of 1914. The published charts are not entirely accurate for this group.

Anchorage is possible only with S.E. trade winds, off the west side of Pukapuka. Here a landing can be made over the reef at high tide in canoes or flat-bottomed boats, or on the reef flat at low tide when the sea is not too rough.

Pukapuka is thickly covered with vegetation, consisting of coconut palms, among which are scattered trees of species noted of Nassau. Three large swampy areas, dug by man long ago, have been planted to taro and bananas. Motu Kotawa has taller and more luxuriant vegetation, up to a total height of 80 to 100 feet, its west end with especially dense undergrowth, tall *Pisonia* trees, and giant taro in a central wet depression. Motu Ko is covered largely with scrub forest, clumps of coconut palms, and one small swampy area on the east, planted to taro and bananas. Much more of it could be cultivated.

There is good water supply on all three islands, from wells, open seep holes, and concrete cisterns on Pukapuka. Weather records kept from 1930 to 1935 show an average rainfall of 128.4 inches (113 to 156), rainy season July to February; temperature, maximum 86.8 to 92.2, minimum 67 to 75, mean 80.9 to 83.9 degrees F. The prevailing winds are: May to October from the east and southeast; November to April from the northward, with occasional storms.

Animal life is like that described for Nassau. Pigs, chickens and rats have arrived with man. Sea birds are comparatively scarce, and the land cuckoo and pigeon are practically extinct. Insects include three kinds of butterflies, five kinds of dragonflies, day and night mosquitoes, and bothersome flies. Fish are common and much used for food.

The atoll has been inhabited for a long time by a Polynesian people, whose traditional history and culture have been discussed extensively by Dr. and Mrs. Ernest Beaglehole in Bishop Museum Bulletin 150, 1938. The old name for the atoll was Te Ulu-o-te-watu (head of the rock), and the northern island was wale (home).

The group was discovered June 21, 1765, by Commodore Byron, in the British ship Dolphin. Some authorities believe it to be the San Bernardo seen by Mendana, August 20, 1595. Due to its isolation, few vessels visited it prior to 1857, when missionaries were landed by the London Missionary Society. In 1862, Rev. Wyatt W. Gill found most of the people on the island converted to Christianity. Peruvian slavers raided the island in 1863, and took off about 100 men and women. The English missionary bark John Williams was wrecked on the west side in May, 1864.

In search of Polynesian laborers for Hawaii, the Hawaiian bark R. W. Wood, Captain English, made a cruise south from Honolulu, September 6, 1869, returning December 19, with about 14 men and 28 women from Pukapuka. They were under contract for two years; but proving neither good plantation laborers nor household servants, twenty were sent back soon after on the schooner Annie, Captain Babcock.

The U.S.S. Tuscarora, Comdr. J. N. Miller, examined the atoll in 1876. H.M.S. Alert made observations in 1880. The group was annexed to Great Britain in 1892, and included in New Zealand's Cook Islands Administration in 1901.

The people live in three villages, along the lagoon side of the north island. The villages are neat and clean with substantial houses and good paths, one crossing an arm of the lagoon on a stone causeway. The population has increased steadily from 435 in 1906 to 682 in 1938. In September, 1914, 52 were transferred to Rarotonga, to relieve distress caused by the tidal wave of January, 1914. In 1935 there were 199 males, 195 females, and 238 children. During harvest periods, natives from two of the villages move to the other two islands, which they cultivate. Up to 120 tons of copra have been produced annually.

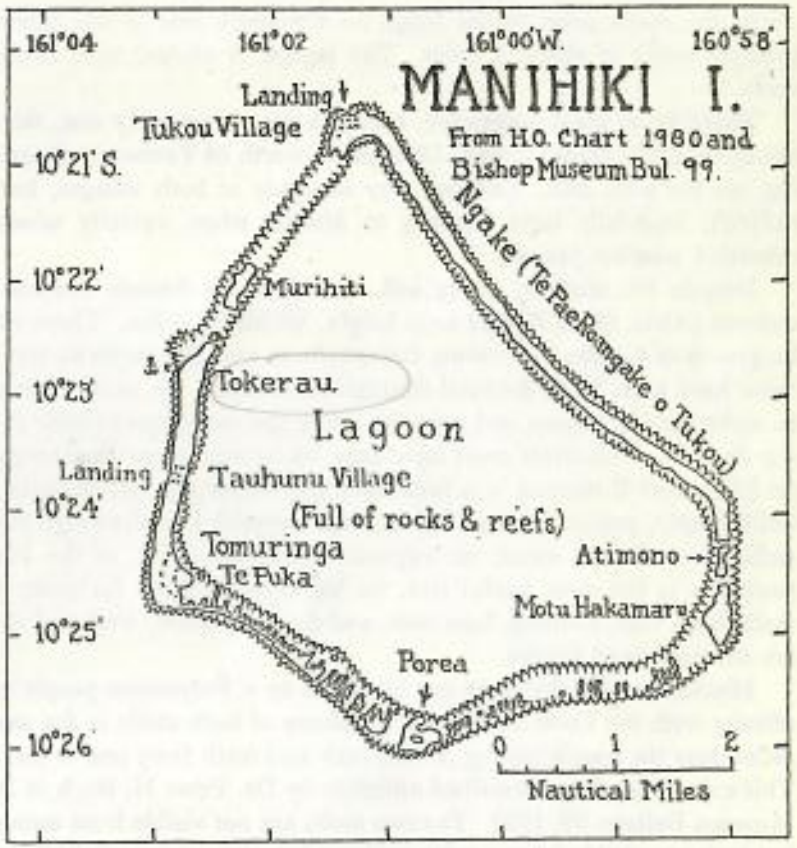
The majority of the people are members of the London Missionary Society church, their church being a conspicuous building near the center of the lagoon beach. A Seventh Day Adventist mission was started in 1919, and a Roman Catholic mission about 1929. All three have native pastors. Since white contact, the old religion has disappeared, and there has been a cultural revolution. The pukapuka language has given way to Rarotongan, official language for church and government.

Economic life also has been affected by white contact. Many natives live in whitewashed, lime-walled houses, and practically all wear European clothes—trousers and undershirts for men, dresses for women, especially in public. They make fine-weave pandanus hats. Money from sale of copra made foreign food and clothes available. Recent depression and low price of copra have caused the withdrawal of traders, and the natives, perforce, are returning to native clothing and foods.

The island has been made famous by Robert Dean Frisbie's "Book of Pukapuka." The resident agent in 1938 was Geoffrey Henry, a descendant of Geoffrey Strickland, American ship builder. He introduced breadfruit trees from Rarotonga, not previously growing on Pukapuka. Top minnows, introduced in January, 1937, have helped to reduce mosquitoes. A radio station was established in 1937, with a part Rarotongan in charge.

Tema Reef, 14 miles, S.E. by S. of Danger Islands, discovered by Captain William Williams, of the John Williams, May 15, 1864, and examined by H.M.S. Alert, is 400 to 600 yards in diameter.

CHAPTER 30
Manihiki Island



Manihiki is a triangular coral atoll, 620 nautical miles south of the equator, 290 miles east of the Danger Islands, and 655 miles north-northwest of Rarotonga, its center for administration. The companion island of Rakahanga is about 18 sea miles to the north and 4 to the west.

The atoll is a continuous rim of reef without lagoon entrances through which so much as a boat could pass. A long, narrow islet stretches along

the northeast side, with Tukou village at its northern point. Another long islet occupies the southern part of the west side, with another village, Tauhunu. Numerous small islets are ranged along the south side, those on the west periodically being connected by ocean beach. The land area is about 1250 acres. The longest stretch of bare reef is on the northwest. From the north point to the bulge on the south side is 5½ miles; the greatest width is about 5 miles. The lagoon is choked with rocks and reefs.

There is no good anchorage, except a very temporary one, fair with off-shore (S.E. trade) winds, 1800 yards, north of Tauhunu village landing, on the west side. Landing may be made at both villages, but it is difficult, especially from January to March, when westerly winds and unsettled weather prevail.

Despite the shallow, sandy soil, the islets are densely covered with coconut palms, 60 to 70 feet total height, visible 12 miles. There used to be groves of *Cordia, Guettarda, Calophyllum,* and *Tournefortia* trees, but these have been much depleted through the demand for wood from which to make canoes, houses and utensils. Only the worthless *Pisonia* is holding its own. Breadfruit trees have been introduced from Rarotonga, and do fairly well if planted in a little soil, also imported; but bananas grow indifferently, papayas a little better, and vegetables well enough if given sufficient soil and water, an expensive process. Next to the coconut, pandanus is the most useful tree, its leaves being used for mats, house walls, hats, fans, clothing, boat sails, and the fruit eaten. Fish and coconut are the main food staples.

Manihiki and Rakahanga are inhabited by a Polynesian people having affinity with the Cook Islands. The culture of both atolls is the same, in olden days the people having moved back and forth from one to the other. This culture has been described minutely by Dr. Peter H. Buck in Bishop Museum Bulletin 99, 1932. The two atolls are not visible from each other, but both are visible from a point midway between. So many natives were drowned making the passage, that in the 1850's the population was divided and both atolls occupied permanently. A hundred years ago there were about 1200 inhabitants. The population has decreased steadily to 486 in 1937. The early decrease was due to Peruvian "black-birders" and disease. Much of the disease has been stopped, but now many persons move to Rarotonga or elsewhere to seek more profitable employment.

The island was discovered and made known to the outside world by Captain Patrickson of the American ship Good Hope, October 13, 1822,

and by him called Humphrey's Island. About 1828 it was sighted by Captain Joshua Coffin, in the whale ship Ganges, of Nantucket. He named it Great Ganges Island. Various other whalers and exploring ships sighted or visited the island, its natives being friendly and willing to supply coconuts. It is believed to be the island called Liderous, Gland, and Sarah Scott.

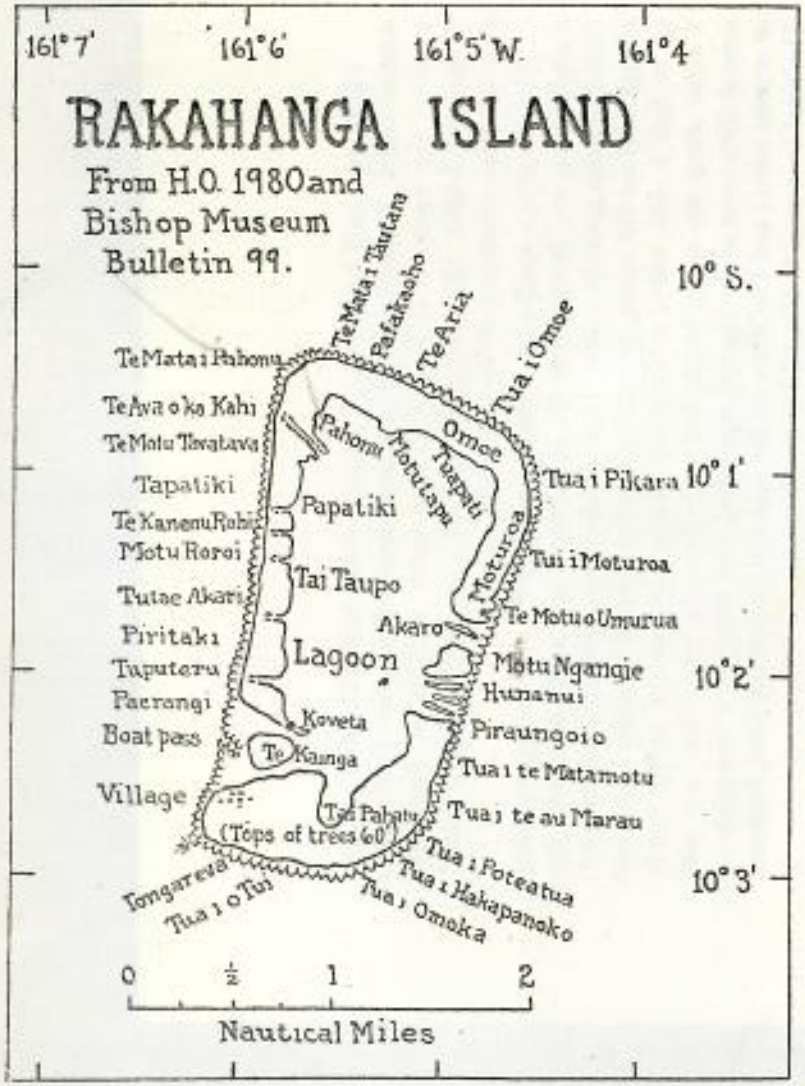
One early whaler brought a Tahitian boy, who deserted ship there, and told such tales of other lands that many young men of Manihiki set out in canoes and lost their lives. One sailing party in 1849, on the way to Rakahanga, was driven far from land, picked up by a ship and landed at Manuae in the Society group. The missionary ship John Williams took them to Aitutaki in the Cook group, where their story of the heathen ways in Manihiki prompted the newly converted Cook Islanders to send them home with two native missionaries. The new religion was promptly accepted, the native gods destroyed, and by 1852, Rev. W. W. Gill states, all had been converted to Christianity, churches and schools had been established, and the foundations of Western culture were laid.

British protectorate was proclaimed over the atoll on August 9, 1889. In 1901, chiefs of Manihiki and Rakahanga petitioned to be taken under the rule of New Zealand's Cook Islands Administration, which was done. The native villages had long been noted for their substantial houses, neat, stone-lined paths, and attractive yards, containing flowering herbs and shrubs. The new government improved health conditions and made the people safe from exploitation by unscrupulous persons seeking laborers. Chief trade connections are with Rarotonga. A radio station was established in 1937.

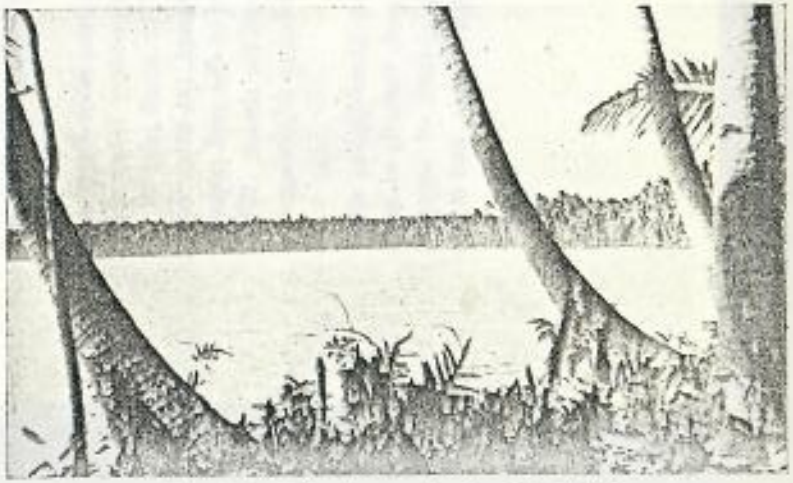
On February 7, 1899, a huge wave, caused by an earthquake, did much damage to Manihiki and Rakahanga. The chief products are copra and pearl shell, both of good quality. The shell is especially fine and free from wormy shell, owing to a thorough cleaning given to the lagoon at one period when it was being worked by diving machines. Water supply has been improved by the construction of two concrete water tanks (5,000 gallons each) at each of the villages. The landing places have been considerably improved recently, and if the price of copra would only rise, prosperity would be assured for this attractive coral atoll.

CHAPTER 31

Rakahanga Island



Willi, the salt maker, and his sister entertain our party, Fakaofu, 1924.



A portion of the lagoon, Swains Island, 1935.

Rakahanga atoll lies about 19 nautical miles from Manihiki, 4 miles west of north. Its northern end is almost exactly 10 degrees (600 miles) south of the equator. It is 190 nautical miles W.S.W. of Tongareva (Penrhyn) Island, 580 miles south and 60 miles west of Jarvis Island, and 520 miles westward of Vostok Island.

The island is a small atoll, a continuous ring of coral reef surrounding a shallow lagoon. It measures 2½ miles north and south by a little less than 1½ miles greatest width. Low, sandy islets cover most of the reef: a large islet on the south, measuring 2 miles around its outer curve and up to half a mile wide; a horseshoe of land around the north, nearly 4 miles along the ocean beach, but only about ¼ mile wide, and with several deep arms of the lagoon, suggesting that formerly it was made up of several islets; and five islets on the east and one on the west, between. The total land area is about 1000 acres.

Most of these islets are rather thickly covered with vegetation: groves of coconut palms, the remains of former native forest, and excavated or natural low, swampy places planted to a kind of taro called puraka (*Cyrtosperma*). Other food plants, such as papayas, bananas, breadfruit, and vegetables, have been imported from Rarotonga, and do fairly well when set out in imported soil.

Rats and coconut crabs have done much damage to coconuts and fruits. Mosquitoes and flies also have been a great nuisance. In October, 1936, top minnows were introduced to prey upon mosquito wrigglers, and were widely distributed through puraka swamps. Special effort has been made to rid the usually clean village of breeding places for flies and mosquitoes.

The Polynesian inhabitants are thought to have come from Rarotonga at an early date, although there is linguistic and legendary relationship with the Maori people who settled New Zealand. The small islet of Te Kainga was the site of the original village on Rakahanga, the other islets being used to grow a food supply. A narrow break in the reef opposite this islet, which facilitates landing, may have influenced the choice. When this islet was outgrown, the village was moved to the larger adjoining islet to the south.

Alternate seasons were spent on Rakahanga and Manihiki, to allow Nature to replenish crops. As we have already related, hazards of mass migration back and forth finally led to the establishment of separate permanent villages. The culture was the same on both islands, and it has

been described in detail by Dr. Peter H. Buck in Bishop Museum Bulletin 99, 1932.

Foreign contact began with the arrival of the Russian explorer, Bellingshausen, on August 7, 1820. He named the island the Russian equivalent of "Grand Duke Alexander Island." In October, 1822, Captain Patrickson sighted the island from the American ship Good Hope, and called it Reirson Island. Captain Joshua Coffin, of the Nantucket whale ship Ganges, about 1828, called it Little Ganges Island.

London Missionary Society representatives, natives from Aitutaki, arrived about 1850. As a result, within a year the old idols were destroyed and the old beliefs forgotten. Following this the native culture underwent a change. There was no pearl shell in the lagoon, but sale of coconut oil and later copra brought in money with which to purchase foreign foods and clothing.

The former rulers of the atoll had been priests who kept hurricanes away. There had been two rival factions, each hating the other. The introduction of Christianity took away the power of both, and substituted brotherly love for hate. The island was governed by a self-elected body called the hau, subtlely directed by the pastor, who was also school teacher. One pastor kept the island from being annexed by a French expedition by hoisting the British flag and refusing to allow it to be hauled down.

British protectorate was officially proclaimed August 9, 1889; and the island, together with Manihiki, came under the New Zealand Cook Islands Administration, June 10, 1901. The Resident Agent for the two islands lives on Manihiki, where he is also radio operator, visiting Rakahanga periodically. Between visits the Island Council assists the local Sergeant of Police in governing the island.

The population averages around 300, decreasing from 352 in 1906 to 295 in 1916, up to 327 in 1926, and again dropping to 290 in 1936. Of the present population, 173 attend the London Missionary Society church, 103 are Roman Catholics, and 14 Seventh Day Adventists. There are 145 men, 143 women, and 2 male Europeans. There are two schools; 48 students under one teacher in the L.M.S. school, 44 students with 2 teachers in the Catholic school.

The people show a fine community spirit, maintaining a model village. In 1936 they all got together and erected a substantial school, paying for the materials with funds which they themselves had contributed. Other

public buildings are planned. Five men were furnished to the New Zealand expeditionary force during the first world war.

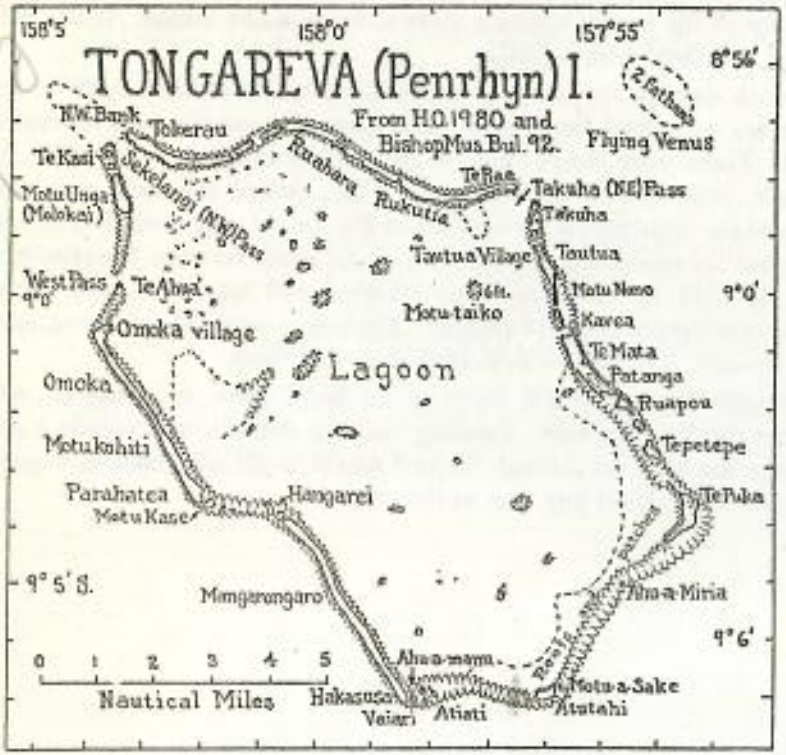
One feature of the island is a spring of medicinal water, beneficial to persons suffering from rheumatism, skin diseases, and the like, located on the edge of the lagoon within a stone's throw of the village. It has been walled and fitted with a pump.

Much damage was done by the tidal wave of February 7, 1899, and there are occasional hurricanes. The climate is usually quite uniformly good. There were heavy rains in November and December 1936, but drought from March to September, 1937, ruined the food crops and reduced the copra output. From 100 to 200 tons of copra are shipped each year, but the recent low price has prevented much revenue. Supplies have been brought by two Rarotonga trader-owned schooners, and during 1937 were valued at 1,214 pounds. There is a minimum of crime, none of it serious. The natives even have their own bank.

Vessels can anchor 200 yards off the N.W. point, in 8 fathoms, with the usual S.E. trade wind. Landing has been difficult, but recently a new passage has been cut through the reef on the south side, making it possible to land at almost any time of the year.

CHAPTER 32

Tongareva Or Penrhyn Island



Tongareva is a large atoll, the northern side of which is 537 nautical miles south of the equator. It is 190 nautical miles E.N.E. of Rakahanga, 325 miles westward of Vostok, 235 miles S.W. of Starbuck, and 640 miles south of Christmas Island. The anchorage at Omoka is almost exactly 9 degrees south, so that mariners find it a good place to check their instruments.

The atoll measures 12 miles N.W. and S.E., by 6 to 8 miles wide. The rim is about 40 miles around. The enclosed lagoon has an area of about 108 square miles, but is much choked with reefs and coral heads. Much of the rim is covered by low sand and coral islets, the land reaching a height of about 14 feet, and the tops of the coconut palms, pandanus and usual low trees about 50 feet. The land area is given as 4,000 acres.

Through the rim there are three passes deep enough to admit ships. The best of these is the Teahua or west pass, less than a mile north of Omoka village. This has 15 feet of water for a width of 100 yards, and depths of at least 20 feet in the middle. A strong tidal current runs out for 7½ hours, and in during the next 4½, twice a day, reaching a velocity of 3 or 4 knots.

The Sekelangi or northwest pass is 700 yards wide, but is so blocked by coral heads that the services of a local pilot are needed, and it is impassable in rough weather. It and the Takuha or northeast pass will admit vessels drawing less than 12 feet. During the usual trade wind season this last pass is exposed and has heavy breakers, as well as a 5 knot current.

There is anchorage off the west side for vessels too large to enter the lagoon. For smaller ships the lagoon furnishes one of the few safe havens in this region during the hurricane season. It is possible for ships to navigate in the lagoon by keeping a sharp lookout for reefs and coral heads, plainly visible in bright sunlight. There is a wharf at Omoka village.

Three miles off the northeast corner is a sunken reef, with about 2 fathoms (12 feet) of water over it, named for the bark Flying Venus which was wrecked there September 6, 1889.

The native name, Tongareva, means "floating Tonga," and was given to the atoll by the Polynesian discoverers. Dr. Peter H. Buck discusses the culture and traditions of the native inhabitants in Bishop Museum Bulletin 99, 1932. Tradition states that they came to Tongareva from Manihiki, although darker skin and a different dialect have led to statements that they are of a different stock.

The atoll was made known to Europeans by the British ship Lady Penrhyn, Captain Sever, it having been sighted by Lieutenant Watts on August 9, 1788. The exploring ship Rurick, Capt. Otto von Kotzebue, visited the atoll April 30, 1816, and provides an early scientific account of the island. William Endicott tells about the encounter between the natives and the crew of the trading ship Glide, November 6, 1830. The ship Porpoise took members of the U. S. Exploring Expedition to the atoll February 15, 1841. The American clipper brig Chatham was wrecked on the S.W. islet in 1853. E. H. Lamont gives an entertaining

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British protectorate was officially proclaimed August 9, 1889; and the island, together with Manihiki, came under the New Zealand Cook Islands Administration, June 10, 1901. The Resident Agent for the two islands lives on Manihiki, where he is also radio operator, visiting Rakahanga periodically. Between visits the Island Council assists the local Sergeant of Police in governing the island.

The population averages around 300, decreasing from 352 in 1906 to 295 in 1916, up to 327 in 1926, and again dropping to 290 in 1936. Of the present population, 173 attend the London Missionary Society church, 103 are Roman Catholics, and 14 Seventh Day Adventists. There are 145 men, 143 women, and 2 male Europeans. There are two schools; 48 students under one teacher in the L.M.S. school, 44 students with 2 teachers in the Catholic school.

The people show a fine community spirit, maintaining a model village. In 1936 they all got together and erected a substantial school, paying for the materials with funds which they themselves had contributed. Other

public buildings are planned. Five men were furnished to the New Zealand expeditionary force during the first world war.

One feature of the island is a spring of medicinal water, beneficial to persons suffering from rheumatism, skin diseases, and the like, located on the edge of the lagoon within a stone's throw of the village. It has been walled and fitted with a pump.

Much damage was done by the tidal wave of February 7, 1899, and there are occasional hurricanes. The climate is usually quite uniformly good. There were heavy rains in November and December 1936, but drought from March to September, 1937, ruined the food crops and reduced the copra output. From 100 to 200 tons of copra are shipped each year, but the recent low price has prevented much revenue. Supplies have been brought by two Rarotonga trader-owned schooners, and during 1937 were valued at 1,214 pounds. There is a minimum of crime, none of it serious. The natives even have their own bank.

Vessels can anchor 200 yards off the N.W. point, in 8 fathoms, with the usual S.E. trade wind. Landing has been difficult, but recently a new passage has been cut through the reef on the south side, making it possible to land at almost any time of the year.

coconut palms and their scrub and low trees reach a total height of only 15 to 30 feet.

There is no native population, but from time to time some of the islets are occupied by copra harvesters and collectors of pearl shell, which is plentiful in the lagoon. Sea birds are very abundant, and some of the islets have been made into a sanctuary for them. There is good fishing in the lagoon and around the coast.

Vessels drawing less than 25 feet may pass through the entrance and find safe anchorage in the lagoon. The islet which forms the west side of the entrance, called Anchorage Islet, has an area of about 80 acres, and is covered with trees and coconut palms. It has a small jetty across its fringing reef on the west side. Its southeastern part has been set aside by the British Admiralty as a naval reserve.

The atoll was discovered September 27, 1814, by Lieutenant Lazareff, commanding a vessel of the Russian-American Company, for which the island was named. Different authorities give different spellings for this name; in addition to the two given above, Findlay spells it Souwaroff. Both ship and island bear the name of a Muscovite general, famed for his siege of Ismael. Lazareff records finding no sign of inhabitants, but states that the islets were overrun by crabs, rats, and large flocks of birds. He does not mention coconut palms nor entrance through the reef, which makes one believe that he did not visit the northern islets.

H. B. Sterndale, in a Wellington (N.Z.) journal for 1890, gives an entertaining account of the island, including stories of shipwreck, murder, buried treasure, and ruins of a former population who built cement walls and had iron tools and weapons.

In 1855 the American whale ship Gem, loaded with oil, ran ashore. The captain and crew made their way safely to Samoa and later to Tahiti. Here the wreck was sold to Messrs. Hort Brothers, who sent one of their vessels, the Caroline Hort, to salvage the cargo. The supercargo, named Livington Evans, not only did this to the considerable profit of his employers, but also dug up a chest containing coins estimated to be worth $15,000. Later, another man from Tahiti, acting on some sort of information, dug up an additional $2,400, buried at the foot of a tree.

In 1860, a canoe containing seven natives (four men and three women) and an Englishman, Tom Charlton, attempting passage from Rakahanga to Manihiki, drifted to Suvarov. They lived on the island three months, eating coconuts, fish, birds' eggs, and turtle. Then they were joined by Joseph Bird and thirty Penrhyn islanders, landed from the

Dart by Captain Samuel S. Sustenance, to collect pearl shell. He was to return in six months and pick up the lot. A short time later, the armed schooner Tickler, Captain Thomas F. Martin, from San Francisco, came by and landed one Jules Tirel, to see how the pearl diving progressed, while the ship went to Niue Island for a load of yams. Because of trouble between Bird and the natives, all three white men were murdered.

Sterndale's description of massive stone walls in the forest, rusted muskets, lime kilns, and buried treasure, if true, suggests that prior to the Russian discovery the atoll had been utilized by Spanish or other foreign visitors.

As early as 1876 the atoll was leased to an Auckland firm, Messrs. Henderson and Macfarlane, who built a wharf, installed a light on a wooden pyramid, and commenced to gather pearl shell. British sovereignty was proclaimed April 22, 1889. The Pacific Trading Co. obtained large quantities of pearl shell of excellent quality.

In 1903 the atoll was leased to Lever Brothers, "for the purpose of removing guano or other fertilizing substances therefrom, and of planting the land with coconuts, and for collecting pearlshells, and for other purposes of a like nature." They tried to introduce and plant gold-lipped shells from Torres Strait, but without success. They maintained about thirty persons on the island. The hurricane of 1914 both spoiled pearlshell operations in the lagoon and damaged the coconut plantation. In 1916 there were seven persons living on the island.

The lease has passed to Messrs. A. B. Donald, Ltd., of Auckland, who are producing a little copra on the island, according to last reports. There is still good pearl shell in the lagoon, but it is being given a long rest.

With the other islands we have just discussed, Suvarov is under the New Zealand Cook Islands Administration.

and graphic account of experiences of its crew in his book, "Wild life among the Pacific Islanders," London, 1867.

In 1864 the villages were almost depopulated by Peruvian slavers. It has been estimated that at least 1,000 men, women, and children were taken to South America from this island. Native pastors of the London Missionary Society had introduced Christianity from Rarotonga in 1854. The new religion had been accepted enthusiastically, and the villagers immediately wanted to build churches. Promise of good pay and safe return from the slavers offered a way to obtain money for churches. But most of the natives died in exile, virtually slaves.

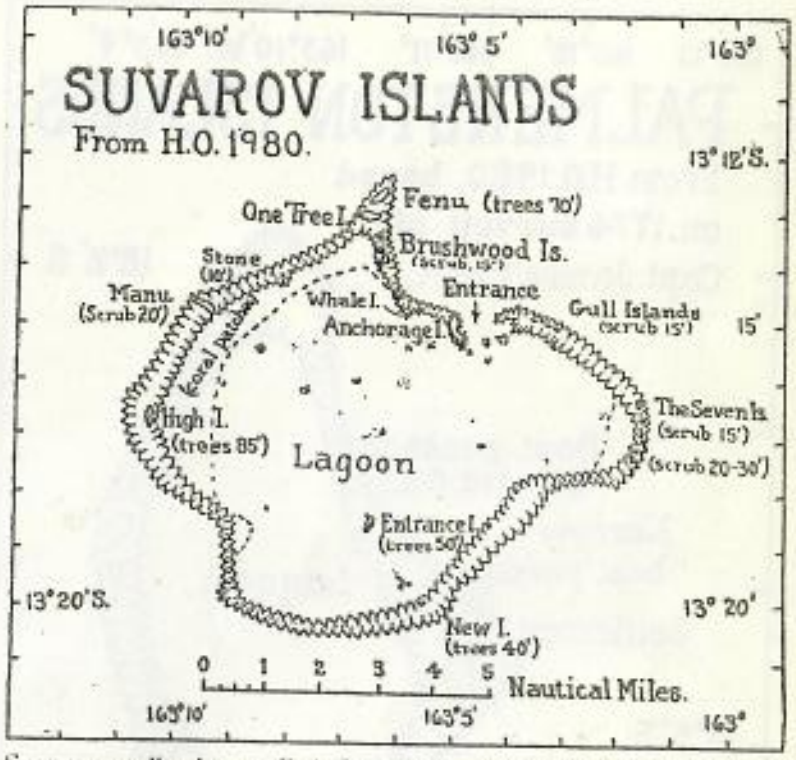
Trade with Rarotonga brought about a loose British protectorate, despite French attempts to include Tongareva in the administration of the Society Islands. Actual annexation to the British Empire was declared in the spring of 1889 by officers of H.M.S. Egeria. By proclamation made at Auckland, June 10, 1901, Tongareva came under the Cook Islands administration of New Zealand.

The native population decreased from 420 in 1906 to 326 in 1916; but since, it has risen steadily to 462 in 1936 at which time there were also five Europeans on the island. They live in two villages, Omoka on the west, and Tautua, nine miles across the lagoon, on the east side. There is a L.M.S. school at each. Each village has a good water supply from concrete tanks. There is no serious crime, and health conditions are, in general, good. Unfortunately a number of the natives have developed leprosy. A leper hospital and receiving station has been built for them and lepers from other nearby atolls, on the little island north of Omoka called Motu Unga, and by some called Molokai.

The chief products of Tongareva are copra, pearl and pipi shells, and native handiwork. During recent years, when the price of copra has been so low, only about one-third of the coconuts have been dried, the rest being used for human food or fed to pigs. Copra shipments decreased from 173 tons in 1932 to 35 tons in 1935, but rose again to 135 tons in 1937. Large lizards and rats have done some damage to coconuts. Much pearl shell and pipi shells have been gathered in the lagoon.

A radio station was installed June 23, 1937; and occasional vessels, other than trading schooners from Rarotonga and government ships, visit the atoll. One of these, in September, 1936, was Templeton Crocker's yacht Zaca, with an expedition to gather material and notes for a marine exhibit in the American Museum of Natural History, New York.

CHAPTER 33
Suvarov Islands



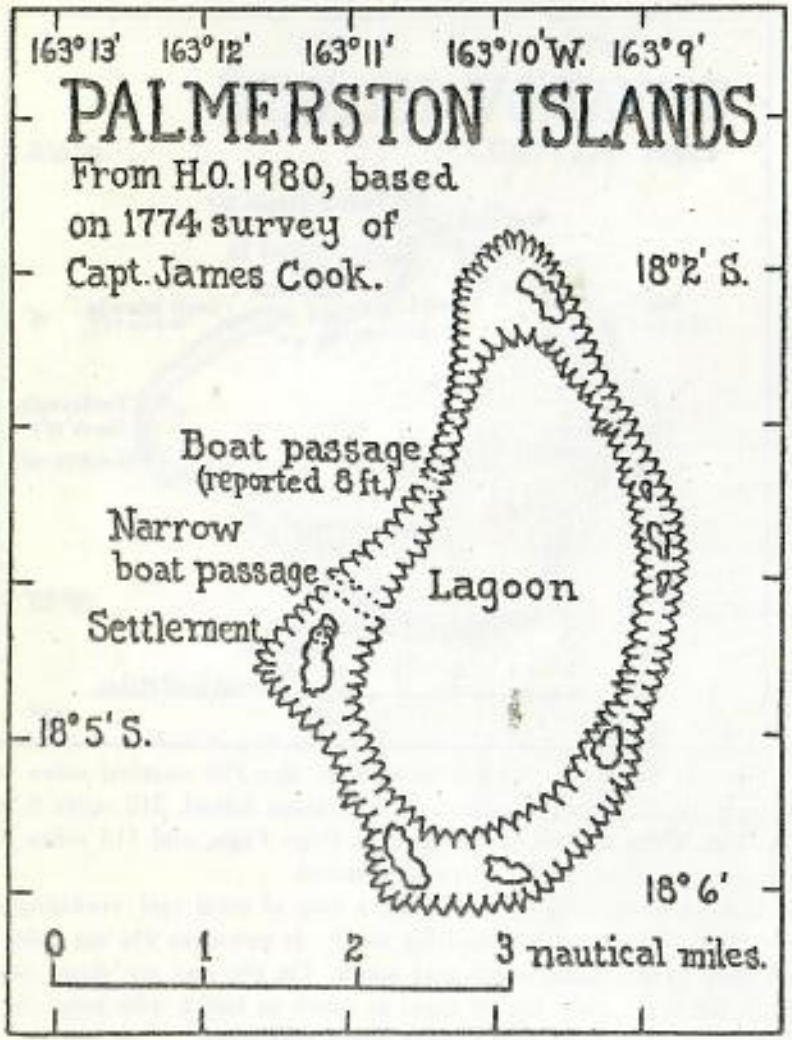
Suvarov atoll, also spelled Suwarrow, lies 793 nautical miles south of the equator. It is 170 miles S.E. of Nassau Island, 210 miles S.W. of Manihiki, about 450 miles eastward of Pago Pago, and 513 miles N.W. of Rarotonga, from which it is administered.

It is an irregularly circular atoll, a ring of coral reef, enclosing a lagoon with one entrance toward the north. It measures 9¼ sea miles east and west by 8¼ miles north and south. On the reef are about twenty-five small islets, only five of them as much as half a mile long, the rest very small. The total land area is about 600 acres.

Some of the islets are covered with coconut palms and tall trees, which reach a height of 60 to 100 feet above sea level. Other islets lack

CHAPTER 34

Palmerston Islands



central Pacific atolls. The northern islet is 1082 nautical miles south of the equator. The atoll is about 280 miles south of Suvarov Island, 360 miles southeast of Rose Atoll, 400 miles eastward of Niue Island, and 270 miles northwest of Rarotonga, from which it is administered.

The atoll consists of a continuous ring of reef, surrounding a shallow lagoon. It measures about 4½ nautical miles (one report gives 6½ miles) north and south, by 2¾ miles wide. There is no safe anchorage, and ships cannot enter the lagoon, although the skillful native boatmen make use of two narrow boat passes north of the western islet, the northern one being said to have about eight feet of water through it.

On the reef are eight small islets, with a total land area of about 1,000 acres. All of the islets are wooded, with thick stands of coconut palms, pandanus, and native trees. Many of these lean to the west and southwest, attesting the strong winds which are experienced, especially during January and February. Native arrowroot is said to grow well. There is no water on the islets, other than that which is caught from rainfall. Giant clams are found on the reef, and fish are plentiful.

The atoll was discovered on June 16, 1774, by Captain James Cook, on his second voyage to the south Pacific, in the British ships Resolution and Adventure. He named the atoll in honor of Lord Palmerston, one of the Lords of the Admiralty. The chart which he drew at that time still forms the basis of the present nautical charts.

On his third voyage to the Pacific, Captain Cook again visited the atoll, in the Resolution and Discovery. In order to obtain fresh green food for the cattle he had on board, four days, April 14 to 17, 1777, were spent, hove-to off the west side. Landings were made on two of the islets, and in addition to cattle feed the men obtained 1,200 coconuts and many fish, for their own food. Interesting observations regarding coral reef formations, birds, fishes, crabs and rats are recorded in the account of the voyage. There was no sign of inhabitants, except part of a canoe, cast up on the reef.

On April 1, 1797, the London Missionary Society's ship Duff, under Captain James Wilson, also visited Palmerston, landings being made for coconuts on the same two southwestern islets.

In 1862, William Marsters (also spelled Masters) went to Palmerston to manage the island for a trader named Brander. The trader did not return, but Marsters stayed on with his family, and in 1892 he was granted a lease to the island by the British Crown. He was married to a woman

from Penrhyn Island, and he also left children by his wife's sister and a third Penrhyn woman. The descendants in these three lines make up the present inhabitants of the island. At first they intermarried. More recently they have married people from Penrhyn, Manihiki, Rakahanga, and Aitutake, and have developed a strong and healthy population, which numbers up to 100.

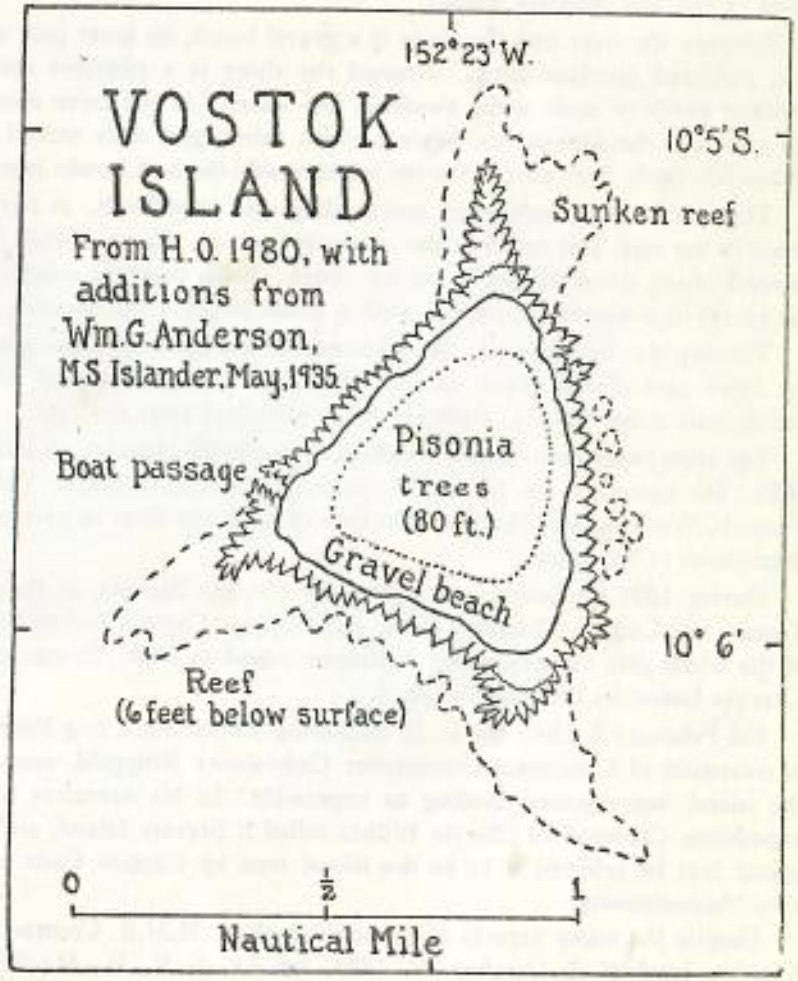
William Marsters died in 1899, and was succeeded by the eldest son of his legal wife, William Marsters, 2d, who was 72 years old in 1935. The present lease is made out to all of the descendants through the heads of the three families. The people speak a peculiar dialect of English, and are an honest, hard-working, and law-abiding group. Their settlement of clean, attractive houses is located on the northern part of the western islet.

Despite their industry, they have met with one misfortune after another. In December, 1883, there was a severe storm, which destroyed all of their coconuts. The hurricane of 1914 wrecked houses and crops. In 1923, a hurricane leveled 27 of 30 homes, and destroyed the crops. During March to April, 1926, the island was hit by another hurricane. Men, women, and children pitched in to repair damage and replant coconuts. They were just beginning to recover from that disaster, and gales experienced during January and February, 1931, when another hurricane ravaged the island, in February, 1935, leaving the inhabitants dependent almost entirely upon fish for food. Relief was sent them on the New Zealand government ship Matai, but the people, with food supplies low, and their resources nearly gone, are having great difficulty in making another start.

The island is under the New Zealand Cook Islands Administration. A school is maintained by the London Missionary Society, with an enrollment of about 38. In 1936 the population numbered 90.

Copra has been the chief product of the atoll. Tropic bird feathers also have had some commercial value. Pigs and fowls are raised for home consumption. About once a year a schooner calls to collect the copra and bring food and other supplies.

CHAPTER 35
Vostok Island



Vostok Island lies 605 nautical miles south of the equator. It is about 325 miles east-northeast of Tongareva (Penrhyn) Island, 86 miles north-northwest of Flint Island, 125 miles west of Caroline Island, 385 miles

south-southeast of Malden Island, and 800 miles northwest of Rarotonga.

It is a triangular, low sand and coral island, about 1,400 yards long, north and south, and not over 15 feet high to the land surface. The central part of the island is covered by a continuous thicket of buka (*Pisonia*) trees, which reach a height of about 80 feet above the sea. This type of vegetation is very distinctive, being found also on Rose Islet. The canopy is so dense that no other plants will grow beneath the buka trees. The soil is rich in humus, from decaying leaves and branches, damp about the bases of the soft, massive trunks.

Between the trees and the shore is a gravel beach, its inner part with low, scattered purslane herbs. Around the shore is a platform reef, a hundred yards or more wide, awash at low water. At the three corners the reef runs out into points, beyond which submerged reefs extend out 400 to 500 yards from shore. On the weather side the surf breaks heavily.

There is no good anchorage, and landing may be difficult. A narrow break in the reef, just north of the southwest corner, allows a small boat to reach shore when the sea is not too rough. Swift currents sweep past the island in a westerly direction, with a small eddy on the lee side.

The island is uninhabited. Sea birds nest in the buka trees and around the inner part of the gravel beach. There are the usual hermit crabs, lizards, and a few insects. Fish are fairly abundant near the reef.

The island was discovered by Captain F. von Bellingshausen, August 3, 1820. He named it for his vessel, variously spelled Wostok, Vostok, Vostock, Wostock, and Bostock. He did not land, nor does he give much description of the island.

During 1821 the island was sighted by Captain Stavers, in the ship Tuscan, and Captain Thornton, in the ship Supply. Captain Joshua Coffin, of the whale ship Ganges, called it Reaper Island in 1828. It was called Leavitts Island by the ship Peruvian.

On February 8, 1841, the U. S. Exploring Expedition's brig Porpoise, in command of Lieutenant-Commander Cadwalader Ringgold, examined the island, but reported landing as impossible. In his narrative of the expedition, Commodore Charles Wilkes called it Stavers Island, and also stated that he believed it to be the island seen by Captain Cash of the ship Massachusetts.

Despite the many reports of no landing place, H.M.S. Constance effected a landing on October 22, 1884, for Lt. J. R. H. MacFarlane collected specimens and eggs of a small black-cheeked noddy on the island.

No great difficulty in landing was experienced by Captain William Greig Anderson in 1935. He collected a specimen of the *Pisonia* tree for Bishop Museum on March 22, 1935, and made a sketch map of the island in May, when south on the motor sampan Islander.

In the list of islands claimed by American guano diggers, under the Guano Act of August, 1856, this island appears twice, as Stavers and as Anne Island. No guano is known to have been dug by them, however.

According to last reports, Vostok Island is leased to an Auckland (N.Z.) firm, S. R. Maxwell and Co., Ltd., but apparently no use is being made of it.

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CHAPTER 35
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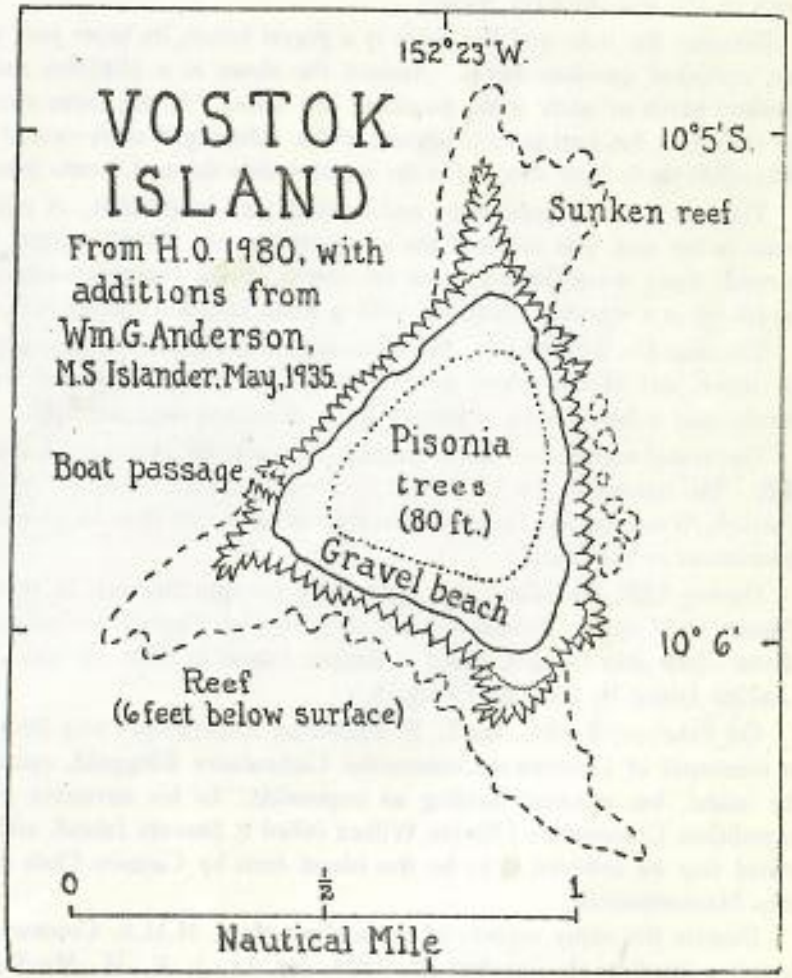

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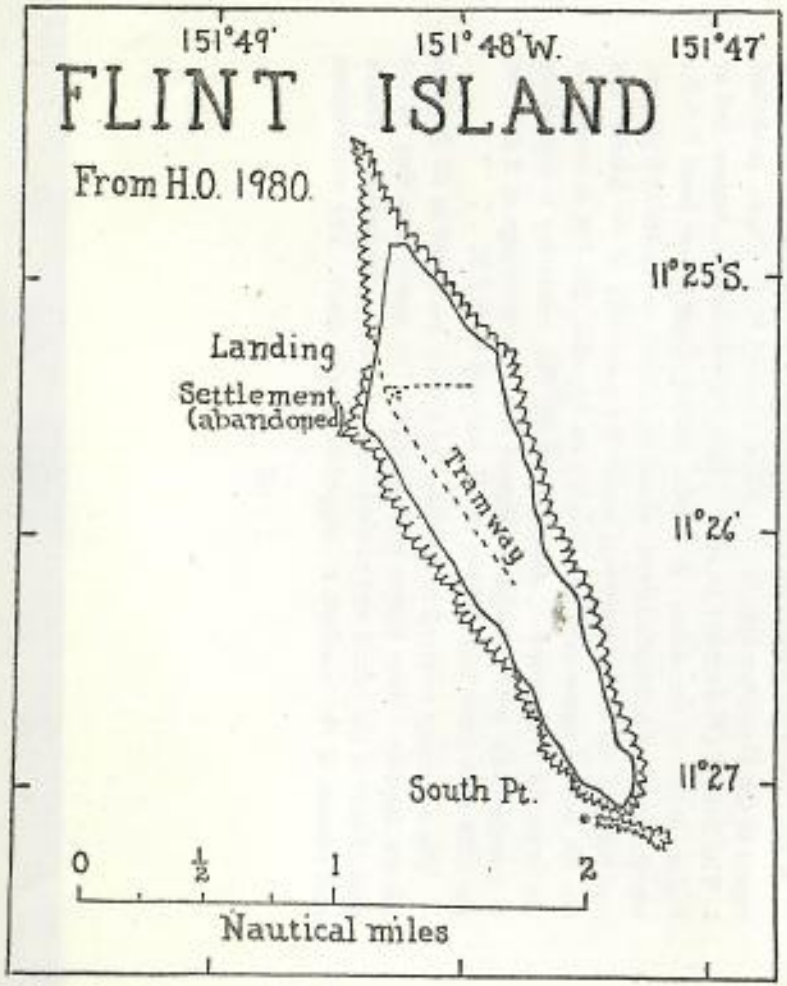
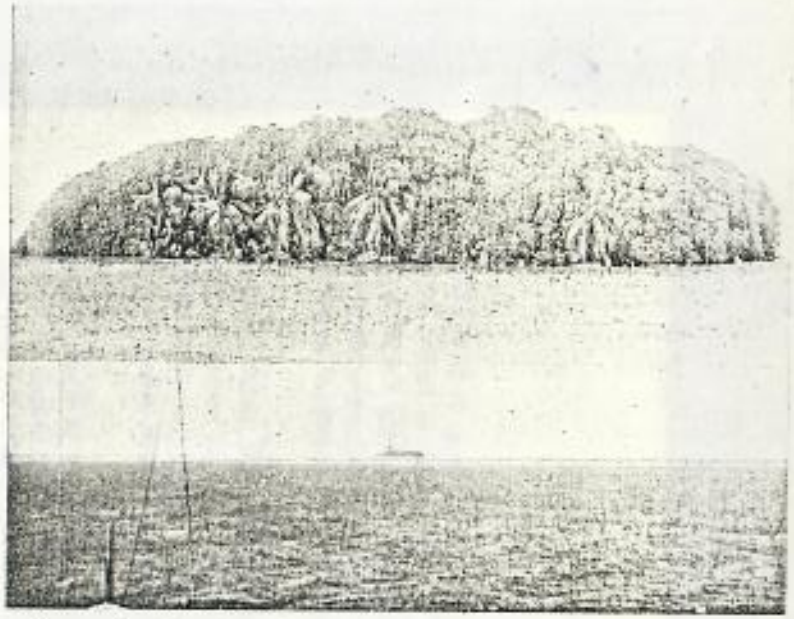
CHAPTER 36

Flint Island



Flint Island is located 685 nautical miles south of the equator. It is about 86 miles S.S.E. of Vostok Island, 125 miles S.W. of Caroline Island, and 390 miles N.N.W. of Papeete, Tahiti.



Rose atoll and a closer view of the *Pisonia* thicket on Rose Islet, 1938.

Culvert across an arm of the lagoon, Pukapuka, 1924.

It is a narrow coral island, two and a half miles long, N.N.W. and S.S.E., tapering toward both ends from a greatest width of half a mile. Its greatest land height is 22 feet. When visited by the brig Porpoise of the U. S. Exploring Expedition, February 5, 1841, it was reported to be thickly wooded. Since then, most of the forest has been replaced by coconut palms.

The island is surrounded by a narrow fringing reef, which extends nearly half a mile off the northern point. The surf breaks heavily on the east side, and also to some extent on the lee side. There is no safe anchorage. Landing is not easy, even at a spot on the northwest side where a break has been blasted through the fringing reef.

No information is available as to the first discovery of Flint Island, except that it was about 1801. It is said to have been named by Capt. Keen in 1835. Various voyagers sighted the island during the first half of the 19th century, but not even the U. S. Exploring Expedition landed.

The island was claimed by American guano diggers under the U. S. Guano Act of 1856, but apparently it was not occupied by them.

Some time in the 1870's Flint Island was leased by Great Britain to Houlder Brothers and Co., of London, for whom John T. Arundel was field manager. Extensive guano digging was carried on, especially between 1875 and 1880. Communication was chiefly with Papeete, but an occasional vessel arriving at Honolulu from Flint Island, or leaving Honolulu for that island, gives us information concerning activities.

Some idea of the difficulties encountered may be had from the following report of the Hawaiian brig W. H. Allen, Captain R. B. Chave, published in The Friend (Honolulu) in 1876. "Left Papeete harbor August 2nd at 5 p.m., in tow of the steam tug Scotia. Struck fresh breeze from E.S.E., which continued to Flint's Island, where we arrived on the 4th at 6:30 p.m. and brought up at the moorings under the west side of the island. On the 5th landed passengers and freight; on Monday, the 7th, a heavy sea set in on the reef, which continued until the 8th, rendering it impossible to communicate with the shore. Slipped from the moorings at 5 p.m. on the 10th with fresh breeze from the E. varying to E.S.E. ."

The moorings referred to consisted of a buoy anchored in 95 fathoms off the landing. Here guano was shipped. The guano was dug in the central part of the island and carried on a tramline to the landing. Traces still remain of the roadbed as suggested on the chart. The excavations

have filled with brackish water and form two or three small lagoons. There is no fresh water other than that caught from rain.

In 1881, Mr. Arundel commenced to plant numbers of coconut palms on Flint, as an independent venture of his own. His ware-house for copra and houses for the overseer and workmen were just southeast of the landing, where the guano diggers' camp had been. Arundel and Company withdrew from this region before 1890.

An outstanding event in the history of Flint Island was a total eclipse of the sun, visible there January 3, 1908. The eclipse was observed by an expedition from Lick Observatory, financed by W. H. Crocker. Professor and Mrs. W. W. Campbell headed a group of observers, including Aitken, Albrecht and Perrine from Lick, Lewis from Berkeley, and Abbot from the Smithsonian Institution. They were transported from Tahiti to Flint Island on the U.S.S. Annapolis, arriving December 9, 1907. A private expedition, organized by F. K. McClean, brought astronomers from Sydney. Rain threatened to spoil the eclipse, but it cleared in time to allow valuable observations to be made. The eclipse was 27 seconds ahead of calculated schedule. The sky above Flint Island was found to be four times as bright as over Mount Wilson, California. The position of the observation spot was determined to be 11° 25′ 27″ S., 151° 48′ 15″ W. Mr. Mortimer was resident on the island at the time.

In 1911 the island was leased to S. R. Maxwell and Co., Ltd. About thirty native workmen, under a white manager, cared for the harvesting of copra from about 30,000 coconut palms. The latest report is that the island has been abandoned. This has not been verified.

On October 16, 1934, the Bishop Museum's Mangarevan Expedition stopped at Flint Island, and botanical collections were made by Dr. H. St. John and F. R. Fosberg. In Bishop Museum Occasional Papers, vol. XII, no. 24, they list 36 species of plants and discuss the vegetation. They say:

"The original vegetation of this island has been practically destroyed, and the island is now an intensively cultivated copra plantation. Introduced weeds are abundant around the houses and in the plantation under the coconut palms. *Carica papaya* grows, apparently spontaneously, here and there in the plantation. Around the houses several edible and ornamental plants are cultivated." Only traces of the original flora exist.

CHAPTER 37
Caroline Island

Caroline Island lies 596 nautical miles south of the equator. It is about 125 miles east of Vostok, 125 miles northeast of Flint, 420 miles southeast of Starbuck, 640 miles west of Hivaoa, Marquesas, and 450 miles north and a little west of Papeete, Tahiti.

It is a long, slender atoll, shaped like the bone point of a southeastern Polynesian trolling hook. It measures about five and three-quarters miles north and south, tapering from a width of a little over a mile at the southern end; about thirteen miles in circumference. Two dozen islets surround a shallow lagoon, into which there is no passage through the connecting reef which will admit more than a ship's boat.

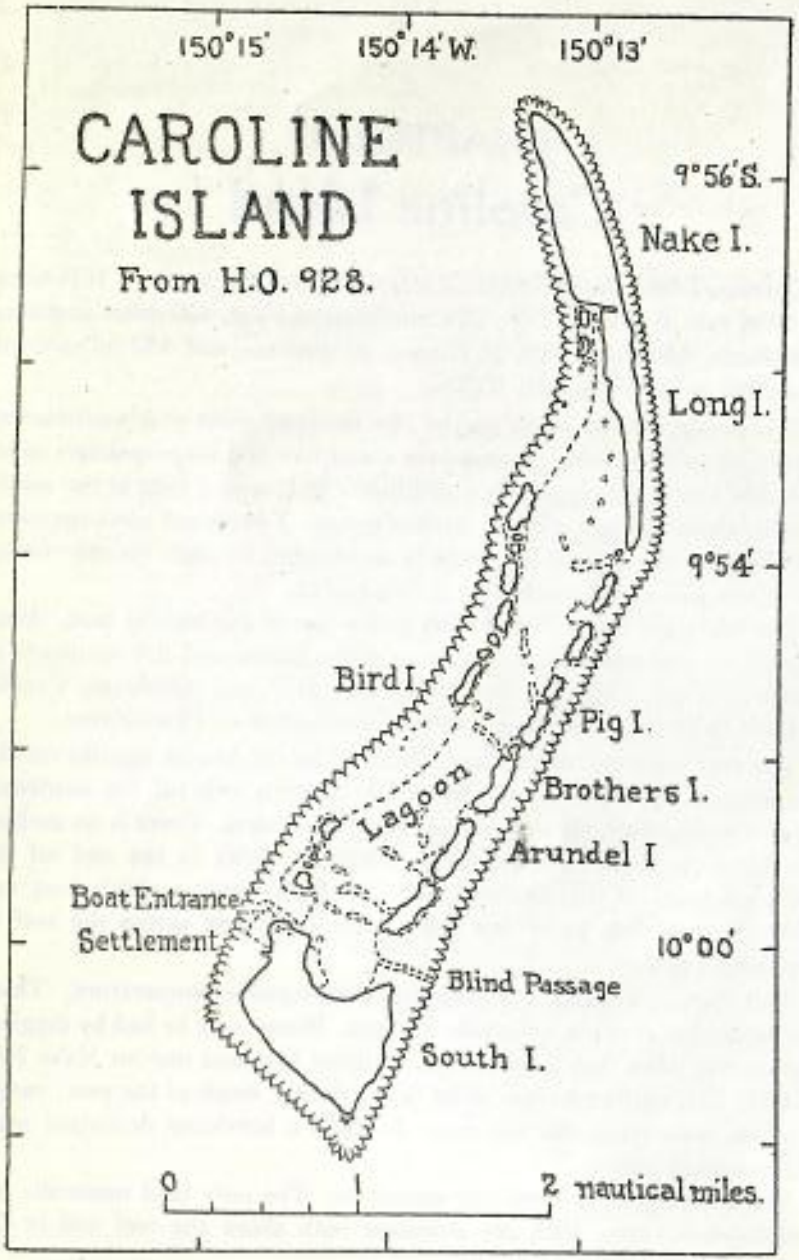
The islets are 15 to 20 feet high to the top of the highest land. Most of them are covered with groves of coconut palms and the remnants of low forest trees, 12 to 15 feet high, tree heliotrope, pandanus, *Cordia*, *Morinda*, with here and there a taller *Calophyllum* or *Pisonia* tree.

The reef does not dry at low water. The sea breaks heavily on the weather side. The reef is said to extend about a mile off the southwest and southeast points, although not so shown on charts. There is no anchorage. Landing can be made through a narrow break in the reef off the northwest point of the southern islet. At high water a ship's boat can reach shore; at low water one must wade 1,400 feet across the reef in knee-deep water.

The climate is warm but pleasant, with equable temperature. There may be sudden showers, especially at night. Water may be had by digging, there having been two wells on the southern islet and one on Nake Islet in 1883. The southeast trade wind blows during much of the year, varied by winds from the north and east. In 1878 a hurricane destroyed most of the coconut palms.

Sea and migratory birds are numerous. The only land mammals are reddish-brown rats. Fish are abundant both about the reef and in the lagoon.

There must have been Polynesian inhabitants on Caroline Island some time prior to its discovery, for graves, containing adzes, and native temple



platforms have been found, especially on the two northern islets. A drawing of the largest marae, located on the west side of Nake Islet, made by George W. Robertson, of Liverpool, was published in the National Academy of Sciences' report of the 1883 eclipse expedition.

The island was discovered, December 16, 1795, by Captain William Robert Broughton, in the British sloop Providence, who passed at a distance of six miles. He named it Carolina "in compliment to the eldest daughter of Sir P. Stephens," then first Lord of the British Admiralty.

In 1821 it was seen by Captain Thornton of the English whaler Supply, for whom it has been called Thornton Island. Other early names were Hirst's, Clark's and Independence Island.

Lieutenant Hiram Paulding, who visited the island October 10, 1825, in the U. S. schooner Dolphin, gives an interesting account. Captain Stavers landed in 1828, leaving some hogs, of which there was no later trace.

One of the most extensive accounts of Caroline Island is that given by Frederick Debell Bennett, in his "Narrative of a whaling voyage around the globe," vol. 1, pages 365-378, 1840. This account has been reprinted in the Paradise of the Pacific magazine for November, 1939. Bennett landed April 23, 1835.

Between 1865 and 1872 Messrs. Brown and Brothers planted coconuts on Caroline Island. On July 9, 1868, the British flag was hoisted by Commander George Nares, of H.M.S. Reindeer. He reported 27 persons living in the settlement on the southern islet, raising stock, pigs, and poultry; salting fish; and planting coconuts and extracting coconut oil. In 1870 Lieutenant Chauviniere, of the French transport Somme, described it as a low lagoon island, similar to those in the Tuamotu group.

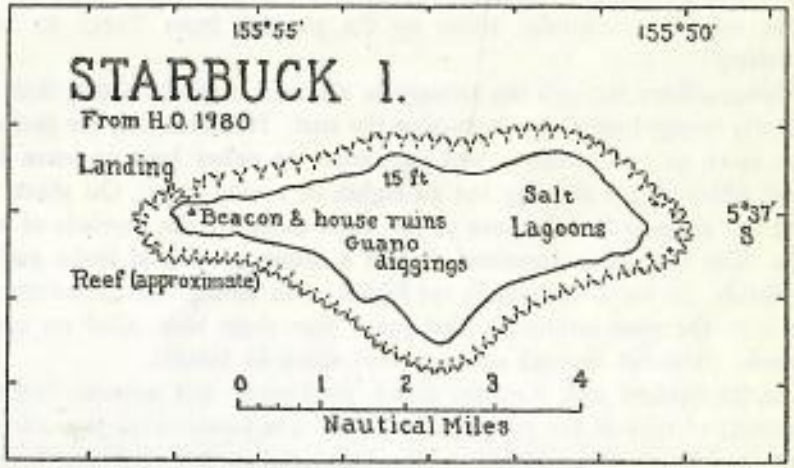
In 1872 the island was leased by Queen Victoria to Houlder Brothers and Company, of London. They dug some little amount of guano. In 1881 their manager, John T. Arundel, took over the lease himself, planting numerous coconut palms. In 1883 he employed four men, one woman, and two children on the island. During these years ships were moored to a buoy, anchored 120 yards off the reef in 90 fathoms of water. There was evidence of several wrecks on the reef.

On May 6, 1883, a total eclipse of the sun was visible from Caroline Island. It was observed by a party of American astronomers, headed by Edward S. Holden, and two British observers. They were transported from Callao, Peru, to the island on the U.S.S. Hartford, arriving April 21, 1883. A French expedition also observed this eclipse. A map of the island

was made by Lieutenant E. F. Qualtrough, U.S.N., and natural history specimens were collected by Dr. W. S. Dixon, both of the U.S.S. Hartford. Insects were collected by Dr. Palisa of the French expedition. The position of the observation spot was determined to be almost exactly 10 degrees south and 150 degrees 14 minutes, 24 seconds west.

The island is now leased to S. R. Maxwell and Company. In 1926 the inhabitants numbered 10. In 1936 there were two Tahitians and their families living on the island.

CHAPTER 38
Starbuck Island



Starbuck Island lies 336 nautical miles south of the equator. It is 235 miles northeast of Tongareva (Penrhyn), 345 miles northwest of Vostok, 400 miles southeast of Jarvis, 450 miles south-southeast of Christmas, and 108 miles south-southwest of Malden.

It is a low, flat coral island, with a greatest height, along the beach crest, of about 15 feet. Within this crest the island is depressed, with small salt lagoons near the eastern end. The shape is described as that of a shoulder of mutton, with the knuckle at the west end. It is 5½ miles long, east and west, by 2¼ miles greatest width, tapering toward both ends. The area is given as about one square mile.

The steep beach is surrounded by a fringing reef, which averages about 1,000 yards in width, a little wider at the eastern point. Near the west point a break has been blasted in the reef, making possible a rather difficult, and at times dangerous, landing. There is no safe anchorage. During the guano-digging period vessels tied up to two mooring buoys near the landing.

The appearance of this island is well described by John T. Arundel in an address before the Geographical Society of the Pacific, at San Francisco in March, 1885.

"At first nothing but a strong white glare in the western sky, painfully bright and shining, even at the distance of four miles or so; then, as the vessel rose on the tops of the waves, a long low line of white sand becomes visible; then, as we gradually got nearer, we could see wrecks of ships at intervals, strewn along the coast, and clusters of white sea-birds resting upon them; and, as we got to the western end, a few houses, of which we had come to take possession, and towering high above all, the remains of the French transport Euryale, which had been sailed ashore about twelve months previously, while on the passage from Tahiti to San Francisco."

Going ashore through the passage in the reef, Arundel stated that he narrowly escaped capsizing in passing the surf. He notes that for periods of as much as two weeks it was impossible to either land or leave the island, although the ship lay but an eighth of a mile away. On shore he could not sleep at first because of the noise made by the myriads of sea birds. The vegetation consisted of half a dozen species of herbs and a low shrub. So inconspicuous is the island, with strong current sweeping past it to the west-southwest, that many fine ships have piled up upon its reefs. Arundel counted seven wrecks when he landed.

At the eastern end, Arundel noted, were some salt lagoons, "where thousands of tons of the purest kind of salt was found in various forms, coarse and fine." They varied in size, being almost dry at times. It was dangerous to approach them. One of Arundel's workmen sank up to his shoulders before he was pulled out. From the west end beacon, ridge after ridge of old block coral was visible, enclosing the guano beds.

Another description was given by a sailor on the British ship George Thompson, under Capt. William Shepherd, which moored to load guano in October, 1872. "I think they ought to call this the island of desolation; it is indeed a desolate region. It puts me in mind of a vast flat iceberg. The coral is all over it, ground to fine powder, which looks much like sand. The kanakas have to launch surfboats over and through great monster seas and load the ships. The climate is beautiful and delightful. A nice breeze from the S.E. is always blowing. There are only five white men and about 100 kanakas."

Starbuck Island was discovered by Captain Valentine Starbuck, in the English whale ship L'Aigle, in 1823. He called it Volunteer Island. That same year he took the Hawaiian king, Liholiho (Kamehameha II), his wife and party to England, November, 1823, to March, 1824. The royal couple died in England, and their bodies were sent back to Hawaii on

H.M.S. Blonde, Captain Lord Byron. On August 1, 1825, after leaving Hawaii, the Blonde passed by Starbuck, but did not land. The narrative says: "Its appearance was still more uninviting than that of Malden's Island, there not being even the trees to enliven the flat coral rock."

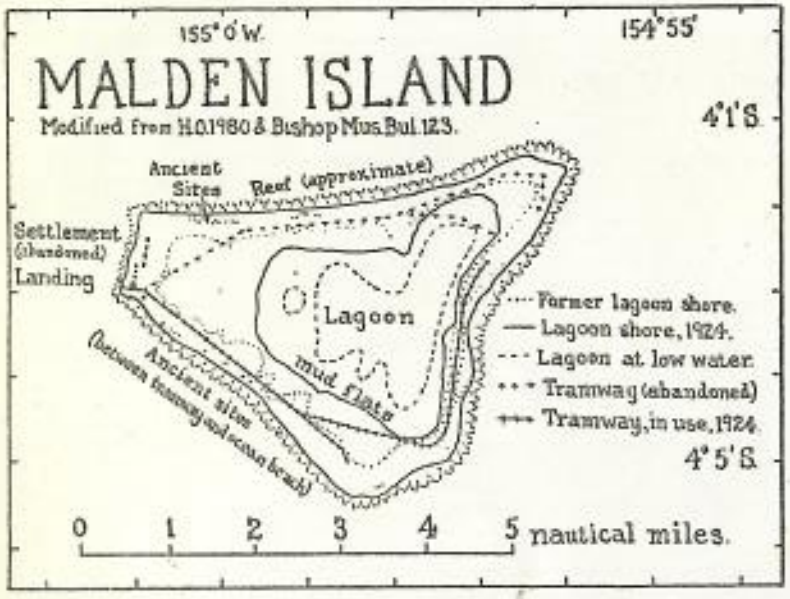
It was taken possession of by Commodore Swinburn, in H.M.S. Mutine, in December, 1866. Guano digging began soon after. The French transport Euryale was wrecked on the night of March 10, 1870. The date of Arundel's arrival would have been 1871. Records in The Friend (Honolulu) of shipping to and from Starbuck, at the port of Honolulu, are frequent during 1871-1874. After the island was given up by Arundel, it was revisited by the company which worked Malden Island.

One provision of the British lease was that a tall beacon should be erected, so that the island might be seen at more than four miles. One was maintained near the west point. In 1926 it consisted of a large wooden pyramid about 25 feet high, in fair condition, although the island long since had been abandoned. In 1937, H.M.S. Achilles reported it still standing, although the houses and sheds were in ruins. A vessel visits the island at intervals to see if there have been any wrecks.

Besides Starbuck and Volunteer, the island has been known by several names, including Low, Starve, Hero, Barren, and Coral Queen.

CHAPTER 39

Malden Island



Malden Island lies 241 nautical miles south of the equator. It is located 108 miles N.N.E. of Starbuck, 460 miles N.W. of Caroline, 365 miles S.S.E. of Christmas, and 373 miles S.E. of Jarvis Island.

It is a triangular, flat coral island, about 5 miles long (east and west) by 4½ miles wide. Its east-central portion is occupied by a very salty lagoon, the outline of which changes with the tide. The map indicates the high and low water outline as observed by a Bishop Museum party in 1924. The land area is given by the guano company as 10,700 acres, with an additional 9,000 acres of lagoon.

There is evidence that at some time in the past the sea broke through the east rim and flooded a much larger area of the central basin. This is indicated by the dotted line on the map. It is also claimed that the island has risen several feet with reference to sea level. This also would have accounted for a former larger lagoon.

The enclosing ridge is nowhere more than 25 or 30 feet high. Most of the island cannot be seen at a distance of over 7 or 8 miles. There are numerous small, reddish fish in the lagoon which evidently pass through some underground channel to and from the sea.

The shore is surrounded by a narrow fringing reef, the greatest width of which is variously given as between 200 and 600 yards. A steep beach rises from the reef and forms a rim about 400 yards wide, in places with successive ridges of coral and marine debris, cast up by storms.

Anchorage is precarious, for there is deep water off the edge of the reef. During the guano days, buoys anchored off the west end, in 80 to 100 fathoms, provided mooring for small vessels. In 1926 there were two of these left. Landing often is difficult, despite a small pier near the south end of the west shore. At times, due to the swell, it is better to land on the beach just north of this pier.

A weather record was kept on Malden for many years, almost continuously from 1890 to 1919. This shows a warm but pleasant climate, despite its uniformity. The mean pressure varies but little from 29.86 inches of mercury. The mean temperature is 84.8 degrees F., with 75 and 99 degrees marking the extremes. Trade winds predominate: 62 per cent from the east, 21 from the northeast, 8 from the southeast, 4 from the north, 3 per cent calm, and the other 2 per cent from the northwest and west. Violent storms are rare. There generally is a current past Malden from the east varying from northeast to southeast with the seasons.

The most variable factor in the climate is the rainfall. The yearly average is 28.62, but it has varied from less than four inches (1908) to over 93.5 inches (1914). The record came to an end in October, 1919, but during the ten months of that year it rained 95.45 inches. No rain at all fell during nineteen different months, and only a trace in many more. The heaviest rainfall is between January and May. During March, 1914, it rained 25.73 inches.

There is abundant evidence to show that Polynesians lived on Malden before its discovery by white men. Earliest explorers reported stone-faced platforms and graves. Several descriptions have been given of these, together with speculations as to when and by whom they were built.

The late Dr. J. Macmillan Brown draws a highly imaginative picture of "great temple pyramids" dating from a time when Malden formed part of a "vanquished empire," and people coming on pilgrimages to it from "fertile archipelagos within canoe distance of its shores," which now have sunk.

Kenneth P. Emory, Bishop Museum anthropologist, who studied the ruins in 1924, has published an account which agrees not at all with these fantastic ideas. The stone structures are located around the beach ridges, principally on the north and south. They include temple platforms, called marae, house sites, and graves. They indicate that Polynesians lived on Malden for several generations, and that this was not many centuries ago. Comparisons with stone structures on Tuamotu atolls show that a population of between 100 and 200 natives could have produced all of the Malden structures. Maraes of a similar type are found on Raivavae, one of the Austral Islands. The natives got their water from wells, remains of which have been found, always dry or salty at present.

Malden was discovered July 29, 1825, by Captain Lord Byron, in H.M.S. Blonde. He had just taken to Hawaii the bodies of Kamehameha II and his wife, who had died in England. It was named for Charles Robert Malden, Lieutenant, R.N., who landed and made observations on shore. Andrew Bloxam, naturalist of the Blonde, also landed, and his diary, published in 1925 by Bishop Museum, gives more complete observations than the official narrative of the voyage.

The "several clumps of thick, fresh-looking (*Pisonia*) trees, so compact that at a distance they were taken for rocks" are still there, although, like much of the other vegetation, damaged by goats which were introduced in the 1860's. Other plants include *Sida* shrubs, bunchgrass, and low herbs, a total of about ten species. Polynesian rats, found on the island, now have been exterminated by introduced cats. Sea birds of the usual kinds, formerly abundant, in 1924, were rare except for sooty terns. Two kinds of lizards and a few insects also have been reported. An account of the natural history and an analysis of the guano were given by W. A. Dixon in 1877.

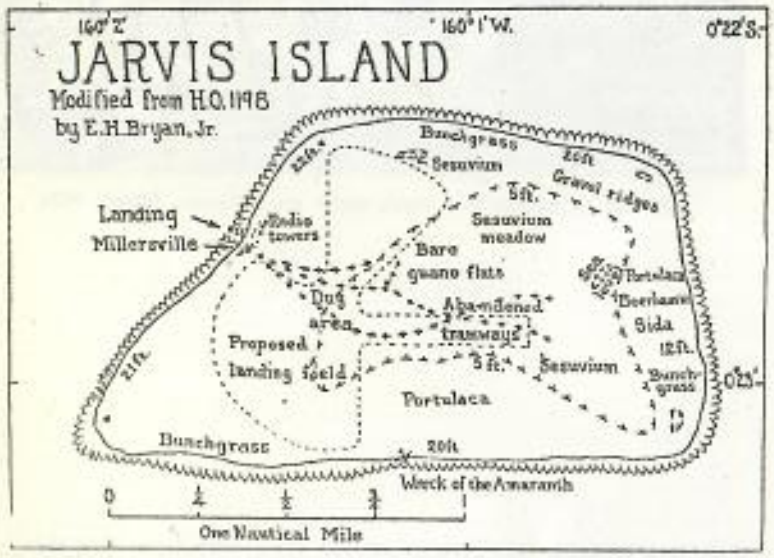
The island was called Independence by Brayton in 1836. The story is told that the extensive guano deposits were discovered by an American whaling master in 1848, but that he decided to finish his cruise before exploiting any of it. Soon after, another whaler came along and noted the layers of guano. Her captain immediately sailed for Sydney, where he sold his discovery for a considerable sum.

Thus was started a series of guano enterprises, which worked the island, with considerable profit, for nearly seventy years. In 1876 there were 79 persons on the island. Just prior to 1889, Messrs. Grice, Drummer and Co., of Victoria, employed 8 Europeans and 150 Polynesians on Malden. Natives of Niue dug and transported the guano, and Cook Islanders from

Aitutaki handled the boats. Water had to be distilled by means of condensers in dry years. Coconuts, planted by the guano diggers, grew for a few years and then died.

Malden was claimed by Americans under the Guano Act of 1856, but by then the Australian firm already was established there. On January 1, 1922, Malden was leased to Malden Island Proprietory, Ltd., of Melbourne, for 21 years, but they did not stay out their lease, and the island has been abandoned during the past few years.

CHAPTER 40
Jarvis Island



Jarvis Island is located a little more than 22 nautical miles south of the equator. It is 400 miles northwest of Starbuck, 373 miles northwest of Malden, 200 miles southwest of Christmas, 260 miles a little west of south from Fanning, 310 miles south and a little east of Washington, and 395 miles south-southeast of Palmyra.

It is a low, basin-shaped, coral island, measuring 1¾ miles east and west by a mile greatest width. The highest point on the rim is 23 feet (at Millersville) and portions of the east rim are less than 12 feet. The rim is quite narrow, enclosing an extensive basin, one point being at sea level, although there is no permanent lagoon.

On the map we have drawn the five-foot depression contour within this basin, connecting points which are just five feet above sea level. In 1938, in making a study of plant distribution on Jarvis, the writer noted that most of the area within this line, and hence lower than five feet, was covered by a meadow of *Sesuvium* or pickle weed. Outside the line (elevation 5 to 15 feet) the ground is sparsely covered with *Portulaca* or purslane.

The entire ridge was covered by a narrow belt of *Lepturus* bunchgrass. On the low east side were scattered bushes of *Boerhaavia* and *Sida*; and on the west side was a patch of very dry *Tribulus* (puncture vine) and a little *Eragrostis* bunchgrass. On the steep beach west of Millersville were a few bushes of *Abutilon*, about three feet tall, the highest vegetation on the island.

The steep beach is surrounded by a narrow fringing reef, about 100 yards wide. Off this platform reef, which dries at low water, the water is shoal for another 200 yards, on the south, west, and north, and then deepens rapidly. Off the east side, however, is quite an area of shoal, sounded by the Itasca in 1935. The direction of the wind does not make this a good anchorage. A narrow channel which was blasted through the reef on the west side by the guano diggers makes landing comparatively easy. In good weather a small boat also might land through two similar small breaks in the reef just north of the southwest point.

The usual sea birds are numerous, as well as hermit crabs, lizards, and small field mice. Highly colored fishes and other marine life abound in pools on the reef.

Jarvis is said to have been discovered by Captain Brown of the English ship Eliza Francis, April 21, 1821. The island also has been called Bunker, Volunteer, Jervis, and Brook or Brock, and some of these names appear on charts or occur in lists of discoveries prior to 1821. Captain Michael Baker made landings from the ship Braganza in 1835 and 1836, and from the Desdamona in 1845. The U. S. Exploring Expedition's ships Peacock and Flying Fish surveyed the island in December, 1840.

It is stated that guano samples were taken in 1855. In March, 1857, Alfred G. Benson, of New York, and Charles H. Judd, of Honolulu, landed from the Hawaiian schooner Liholiho (Captain John Paty) and claimed it for the American Guano Co., under the Guano Act of 1856. A few months later the U.S.S. St. Mary's under Commander Charles Henry Davis, surveyed the island and made formal claim in the name of the United States.

February 27, 1858, C. H. Judd took 23 native workmen to Jarvis on the ship John Marshall, Capt. Pendleton, to commence digging operations. Buildings were erected and moorings laid. From 1858 to 1879 there is continuous record of guano shipments from this island, one of the most

extensively exploited of the guano island. On July 26, 1879, the American schooner Jos. Woolley, under Capt. Benj. Hempstead, "took all the men and material on board" and sailed in turn to Baker and Howland, where the guano works on these islands likewise were closed up.

On June 3, 1889, the island was annexed by Great Britain. In 1906 it was leased to the Pacific Phosphate Company of London and Melbourne; but very little, if any, digging was done.

On August 30, 1913, the barkentine Amaranth of San Francisco, C. W. Nielson, master, with a cargo of coal from Newcastle, N.S.W., for San Francisco, stranded on the south shore of Jarvis. The crew made their way safely in two boats, one reaching Pago Pago, September 11; the other making Apia. The wreck of the Amaranth is scattered along the south shore, and rounded fragments of coal still are to be found.

In 1924 a scientific party from B. P. Bishop Museum visited Jarvis on the U.S.S. Whippoorwill, and made a biological survey of the island.

On March 26, 1935, the American flag again was raised on Jarvis by a party of colonists, landed from the U. S. Coast Guard Cutter Itasca. This party was in charge of William T. Miller, of the U. S. Department of Air Commerce, in whose honor the settlement has been called Millersville.

Millersville steadily has been improved. Its tents were replaced by shacks, much of them built from wreckage from the Amaranth. These in turn were replaced by substantial houses of wood and stone, equipped with refrigeration and powerful radio. Weather observations, which have been made carefully and regularly, should be of great value to trans-Pacific fliers of the future.

Typical vegetation in a fresh water seep, Nassau Island, 1924.

Original camp on Jarvis Island, March 26, 1935.

CHAPTER 41
Christmas Island

Christmas Island lies 105 nautical miles north of the equator. It is 200 miles northeast of Jarvis, 153 miles southeast of Fanning, 238 miles southeast of Washington Island, 357 miles southeast of Palmyra, and 1160 miles south of Honolulu.

It is the largest of the low coral islands in the central Pacific, measuring 35 statute miles east and west by 24 miles greatest width. The land area by one account is given as 60,000 acres, by another as 160 square miles (102,400 acres), and by a third as 250 square miles (160,000 acres). This last account gives the total surface within the reef as 382 square miles, a third of which is occupied by brackish or salt lakes and the lagoon. This latter measures 12 by 8 miles and occupies much of the western third of the island.

The height of the land averages 10 feet or less, but there are a few lines of sand hills which reach a height of 20 to 40 feet. The highest of these are along the southern shore of the Bay of Wrecks. A strong current sweeps into this bay from the east and has caused many sailing

ships and even a steamer or two to pile up on the jagged reef, which averages 100 to 300 feet wide.

North and south of the lagoon are groves of coconut palms, most of which were planted after 1880. These can be seen from the deck of a vessel at 10 or 12 miles. But the northeast and southeast points are so low that they are only visible from a few miles. Beacons have been set up on these points, that behind the southeast point being a conical structure of iron, 45 feet high.

Dr. E. Christophersen (in Bishop Museum Bulletin 44) records 24 species of plants as growing naturally on Christmas Island. These include a few *Tournefortia* trees, three *Pisonia* trees, clumps of *Scaevola* shrubs, four kinds of grasses, seven kinds of low shrubs, and the rest herbs. The taller growth is in the western third of the island; grassland and low shrubs in the middle portion; and the eastern end is largely bare. The lakes are practically at sea level. Near the settlements *Erythrina*, hibiscus, and pandanus trees and other ornamental plants have been set out.

In addition to the usual sea and migratory species of birds there is a native land warbler, related to species on other south Pacific islands and on Laysan Island. Introduced cats, which have gone wild, have helped to exterminate the rats. There are fishes in some of the lakes and marine life is abundant in the lagoon and around the reef.

Winds generally blow from the eastward: northeast from November to May and southeast from June to October. There is a strong westerly current past the island. Anchorage is good off the west side, and landing excellent near the two entrances into the lagoon. Rainfall is variable, but usually averages between 25 and 35 inches a year.

Kenneth P. Emory, Bishop Museum anthropologist, described a dozen archaeological sites which he saw in 1924, or which were described to him by Father Emmanuel Rougier and Monsieur Coulon. But in summary he states that Christmas Island has not yet yielded definite evidence of settlement by Polynesians. The few traces of native stone work and the artifacts found belong to different periods and come from different directions, suggesting chance Polynesian visitors or castaways.

The island was discovered by Captain James Cook, in the ships Resolution and Discovery, December 24, 1777. They stayed until the following 2nd of January, in order to refresh the men; obtain coconuts, fish and turtles; and observe an eclipse of the sun. Cook said: "As we kept our Christmas here, I called this discovery Christmas Island."

So much publicity resulted from Cook's account, that many whale ships and other vessels visited the island in search of safe anchorage, provisions, and shore leave for wearied crews. F. D. Bennett gives an interesting account of the visit of the Tuscan in 1834.

On October 10, 1836, the English ship Briton, Captain George Benson, was wrecked on the northeast side of the Bay of Wrecks. The Captain and 29 men were rescued by the American whale ship Charles Frederic, Captain Brown, May 23, 1837. An interesting account of the experiences on the island is given in the Hawaiian Spectator, vol. 1, pages 64-68, 1838, together with a chart of the island.

Captain J. Scott, in H.M.S. Samarang, made observations in 1842 (or 1840). The Bremen whale ship Mozart was wrecked in December, 1847, rescue being made by the American whaler J. E. Donnell. The following month the Chilean ship Maria Helena went ashore. The passengers included U. S. Commissioner Anthony Ten Eyck and family and other prominent persons. They were rescued by the French corvette Sarcelle, in April, 1848, after word was taken to Honolulu by some of the crew in the ship's long boat.

In November, 1856, the lumber vessel, J. C. Fremont, was cast ashore in the Bay of Wrecks. The wreck was sold to J. I. Dowsett, of Honolulu, and about 160,000 feet of lumber were salvaged on the ship John Dunlap, schooner Warwick, and brig Hiro, July-October, 1857.

The island was examined for guano prior to 1857 by Capt. John Stetson, of New Haven, Conn. It was taken possession of by Capt. J. L. Pendleton of the ship John Marshall, in behalf of A. G. Benson and associates, under deed from Stetson dated May 11, 1857. The U. S. Guano Co. acquired the rights in November, 1858, and worked the island for guano for several years.

In 1865 a lease to Christmas Island was given by the British to the Anglo-Australian Guano Co. The island was visited in 1866 by the company's vessel, Marie Louise, Captain Pie, out of Hobart, Tasmania. But the enterprise was found unproductive, and the lease was cancelled in 1869 at the company's request.

License was also granted Alfred Houlder, June 9, 1871. But when the lessee's representative, Dr. Weston, arrived to inspect the island, July 5, 1872, he found three men on the island employed by C. A. Williams of Honolulu. What was more, the U.S.S. Narragansett had just been there and had taken formal possession for the United States. Cmdr. Meade's report of this said, "I recognized this occupancy, subject to the

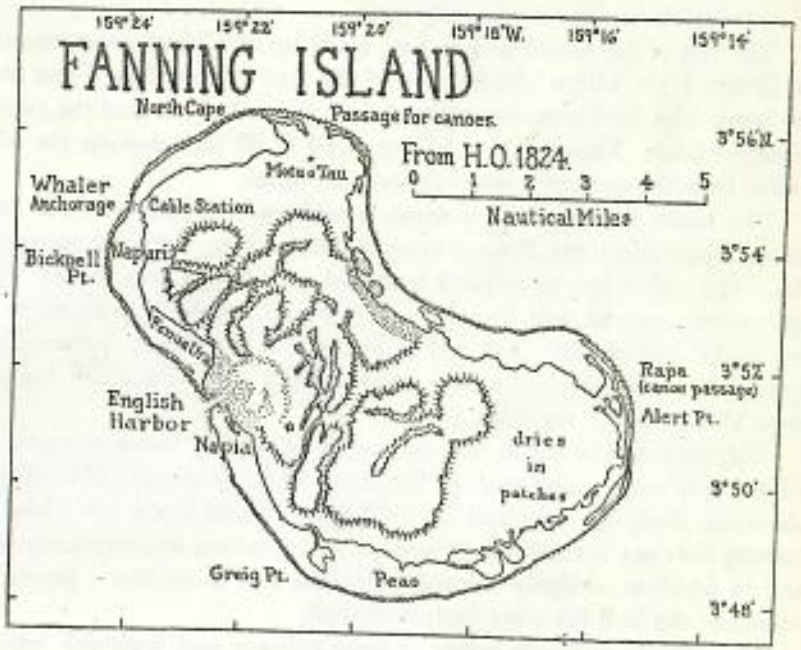
approval of the U.S. Government, and so informed the U.S. Minister resident at the Hawaiian Islands." Mr. Houlder requested that his lease be cancelled, which was done.

Captain Wm. Wiseman, of H.M.S. Caroline, annexed the island to Great Britain March 17, 1888, despite American protest. The British leased the island to Lever's Pacific Plantations Limited, June, 1902, for 99 years. They planted 72,863 coconut palms on 1,457 acres and introduced "silver lip" pearl shells into the lagoon. The S. S. Aeon was wrecked on the east point in 1908. Japanese poachers occupied the abandoned island about 1911, killing thousands of birds.

Father Emmanuel Rougier took over the lease from Lever Brothers, Dec. 17, 1913. The Central Pacific Coconut Plantations, Ltd. acquired the island from him October 27, 1914. They pay 200 pounds a year tax and lease, and still use the island. Franta Jerabak, Czechoslovakian, has been manager, since the death of Father Rougier, with 14 Tahitian workmen and 6 women, in 1937. He harvested about 400 tons of copra a year from approximately 750,000 coconut palms. Besides London and Paris, the two principal settlements, the workmen have several small camps scattered among the coconut groves, to which they move during harvesting.

November 28, 1919, Great Britain reasserted her sovereignty over the island. In February, 1937, a British radio operator was established there, to send daily weather signals, and, incidentally, keep and eye on the island.

CHAPTER 42
Fanning Island



Fanning Island lies 228 nautical miles north of the equator. It is about 153 miles northwest of Christmas, 260 miles a little east of north from Jarvis, 75 miles southeast of Washington Island, and 200 miles southeast of Palmyra.

The island is a roughly oval coral atoll, 9.5 nautical miles northwest and southeast, by 6 miles wide. One writer describes it as shaped like a footprint, adding that the people of Manihiki called it Tapuaerangi, "heavenly footprint." The land area is variously given as 13, 15, 17, and 26 square miles, and 8,500 acres. The first and last agree roughly, and seem about correct. The enclosed lagoon has an area of 42.6 square miles. The deepest water in the lagoon is about 50 feet, only three-quarters of a square mile exceeds 30 feet in depth, and most of it is very shallow.

There are three narrow breaks in the 31 miles of land rim. At two of these the reef admits passage only for a canoe in good weather. The third entrance, at English Harbor, has a width of 300 yards, with depths of 25 to 30 feet in the middle. There is a 5 knot current through this passage at ebb and flow. Vessels may anchor immediately inside the entrance. For small vessels, drawing 10 feet or less, there is a spacious anchorage beyond a sand bar. There is a concrete jetty at which vessels drawing less than 18 feet may load. Vessels also may anchor at Whaler Anchorage, on the northwest side. Here is located the pier of the cable station, at or near which landing is generally good.

The rim of the island is very low, made up of a beach crest, about 10 or 12 feet high, within which much of the land is only 2 to 3 feet above sea level. The land is thickly covered with coconut palms and the remains of native bush. These reach a height of 60 to 90 feet, making the island visible from the deck of a vessel at about 15 miles.

The beach is backed by a dense growth of *Scaevola* and tree heliotrope. Here and there *Pisonia* trees stand out above the coconut palms. Pandanus and a few introduced fruit and ornamental trees occur. Open spaces are carpeted with bunchgrass, purslane, morning-glory vines and low herbs and shrubs. The soil is fertile and breadfruit, bananas, figs, pineapples, taro, and arrowroot grow readily. Soil has been imported from Honolulu for vegetable gardens.

Surrounding the island is a narrow fringing reef, nowhere more than 1,500 yards wide, along most of the shore much narrower. Marine life is abundant along the reef and in the lagoon. Land crabs are numerous, making burrows in the sand. There are the usual sea and migratory birds, and in addition a highly colored parrakeet and a warbler. Several accounts of the bird life have been published.

The climate although warm is very uniform and healthful, with the mean temperature 83.5 (73 to 92) degrees F., modified by nearly continual trade winds. These blow from the southeast 45 percent, from the east 30 percent, and from the northeast 13 percent of the time. The annual rainfall is variable, but usually is between 80 and 100 inches, with as much as 125 inches, and occasional drier years. The late fall usually is the driest time of the year. The barometer stays close to 30 inches of mercury. The weather is worst in March and April, but severe storms are rare.

Kenneth P. Emory, Bishop Museum anthropologist, describes (1934 and 1939) stone ruins, adzes, a fishhook and other ethnological specimens found on Fanning. He concludes that the island was populated by people from Tonga about the 15th century.

Fanning was discovered by Captain Edmund Fanning, in the American ship Betsy, at 3 a. m., June 11, 1798. Fanning's narrative of near shipwreck and his description of the island make good reading.

Several whalers visited Fanning. One commanded by Capt. Mather, called it American Island in 1814. An account of the island is given by Captain Legoarant de Tromelin, of the French corvette La Bayonnaise, which visited the island in 1828. At least four vessels arrived at Honolulu from Fanning between 1843 and 1853.

A short time prior to 1855, Captain Henry English, with 150 natives from Manihiki (Humphries) Island, settled on Fanning and commenced the production of coconut oil. He placed the island under British protection when Captain W. H. Morshead visited it in H.M.S. Dido, October 16, 1855. Shipping records in The Friend, The Polynesian, and The Gazette (all published in Honolulu) give some idea of the amount of coconut oil produced. In 1859 two vessels arrived at Honolulu with 15,000 gallons; in 1860, one vessel with 10,000 gallons; 1861, three vessels with 30,000 gallons; 1862, four vessels with 44,000 gallons; and 1863, four vessels with 10,800 gallons.

About 1857, a whaling ship brought to Fanning an Ayrshire Scotsman, William Greig. A short time later he was joined by an American, George Bicknell. Both married native islanders. Greig's wife was Teanau Atu (1842-1917), sister of the king of Manihiki. Both men died on Fanning, Greig on July 27, 1892. The three sons of Greig remained on Fanning; but the descendants of Bicknell gradually moved away. His heir sold his share of Fanning and Washington Islands to a man in Suva, from whom it was acquired by Father Emmanual Rougier.

A firm, Fanning Island, Limited, was formed which operated Fanning and Washington Islands until 1935. Due to low price of copra, in that year it was sold to a subsidiary of Burns, Philp and Co., Ltd., operating under the name of Fanning Island Plantations, Ltd.

According to shipping records in Honolulu, there was a guano digging boom on Fanning between 1877 and 1879, for ships of many flags sailed there to load guano. Some vessels were wrecked, such as the British bark Crosby, 1879. In 1885 guano still was being shipped. But in 1887 lumber was taken there to make copra drying and storage sheds, and from then on copra was the chief industry on the island.

Fanning was formally annexed to Great Britain by Captain William Wiseman, of H.M.S. Caroline, March 15, 1888.

A cable relay station was established in 1902. This breaks the stretch from Bamfield, Vancouver Island, to Suva; 3,300 miles, Bamfield to Fanning; 2,200 miles, Fanning to Suva. Up to 1931, Union S.S. Co. freighters stopped with supplies. Since then the island has been supplied from Honolulu, the S. S. Dickenson making quarterly trips.

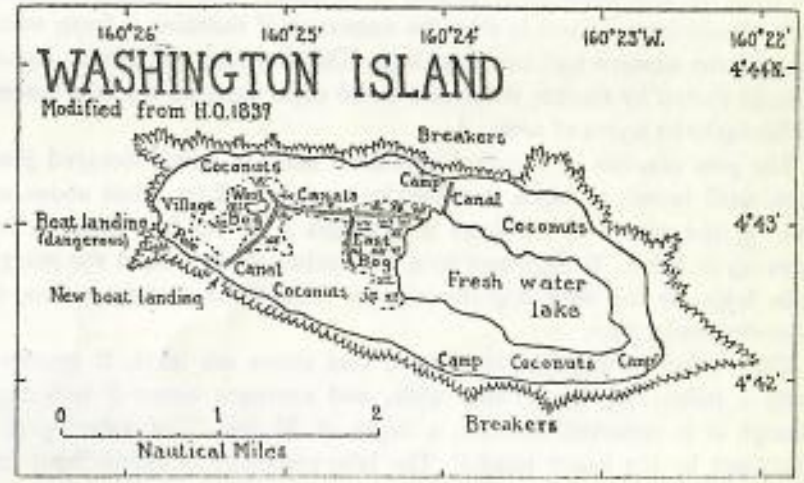
Many comforts are provided, such as radio, refrigeration, electric lights (from Diesel generators), a doctor, tennis court, library, even a branch of the New Zealand Savings Bank, to make pleasant the two year tours of duty of the cable station personnel and their wives, numbering about 20 white people. Storage tanks hold about 8,000 gallons of rain water, and well water also is reported to be both good and plentiful.

In September, 1914, the German cruiser Nurnburg slipped up to Fanning, flying the French flag. They landed and wrecked the cable station, cut the cable, and destroyed a cache of spare instruments. With the assistance of Hugh Greig, who dived for the severed ends of the cable, communication was reestablished within two weeks. In 1939, it was reported that the island was being fortified against a repetition of this; but the report was denied, it being stated that an undefended island of purely commercial importance was safer.

At English Harbor, headquarters of the copra plantation, there are 3 or 4 more white people and between 100 and 150 Gilbert Island workmen. It was reported in 1939 that 300 new Gilbertese recruits were being taken to Fanning.

The island is administered from Ocean Island, 1880 miles away, but there is a resident agent immediately in charge. New Zealand stamps have been used for postage.

CHAPTER 43
Washington Island



Washington Island lies 282 nautical miles north of the equator. It is about 75 miles northwest of Fanning, 238 miles northwest of Christmas, and 120 miles southeast of Palmyra. It also has been called New York and Prospect.

It is a distinctive sand and coral island, about 3.4 miles long by 1.3 miles, greatest width. The circumference is about 9 miles and the area less than 4 square miles. Most of the beach rim reaches elevations of 9 or 10 feet, with a few places, especially toward the west end, where the crest may be 15 feet high. The land is densely covered with coconut palms and forest trees (75 to 90 feet) making the island visible from the deck of a ship at 15 miles.

Most of the beach is of fine sand. The fringing reef is not over 200 yards wide, except at a few places: 1,000 yards at the east point, 800 yards at the northwest point, and 600 yards wide at the southwest point. The island seems to be building westward, for at the west end is an area of about 2 square miles with depths between 5 and 20 fathoms. It is 14 fathoms deep 2.5 miles off the west point.

Although vessels may anchor on this bank, the anchorage is very uncomfortable because of lack of protection. Landing is possible only at the west end. Here it is uncertain, often dangerous, and in rough weather impossible. A new landing, developed on the south side, half a mile from the southwest point, is said to be better. The distinctive feature about Washington Island is that the eastern half contains a fresh water lake, and the western half two peat bogs. These occupy the former lagoon basin, as shown by marine shells and white coral sand on the lake bottom and beneath the layers of peat.

The peat consists of a dense, interlaced mass of partly decayed plant fibers, dark brown or black in color. Its surface is 2 or 3 feet above sea level. At the center of the bogs it averages 3 to 3.5 feet thick, a few places up to 5 feet. It decreases to a few inches thick around the margin of the bogs. In the west bog there is an "island" of coconut palms, its soil underlain by peat.

The surface of the lake is about 3 feet above sea level. It measures nearly 2 miles long by .7 mile wide, and averages about 5 feet deep, although it is reported to reach a depth of 30 feet. The water level is maintained by the heavy rainfall. The lake gradually is encroaching into the east bog.

Dr. C. K. Wentworth (1931) suggested that Washington Island was first built as an atoll at a time when the sea stood at a higher level. As the sea level fell, the lagoon became a closed basin, the salt water seeped or evaporated away; and heavy rainfall produced the fresh water lake. Plants filled the western portion with peat. The lake now is being enlarged.

Partly to drain the bogs, but principally for the sake of transportation, canals have been dug across both bogs, along a narrow strip of bog connecting them, from the west bog to the south shore, and from the lake to the north shore. It is said that part, at least, of the canals was dug by the wives of Gilbert Islands workmen. The level of the water in both canals and lake is controlled by means of dam gates. Along the canals, power and row boats ply to transport workmen and collect coconuts.

Dr. Christophersen (1927) lists 35 species of plants, but many of these are weeds. The vegetation forms several associations. Along the beach crest are mainly tree heliotrope and *Lepturus* bunchgrass, with some *Scaevola* thickets. Within this is a dense stand of coconut palms, over 2,100 acres, only 200 acres of which have been planted. Among the

coconut palms are trees, *Pisonia*, pandanus, and tree heliotrope; and beneath all is a dense undergrowth of birds-nest, polypody, and other ferns.

Each bog measures 200 to 250 acres, and is bare of coconuts and trees. Around the margin of the bog are pandanus trees and large taro-like aroids (*Cyrtosperma*), up to 5 feet high, inferior to taro but edible. In the bogs are bulrushes (*Scirpus*), 5 to 7 feet tall, in solid clumps. In 1924, the water table was 8 or 10 inches down, the bogs being firm enough to walk on.

Judging by the vegetation, the rainfall is heavier on Washington than on Fanning. Otherwise the climate is much the same, high temperature being tempered by trade winds.

The Alexandrine rat, lizards, land and coconut crabs, and land and sea birds like those on Fanning are the principal animals. The reef abounds with marine life.

Kenneth P. Emory, Bishop Museum anthropologist, states (1934) that no artifacts of local origin have been found on Washington Island, although ancient stone-walled enclosures have been found. The people of Manihiki called the island Arapata, and Tuamotu natives called it Teraina. About 1906, James Greig found a canoe hull in a peat bog, resting on the old sand bottom and covered by 50 inches of peat. It was of *Calophyllum* wood, a tree not found on Washington, and only recently brought to Fanning. It may be ancient and of Tongan origin. It is preserved in Bishop Museum.

Washington Island was discovered by Captain Edmund Fanning, in the American ship Betsy, June 12, 1798. He remarked on its beautiful green and flourishing appearance, and named it for President George Washington. He did not land.

Edward Lucett, merchant from Tahiti, passed the island June 19, 1848. He says: "It is about 3 miles long and rather more than a mile in width; elevated from 12 to 15 feet above the level of the sea; its surface presents an unbroken mass of vegetation."

Under the name of Prospect, the island was claimed by American guano interests, under the Guano Act of 1856. Apparently no use was made of it.

Its history is like that of Fanning. It was occupied by Captain John English and Manihiki natives about 1860; then by William Greig and George Bicknell, about 1870. When visited by the U.S.S. Portsmouth in 1874, Bicknell was employing 50 Tahitians as laborers. James Bick-

neil of Honolulu stated that when he visited the island in 1882 his uncle was using men from Manihiki to gather coconuts, and in 1894, Gilbert islanders.

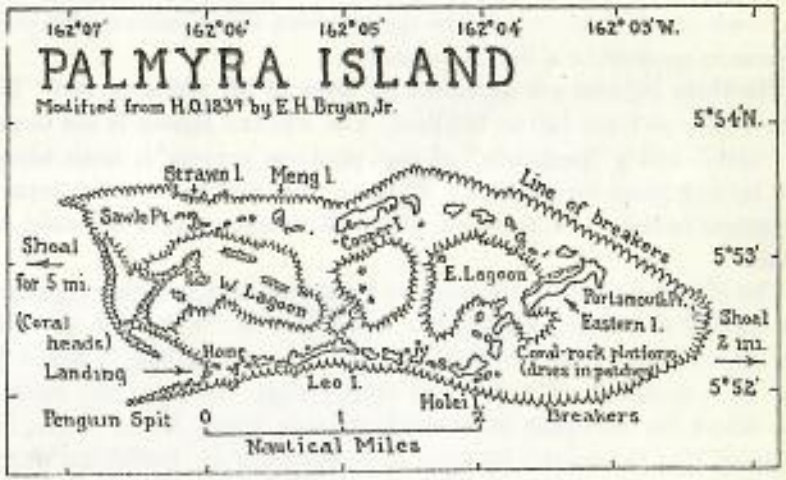
Washington Island was annexed to Great Britain by Commander Nichols, in H.M.S. Cormorant, May 29, 1889. For some years it was in charge of Capt. Benhard Anderson and his wife Marian, daughter of William Greig. After Capt. Anderson's death, 1906, the sons of William Greig occupied the island. They employed about 200 Gilbert Island natives.

The island became part of the assets of Fanning Island, Ltd. In 1935 these were transferred to a subsidiary of Burns, Philp and Co., called Fanning Island Plantations, Ltd. It had been practically abandoned in 1924. In 1935, under the new company, the making of copra was renewed. In 1937 there were 3 Europeans and 80 Gilbert Island workmen on the island. The natives work under a three year contract. One clause provides that they do not have to work in the rain; and how it can rain on Washington Island.

The village consists of several houses near the southwest point. Here have been planted such fruit and ornamental trees as breadfruit, papayas, bananas, guavas, sweet sop, plumeria, and hibiscus. A light is shown on a 70 foot tower, on the southwest point, when a ship is expected. Near there are two black radio masts and a conspicuous red-roofed shed. Supplies are brought about twice a year. The administration is from Ocean Island, through the resident agent on Fanning.

Good descriptions of both Fanning and Washington are given by Prof. Wm. B. Herms (1926), who visited the islands in 1924 to advise on the control of a weevil damaging the coconut palms. B. P. Bishop Museum also had an expedition to these islands in 1924.

CHAPTER 44
Palmyra Island



Palmyra Island lies 352 nautical miles north of the equator. It is about 120 miles northwestward of Washington Island, 200 miles northwest of Fanning Island, 33 miles southeastward of Kingman Reef, and 960 miles south by west of Honolulu.

The atoll consists of about 50 small islets, having a total area of about 250 acres, in a horse shoe surrounding three lagoons. The islets stand but 5 or 6 feet above sea level, but dense vegetation rises to a height of 75 to 90 feet, making the island visible from the deck of a ship at about 15 miles, when it is clear.

Surrounding the islets and the lagoons is a platform of coral and hard sand. Upon this one can walk from one islet to another, even at high water. At low water parts of the platform are dry. This platform measures 4¾ miles east and west by 1½ miles wide.

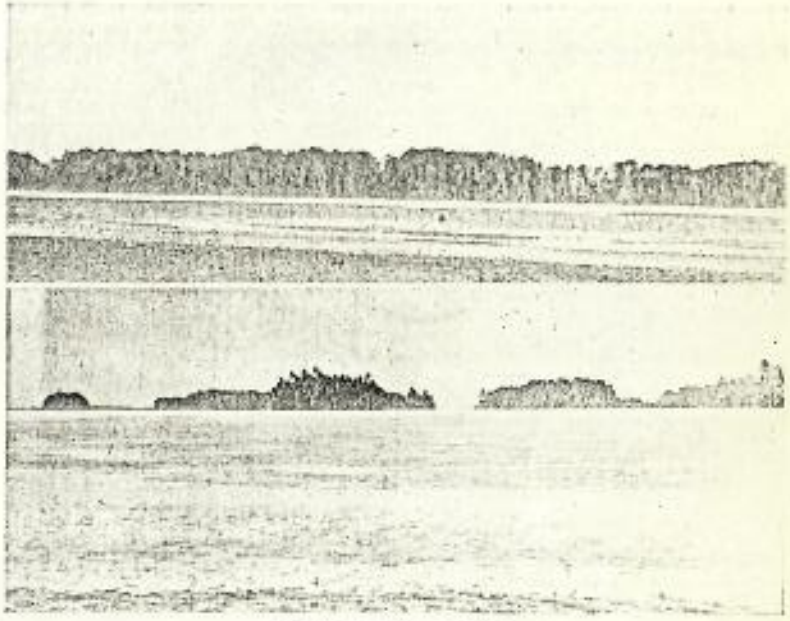
From its eastern end a shoal extends eastward for two miles. From its western end it is shoal for about five miles, the inner mile of which is thickly dotted with coral heads. On this western shoal ships may anchor

for a year, to investigate copra possibilities. They reported a fine climate and plenty of coconuts, but the venture showed that the distance from market and cost of transportation were against the project.

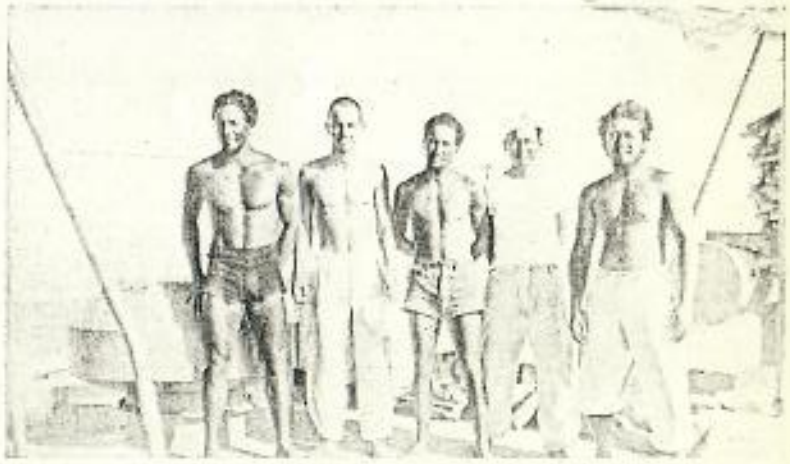
On August 19, 1922, Leslie and Ellen Fullard-Leo, of Honolulu, acquired title from Judge Cooper to all except two isles. After the death of Judge Cooper, May 14, 1929, title to these two, known as Home Islets, passed to his heirs.

The United States Navy has been constructing a base on Palmyra. Preliminary surveys were made during 1938, and the first party to begin construction sailed from Honolulu November 14, 1939. The question of ownership has been under dispute in the U. S. District Court.

The atoll has been declared a U. S. Naval defense area, and all foreign public and private vessels and planes are prohibited. It is to be hoped that the construction of a naval air base will not destroy the natural beauty and scientific value of this, one of the most interesting atolls under the American flag.



Islets at Palmyra, 1938.

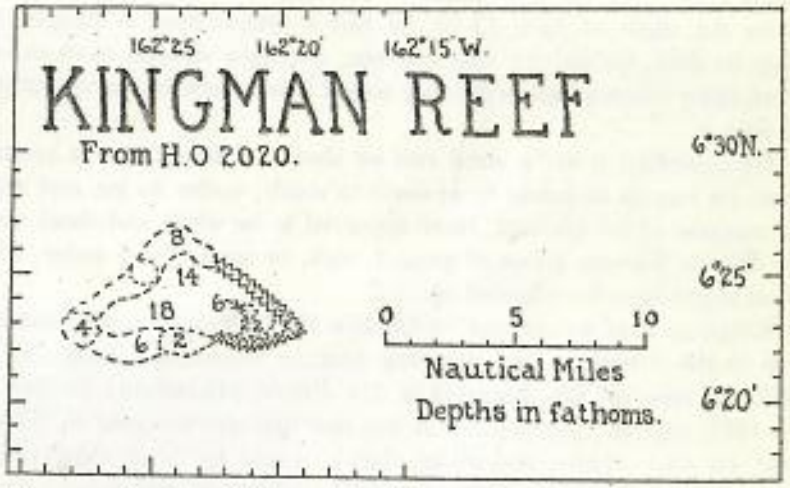


A typical group of American colonists returning home.

All photographs on this and the preceding plates by the author, reproduced by courtesy of B. P. Bishop Museum.

CHAPTER 45

Kingman Reef



Kingman Reef lies 382 nautical miles north of the equator. It is about 33 miles northwestward of Palmyra Island and 925 miles south by west of Honolulu.

It is a triangular, atoll-like reef and shoal about 9½ miles east and west by 5 miles north and south, of which all but the eastern end is now submerged. This leaves exposed a V-shaped bit of reef, with shoals to the westward. Within the line of reef and shoals is a triangular lagoon, about 7 by 4 miles, with depths up to 270 feet.

Much of the reef is awash at low tide, and there are places, especially toward the eastern end, where it dries. The highest elevation is a low pile of bare brown coral, northwest of the eastern point, which varies in size and height, as storms pile up or wash away material. At the western end of the shoal is a patch with less than 25 feet of water over it, on which waves break occasionally. Outside this submerged atoll the slopes drop steeply to 2,000 feet or more.

The area supports a rich marine fauna, including large numbers of fishes. There is no land flora. Some coconut palms, planted in 1924, were still alive in 1926, but it is not known if they have survived.

As described under Palmyra, the first recorded discovery of Kingman Reef was made by Captain Edmund Fanning, in the American ship Betsy, June 14, 1798. In his entertaining "Voyages and Travels," Fanning relates how, after his discoveries of Fanning and Washington Islands, during the night of June 13-14, he had a premonition of danger, and going on deck, he had the ship heaveto. Daylight showed them close to a reef, upon which undoubtedly they would have struck had he not stopped the ship.

He described it as "a coral reef or shoal, in the form of a crescent, about six leagues in extent from north to south; under its lee, and within the compass of the crescent, there appeared to be white and shoal water. We did not discover a foot of ground, rock, or sand, above water, where a boat might have been hauled up . . ."

Kingman Reef was named for Captain W. E. Kingman, who discovered it in the American ship Shooting Star, of Boston, on November 29, 1853. He reported this discovery in The Friend (Honolulu) for September, 1855, page 69. He said that it was near the spot assigned to "Danger rock" on some charts, and added that it would be "very dangerous to approach in the night, particularly with a light wind and smooth sea, as such there would be no breakers visible until a ship was so near as to be in considerable danger."

Under the name of "Danger" it was among the islands listed as claimed by Americans under the Guano Act of 1856.

It was visited in 1859 by the ship Alice Thorndike, and in some accounts is called by that name.

A report regarding the reef is given in The Friend for October 1872, by Commander Nathaniel Green of the U.S.S. Resaca, which visited it August 31, 1872. He says, "It is certainly a dangerous reef, the discolored water being observed to extend eight or nine miles, the sea combing over the ridge of the reef for a space of about three miles in an E.N.E. and W.S.W. direction. Several patches of white sand and coral were observed from the top, even with the water's edge."

June 22, 1874, the British steamship Tarta, Captain J. S. Ferries, on the Australian-American run, struck the reef. After two days she got off, and arrived at Honolulu June 28, 1874.

On April 16, 1888, the British iron bark Henry James, Captain Ralph Lattimore, was wrecked on this reef. The eleven passengers and crew, thirty in all, were safely transported in small boats to Palmyra Island. From here the first mate, Donald McDonald, the boatswain, and three

seamen made their way to Apia, Samoa, 1300 miles in 19 days, arriving in an exhausted condition. Here they chartered the schooner Vindex to make the rescue. Learning of the wreck, Captain H. M. Hayward took the S.S. Mariposa out of her course and rescued passengers and crew on May 29. The Vindex arrived thirteen days later. Despite their experiences, all enjoyed good health. Full accounts of wreck and rescue are given in the Pacific Commercial Advertiser for June 2, and the Gazette for June 5, 1888.

January 16, 1893, the Hawaiian bark Lady Lampson struck the reef.

A careful survey of this region in 1897 by the British naval vessel Penguin showed that it must be the same as Caldew Reef, and Maria or Crane Shoal, reported in 1863 by Captain Crane of the schooner Maria. These names appeared on charts of this region, but have been removed.

The American flag was hoisted over Kingman Reef, May 10, 1922, by the late Lorrin A. Thurston, at the request of Leslie and Ellen Fullard-Leo. He took formal possession by reading a proclamation of annexation, and leaving a record of the proceedings, a certificate of possession the flag, and copies of the Honolulu Advertiser and Star-Bulletin of May 3, 1922, in a glass jar, deposited at the base of a cairn of coral slabs about four feet high. The party consisted of Captain Herman Charles Lemmel, John L. Padgett, L. A. Thurston, D. D. Thaanum, Ted Dranga, Manuel Vasconcellos, and a crew of six. At the time of annexation, the land was described as "a pancake of dead coral" about 90 feet wide, 120 feet long, and 5 or 6 feet high at low water.

The proclamation, which now is preserved in the Archives of Hawaii reads: "Be it known to all people: That on the tenth of May, A.D. 1922, the undersigned agent of the Island of Palmyra Copra Co., Ltd., landed from the motorship Palmyra doth, on this tenth day of May, A.D. 1922, take formal possession of this island, called Kingman Reef, situated in Longitude 162° 18′ West and in 6° 23′ North, on behalf of the United States of America and claim the same for said company."

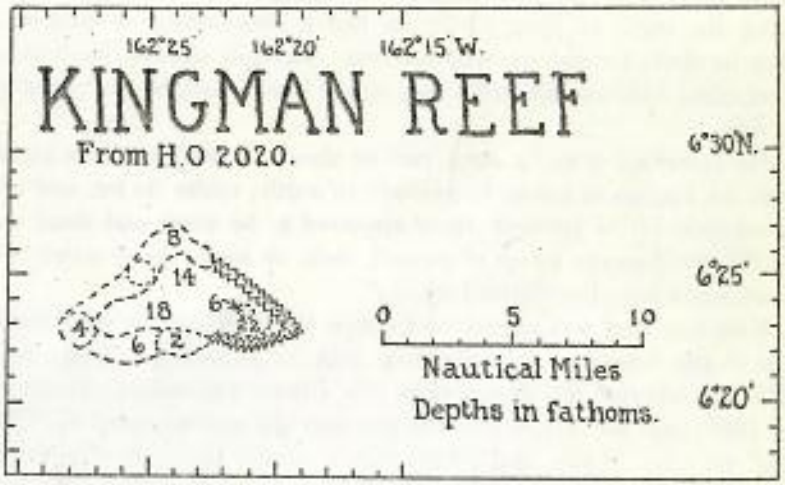
In June, 1926, the U. S. Navy sent the U.S.S. Whippoorwill to visit Kingman Reef, with L. A. Thurston, and W. G. Anderson, who visited the reef in 1924. They arrived June 25, and spent ten days in making surveys.

December 29, 1934, Executive Order of President Franklin D. Roosevelt placed Kingman Reef under the control and jurisdiction of the U.S. Navy, in immediate charge of the 14th Naval District.

In September, 1935, William T. Miller, representing the U.S. Bureau

CHAPTER 45

Kingman Reef



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of Air Commerce, visited the reef on the U.S.C.G. cutter Itasca. He is reported as saying that Kingman Reef had an important place in the Pacific aviation picture.

Early in 1937, the schooner Trade Wind, chartered by Pan-American Airways, took up a position at Kingman Reef. During March and April it served as a base for the trial flight of the Sikorsky Clipper, piloted by Captain Edwin C. Musick, between Honolulu and Pago Pago. The clipper touched on the way south, March 24, and on the return, April 8, 11 hours 46 minutes from Pago Pago.

The Trade Wind also was stationed at Kingman Reef for the trial flights of the ill-fated Samoan Clipper, also under command of Captain Musick. It reached the reef December 23, 1937, on the way south, and January 3, 1938, on the return. On its next flight, the clipper reached Kingman Reef on January 9. It was lost near Tutuila when it took off for Auckland from Pago Pago on the 11th.

Naval vessels occasionally pass the reef. The writer saw it, August 13, 1938, en route from Palmyra to Honolulu, on the U.S.C.G. cutter Taney.

Kingman Reef has been made a U. S. national defense area by Executive Order of President Franklin D. Roosevelt, dated February 14, 1941, and foreign planes and surface craft are prohibited.

CHAPTER 46
The Hawaiian Chain

We see only the peaks of the mighty range of volcanic mountains which form the Hawaiian islands. They stretch from E.S.E. to W.N.W. for a distance of 1660 nautical (1900 statute) miles or more, from the southeast side of Hawaii to beyond Midway and Kure. Each time a survey ship makes soundings along this strip it adds new mountains to the chain.

We may divide the islands of the Hawaiian archipelago into three groups: (1) the eight main islands at the southeastern end; (2) the small rocky islets in the middle; and (3) the low sand and coral islands of the northwestern end.

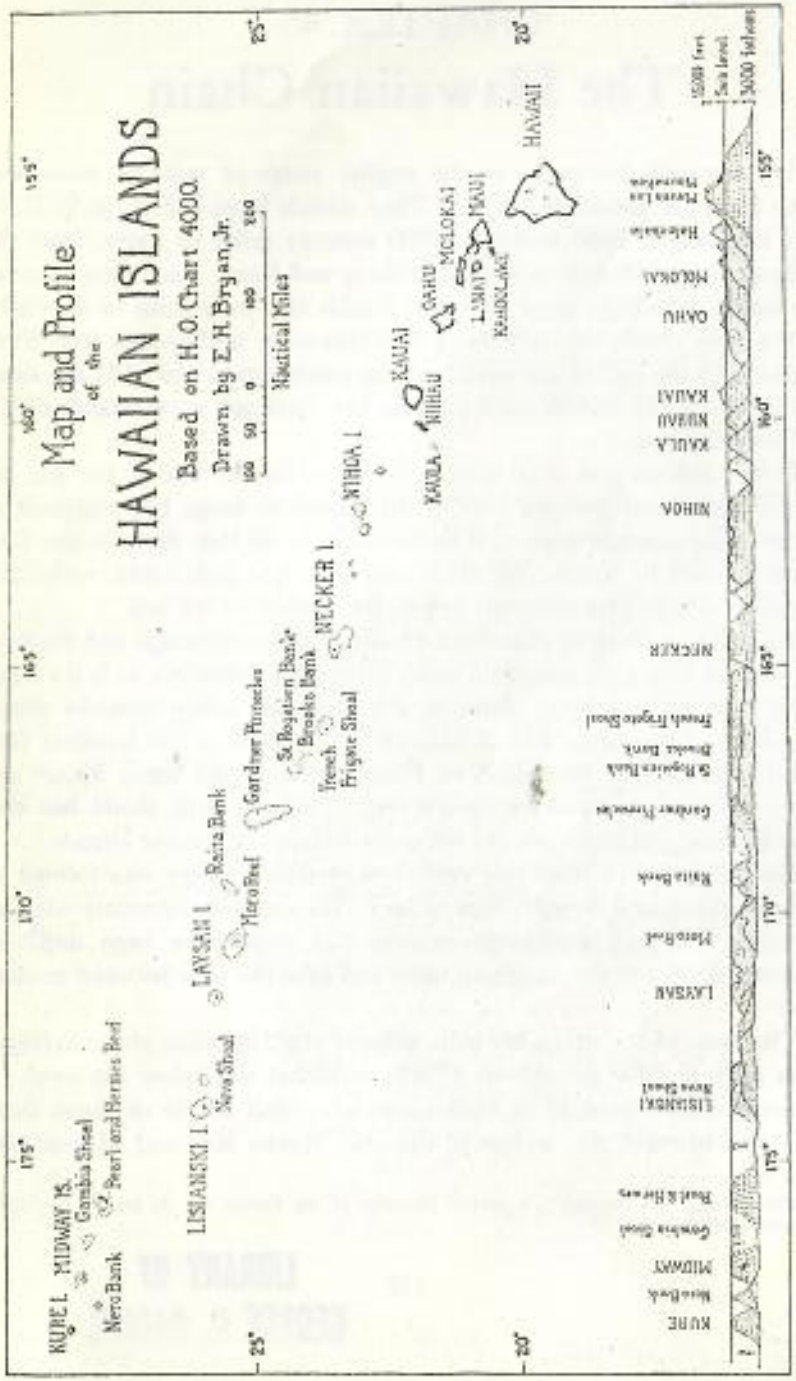
If we look only at what protrudes above the surface of the sea, we get the impression that the bulk of the mountain range lies southeast of Niihau. The average person, if he is aware at all that there is any land northwestward of Kauai, regards it only as a few little rocks, reefs, and sandpiles. He forgets what lies below the surface of the sea.

It is quite a shock to examine a profile of the archipelago and discover that beyond Nihoa the mountain chain is fully as continuous as is the ridge to the southeast of there. Some of the platforms which underlie shoals and banks in the "little end of Hawaii," if elevated a few hundred feet, would rival in area the island of Hawaii, and would make Kauai and Oahu appear very small by comparison. There is little doubt but that some of these platforms are cut off cross-sections of former islands.

Geologists believe that this enormous mountain range was formed by the outpouring of flow upon flow of lava. We can not appreciate what an extensive and long drawn-out process this must have been until we measure the size of the mountain mass and note the time between modern flows.

The floor of the ocean on both sides of the Hawaiian chain averages about 2600 to 2700 fathoms or 15,600 to 16,200 feet below sea level. A mountain would have to be built up to a vertical height of about three miles just to reach the surface of the sea. Mauna Kea and Mauna Loa,

(*Modified from "We see only the peaks," Paradise of the Pacific vol. 51 no. 12, pp. 13-16, December, 1939)



Reproduced through courtesy of Paradise of Pacific

on the island of Hawaii, reach elevations of 13,784 and 13,680 feet respectively. From their summits to the floor of the ocean is a vertical height of more than five and a half miles, exceeding the height of Mt. Everest by several hundred feet.

The moulten magma which was poured out to form the lava flows is believed to have come from a great rift in the ocean floor. A suggestion as to how the mountains were formed is given in chapter 3. We do not know how frequent were the eruptions from the numerous vents along this rift. But today, on the flanks of Mauna Loa, flows take place at intervals of several years. One particularly active rift area toward South Cape had flows in 1868, 1887, 1907, 1916, 1919, and 1926, although these did not overlay each other to any extent. The flows are only a few feet thick. If flows in the past were no more numerous, it would have taken many millions of years to build up the Hawaiian mountain range. But, perhaps, the flows were much thicker and more frequent in former years, beneath the sea. But in any event the foundations of the group are very old.

In discussing the geology of the small volcanic islands (group 2 of the classification given above), Professor Harold S. Palmer, of the University of Hawaii, suggests that each is the remains of a formerly much larger island. Regarding French Frigate Shoal, for example he says: (**)

"French Frigate Shoal, with its reef, sand islets, and La Perouse Rock, represents a stage in the normal life cycle of a volcanic island in a warm region. The reef and the soundings outline a subcircular area about 18 miles in diameter, which represents the sea level extent of a former conical volcanic island. Probably the original volcano was somewhat smaller that the area indicated, for the shoal may have been widened two or three miles by a terrace built of debris eroded from the volcano. Long-continued erosion by streams and waves beveled off the cone, except for the residual La Perouse Rock, which, eventually, will also be removed."

Another indication of the former greater height and extent of these northwest islands is the finding of native remnants of a formerly more extensive indigenous flora and fauna. Most of the plants of these islands are species widespread in the Pacific. These might be old residents or recent arrivals. But here and there are species characteristic of the Hawaiian archipelago, or, perhaps, found on only one or two islands.

(** H. S. Palmer, Bishop Museum Bul. 35, 1937. Complete references will be found in the Bibliography, pages 215-236.)

Thus we find on Nihoa a few small groves of *loulu* (*Pritchardia*) palms, a genus with several endemic species on the main islands; an endemic species of *Schiedea*, an herb of the Pink family; an endemic species of purslane; two native varieties of *Solanum*, shrubs of the Nightshade family, with related species on other islands of the group. The commonest plant on the island is the native Hawaiian goosefoot, *Chenopodium sandwicheum*, also found on Laysan, Midway, and Pearl and Hermes Reef, as well as on some of the main islands of the group.

On Necker and Nihoa the writer in 1923 collected specimens of large weevils of the genus *Rhyncogonus*, one species endemic on each island. Their relatives on the main Hawaiian islands are associated with native forest trees. On Nihoa and Necker they were reduced in habitat to low herbs and the base of bunch grass. The weevils of this genus found in the Hawaiian islands are thought to have had a common origin. Species are very local, and they seldom travel far. The Necker and Nihoa species are closely related, and their nearest relatives are found in the mountains of Kauai and Oahu. Another species formerly was found on Laysan.

But the most interesting biological development is found among the native birds of Laysan. Before the activities of man brought about its downfall, the flora of this island included *loulu* palms, a native variety of sandalwood, and other native plants, characteristic of the Hawaiian group. Among the native plants of this island there developed five species of land birds found nowhere else in the world, but related to native birds of the main islands of the group. These included the flightless rail (cousin of the extinct *moho* of Hawaii), the Laysan teal (close relative of the native Hawaiian duck), the Laysan honey eater (of the same genus as the *apapane*), and the Laysan finch (also a member of the Drepanididae, a family of birds confined to the Hawaiian islands). One of the mysteries of Hawaiian biology is how these five species could have evolved on such a tiny, isolated islet, and how they could have survived so long on two square miles of barrenness.

CHAPTER 47

Kaula Island*

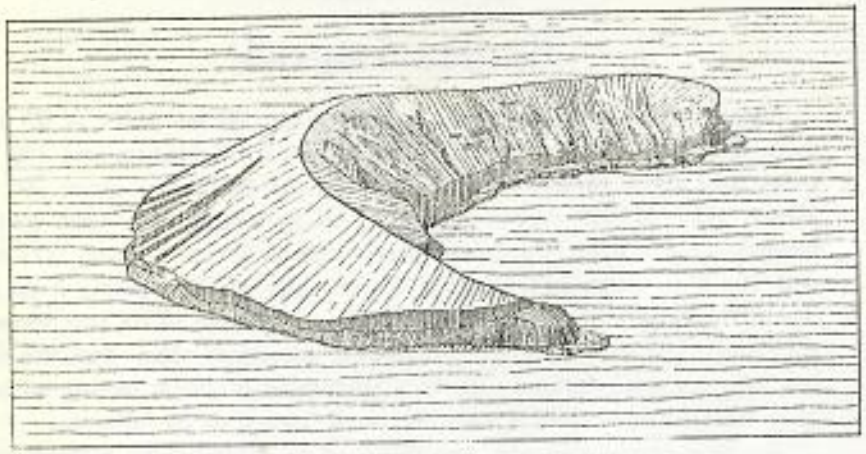
Kaula is a small, isolated islet, lying about 20 sea miles or 23 land miles to the west-southwest of the southern end of Niihau, and 150 sea miles west and a little north of Honolulu. Its position is about 20° 39′ North, 160° 31′ 30″ West. Estimates of its height have been getting progressively smaller, until now they range between 500 and 600 feet, with the U.S. Coast and Geodetic Survey map of 1934 giving it as 550 feet. The elevation of the light is 562 feet. Estimates of its area likewise vary from 108 to 136 acres. Submarine soundings show that the islet lies near the southeastern edge of a submarine platform having an area of at least 30 square miles with depths of from 6 to 50 fathoms.

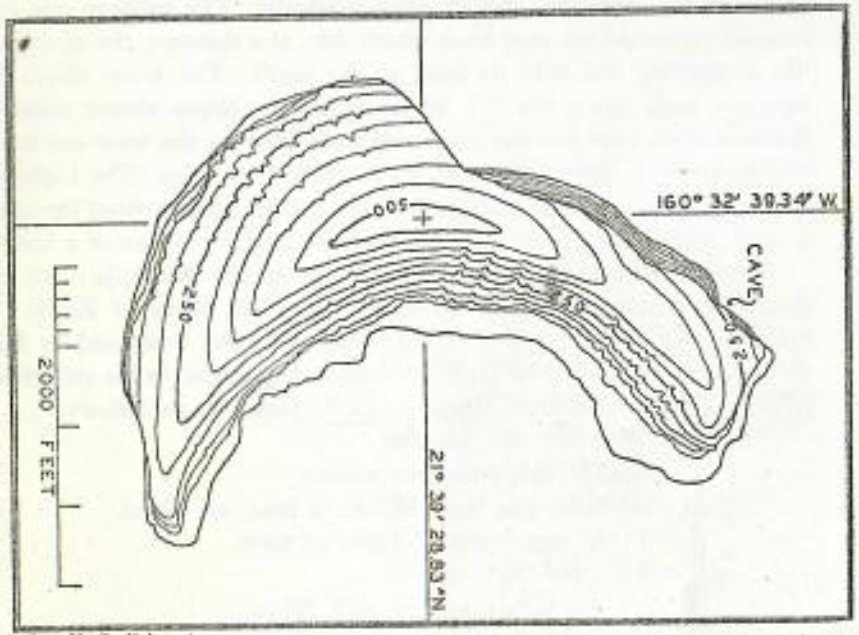
Kaula is crescent-shaped, two thirds of its ridge having a fairly level crest, but the south end sloping down gradually. The concave side of the crescent is toward the east, from which side, at a distance, the island looks like a sleeping seal with its head to the north. The lower slopes have been cut back into a sea cliff which makes the slopes almost impossible to climb, even after one has succeeded in landing on the wave-cut terrace, which cannot be done unless the sea is moderately calm. The Lighthouse Service has had to blast and build a trail to the summit from the convex (west) side, and at times it is necessary to land by means of a hoist.

Kaula has been known for a long time to the Hawaiians, its name appearing frequently in the old meles, especially those of Kauai. The mythical origin of the island is recounted in a mele composed by Kahakuikamoana, translated by Judge Abraham Fornander in his collection of folklore (Bishop Museum Memoirs, IV:1, page 10) as follows:-

"Wanalia was the man
And Hanala'a was the woman;
Of them was born Niihau, a land, an island.
There were three children of them
Born the same day,
Niihau, Kaula, ending with Nihoa.
The mother then conceived no more,
No other island appeared thereafter."

(* Paradise of the Pacific, vol. 50: no. 4, pp. 27, 38, 39, April 1938.)





(After H. S. Palmer)

There also is another version of how Kaula came to be "born." It runs as follows: After giving birth to Hawaii and Maui, Papa (the earth-mother) left her husband Wakea (the sky-father) and went back to Tahiti. After a short time wifeless, Wakea took to himself Kaulawahine, who as a result gave birth to Lanai. Tiring of her, he sought the

company of Hina, who a little later gave birth to Molokai. Meanwhile Laukaula, the plover, told Papa of her husband's faithlessness. Returning quickly to Hawaii, and learning what he had been doing, Papa deserted Wakea in a fury, and took Lua for a husband. They had a child, Oahu, known as Oahu-a-lua. Finally Papa went back to Wakea, and by him gave birth to Kamawaelualaninoku (the "child of heavenly qualities"—Kauai.) To account for Niihau, Kaula, and Lehua, the mele (Fornander, IV:1; pages 14, 18; VI: page 360) runs:

"Papa then went back to live with Wakea.
Papa was restless with child sickness.
Papa conceived the island of Kauai
And gave birth to Kamawaelualaninoku.
Niihau was only the after-birth,
Lehua separated them,
And Kaula was the closing one."

In old Hawaiian lore, reference to the island of Kaula sometimes signified a place far away, on the very edge of the group of islands, as in the legend of Paka'a. When Kaewemiaumi said to Paka'a spirit, "I am coming to search for you," the spirit of Paka'a answered, "I am living on Kaula," or in other words, at the "back of beyond."

The islet must at times have been visited to obtain sea birds, for there are references such as the following, from the legend of Kawelo. That famous warrior chanted to his wife, Kanewahinukiaoha:

"When Hanalei thou shalt possess,
And the mats of Niihau thou shalt wear,
And the birds of Kaula thou shalt eat . . ."

There are a few legendary accounts of Hawaiians who visited the island, but no evidence of extensive human habitation is known. The lighthouse men, when they finally succeeded in reaching the summit, in July, 1925, found on the northern part of the crest the remains of two stone structures, which might have been heiaus (temples). On the concave (east) side, just below the summit, they also found a shelter cave across the mouth of which was a low wall, suggesting that it, too, had been used by visiting Hawaiians.

The establishment of a light on the inaccessible summit of Kaula forms one of the most interesting and important events in the history of that seldom-visited islet. The need for a light there had been felt for several years, because the island lies close to the direct route of

vessels bound for the Orient. In 1921 Superintendent A. E. Arledge visited the island on the lighthouse tender *Kukui*, but was unable to find a landing place, although the sea was moderately calm. He gave copies of the pictures which he took at that time to the German geologist, Immanuel Friedlaender, who published a paper on the geology and topography of the island in a German scientific journal. Friedlaender interpreted the photographs as showing that Kaula consists of ash or tuff ejected at two different times, and that it forms about a quarter of the circular rim of a crater, the rest of which has disappeared.

On July 1, 1923, the U.S.S. *Tanager*, returning from a scientific cruise to the northwest Hawaiian islands, circled the island, and a ship's boat rowed along the lee side and into the sea cave at the northeast end. At that time the writer reached his nearest approach to the island by touching the wall of the cave with a boat hook. No official landing was made, although two or three of the more daring members of the party succeeded in getting ashore on a rocky ledge, from which they could only work their way a few yards up the cliff face. A few photographs and long-range observations were made from the ship.

Lighthouse superintendent Ralph R. Tinkham also visited the island in 1923, without being able to make a landing. George Gay, manager of the Niihau Ranch, is credited as being the first white man to have landed on the island, having swum ashore several years previous. He was unable to get off again through the breakers, and had to remain on the islet over night, until rescued by a Hawaiian crew in an outrigger canoe next day.

In order to learn more about the island, an airplane photograph was urgently desired. In November, 1923, Brigadier General William Mitchell was in Hawaii inspecting army air corps. He volunteered to get pictures of Kaula. That was before the days of inter-island flights, so the plane had to be loaded onto the lighthouse tender *Kukui* and transported to Koloa, where it had to be taken apart in order to get it ashore in small boats. Meanwhile Commander John Rodgers, in command of the local naval air service, learned about General Mitchell's plans. That same spirit of rivalry which marks the Army-Navy game made its appearance. Why should the Navy let the Army run off with the honor of being the first to fly a plane over and photograph Kaula? So two navy flying boats were loaded on the *Pelican* and another minesweeper, and they set off for Kauai. There one of the two planes was safely launched; and while the

army plane was being made ready at a small field near Eric Knudsen's beach house, on the morning of November 8, Lieutenant E. Chourre piloted the navy plane over Kaula so that photographer B. L. Houser was able to take the first picture of the islet from the air. Later a number of photographs were made by the 11th Photo Section, U. S. Army, from which Mr. Tinkham was able to construct maps and plans for the development of the light project.

In 1925 a party under the direction of lighthouse superintendent Fred A. Edgecomb, succeeded in making a landing on July 10, and worked until the 21st building a trail and ladder to the summit. On August 21, 1931, lighthouse engineer Neil W. Wetherby, while making a reconnaissance, was washed off the cliff from a spot 30 feet above sea level. An old Hawaiian in the party maintained that this had happened because he had not first rowed into the sea cave to pay his respects to the shark god which dwelt there and ruled the islet. In spite of this omission he wasn't seriously hurt, and returned on August 2, 1932, with a carpenter, mechanic and six laborers, to complete the installation of the derrick, shelter houses and light. The light finally was put in commission on August 18, 1932.

During this period, August 16 to 19, Dr. Harold S. Palmer, professor of geology at the University of Hawaii, and E. L. Caum, botanist with the Hawaiian Sugar Planters' Experiment Station were guests of the Lighthouse Service on the island, and made a study of the geology, plants, and bird life. In a Bishop Museum publication (Bulletin 35, 1927) Dr. Palmer describes the geologic formation of the island. He outlines its geologic history as follows: First, volcanic eruption built up to about sea level the platform upon which the islet now stands. Then this was eroded away, and corals grew upon the summit of this planed-off mountain peak. After that there was a second period of volcanic activity and a tuff cone was formed with its highest side toward the west. This tuff crater-rim next was eroded by wind, waves, and running water from rainfall, the waves cutting a submarine terrace almost around the island. The level of the sea then dropped about fifteen feet below the wave-cut terrace. And finally the present cycle of erosion took place. It is the wave-cut sea cliff which turns the stream-cut gulches into hanging valleys, and makes the faces of Kaula so difficult to climb.

Mr. Caum, in Bishop Museum Occasional Papers, vol. XI, No. 21, 1936, discusses the vegetation and the bird life. Fifteen species of plants were found growing on Kaula. This August visit having followed a very

dry summer, great areas of the slopes appeared entirely barren, which following a rainy period might have supported grass and sedge. A grass (*Panicum lanaiense*), cactus (*Opuntia megacantha*), *ewaowao* (*Chenopodium sandwichense*), an amaranth weed (*Amaranthus viridus*), a new species of purslane (*Portulaca caumii*), the common purslanes (*Portulaca lutea* and *oleracea*), puncture vine (*Tribulus cistoides*), and a spurge (*Euphorbia celastoides*) were the most abundant species of plants.

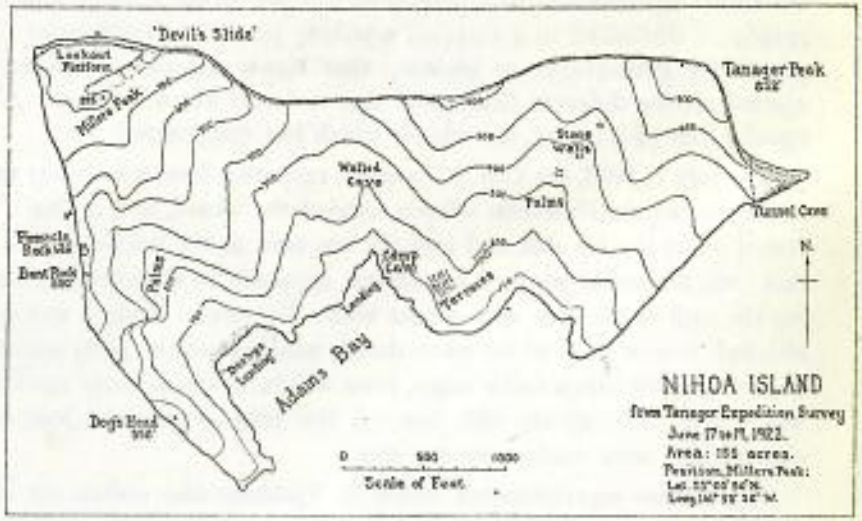
The noddy tern (*Anous stolidus*) was the most abundant species of bird. Other birds were the white tern, the Necker Island tern (called the small gray tern throughout the central Pacific), the sooty tern, the gray-backed tern, Bulwer's petrel, wedge-tailed shearwater, red-tailed tropic bird, the blue-faced, red-footed and common boobies, frigate birds, and the golden plover.

Mr. Caum also collected specimens of fifteen species of insects: two kinds of ants, two of wasps, four species of flies, two of lady beetles, a moth, a leafhopper, a thrip, an embiid, and some pseudoscorpions.

The lighthouse personnel also have captured specimens of a rat and a mouse, and report dry-wood termites in lumber on the island.

The light atop Kaula is the second highest under jurisdiction of the United States Lighthouse Service, being 562 feet above sea level. It is exceeded in height only by the Lehua light, 707 feet, off the northern end of Niihau. Lights at such elevations are only possible in regions, such as Hawaii, where there are no fogs. The Kaula light consists of a double 375 mm. acetylene beacon lantern, a type developed in Hawaii by M. Peter, Lighthouse Service mechanic. Each of the two lanterns has a 480 candle power light, visible at least 12 miles. The height is such that under exceptional conditions of clearness, it may be seen at a distance of 27 miles at sea level. The upper light is automatically turned on when the sun stops shining on it. Should it burn out, the lower light would automatically turn on. The lights are supplied with gas from storage tanks lower down on the west side, where a hoist can lift the heavy tanks from the shore. Two independent pipes, each 1500 feet long, supply the gas to the lights. Each of the two tanks holds enough gas to keep the light burning for fifteen months. The light could keep burning for two and a half years without refueling, if necessary.

CHAPTER 48
Nihoa Island*



Nihoa, also called Bird Island and Moku Manu, is located about 120 miles to the northwest of Niihau and 250 miles from Honolulu, the first of the chain of leeward Hawaiian Islands. It is the summit of a huge volcanic peak, only about 900 feet of which remains exposed above the sea. This exposed summit in shape resembles half of a cowboy's saddle, Miller's Peak (895 feet) being the pommel, and Tanager Peak (852 feet) its upcurved back. The island measures about 1,500 yards east and west by 300 to 1,000 yards wide. It can be compared only to half a saddle as the northern side drops off sheer in a nearly perpendicular cliff. Near its middle this cliff is 360 feet high; but both ends of its 1,500 foot length reach a height of over 800 feet. In places it appears to overhang. The western side of the island also is a cliff, which forms a right angle with the north face. The cliff also continues around the curve of the east end.

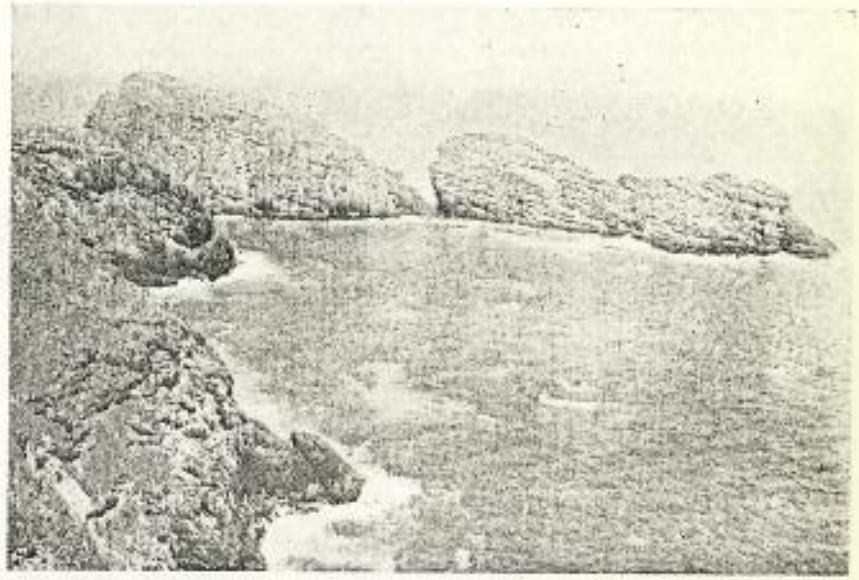
(* Paradise of the Pacific, Vol. 49; No. 11, pages 11, 12, 30, Nov. 1937.)

The southern side of the island slopes upward in a series of six shallow valleys. A low cliff borders Adams Bay. The foot of the southern slope has been cut into to form a bench or terrace, ten to fifty feet wide and from four to eight feet above mean sea level. In the western notch of the bay is a small sandy beach. Breaking waves prevent this from being a good landing place. The best spot at which to land is a rocky shelf near the center of the south slope. Here, in smooth weather, landing is not dangerous in the morning. The sea frequently becomes a little rougher in the afternoon. And in stormy weather landing is practically impossible.

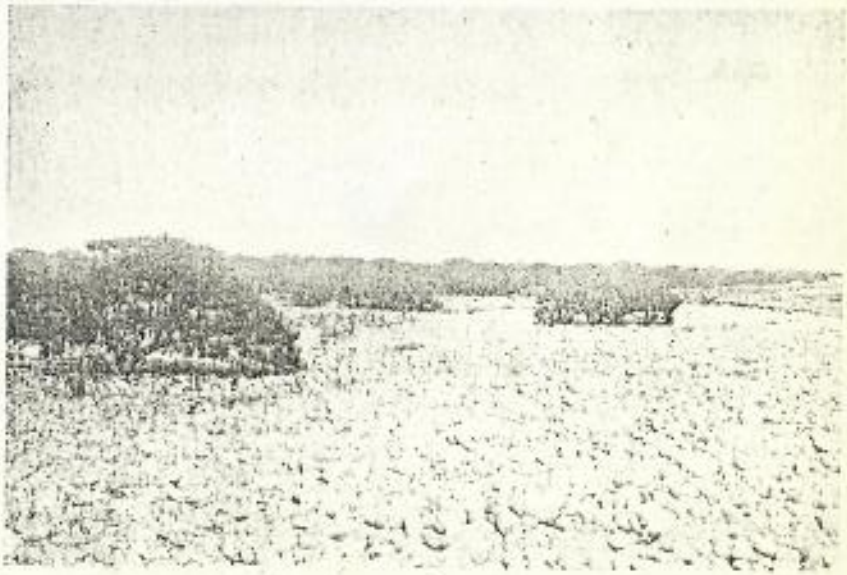
Nihoa is the remnant of a once much larger volcanic cone, according to Professor Harold S. Palmer, who reported upon the island's geology in Bishop Museum Bulletin 35, 1937. Its summit, as one can tell from the dip of the lava strata, formerly was higher and to the northeast of the present summit. The entire northern portion of the island has been eroded away. At present the waves are still cutting back the foot of the cliff, so undermining the face that it falls from above, most of the material being carried away as it falls. The rocks are composed of both dike and flow basalt, some high in olivine crystals. No ash, bombs, or tuff have been found. The present area is about 156 acres, but much of the slope is too steep to be of any practical value.

In contrast to the bare cliffs, the southern slopes appear brownish or grayish-green in color from their vegetation. Most of the ridges are covered with two kinds of grass (*Eragrostis variabilis* and *Panicum torridum*). The valleys are densely carpeted with grayish shrubs, mainly *Chenopodium sandwichicum* and *Solanum nelsoni*, among which are scattered *ilima* bushes (*Sida fallax*) and *ohai*, a leguminous shrub (*Sesbania tomentosa*). The only large plants are a few small clumps of *loulu* fan palms (*Pritchardia remota*), of which about 500 were counted in 1923, not including seedlings. Specimens of twenty flowering plants were collected by the *Tanager* Expedition, in 1923. These are enumerated in Bishop Museum Bulletin 81, 1931.

Archaeological remains and old Hawaiian legends indicate that the island was both known and, at least intermittantly, occupied by Hawaiians in olden days. They may have gone there on fishing trips or in search of bird's feathers, and at an earlier, long forgotten period, stopped there en route to Necker Island or beyond. So many new and interesting archaeological sites were discovered on Nihoa in 1923, that the *Tanager*



Shark Bay, Necker Island, looking west.
(Photograph by E. L. Caum, 1923)



South Shore Wake Island, 1923.
(Photo by Dr. H. S. Palmer, Courtesy of B. P. Bishop Museum.)

made a return visit the following year with scientists who made a thorough archaeological survey. Many of the old house sites and terraces used for cultivation were cleared as well as mapped. A total of 66 sites are reported upon by Kenneth P. Emory in Bishop Museum Bulletin 53, 1928, together with an interesting discussion of the agriculture and type of culture which must have existed on the island. The total of twelve acres of cultivated terraces might have produced 48 tons of sweet potatoes a year. These, with fish, might have been sufficient to feed quite a population, even the 175 persons which the number of house sites suggests. But the real problem was that of water, there being only three small seeps, none of which gave water fit to drink in 1923.

For many years the only regular inhabitants have been birds. These occur in vast numbers. Black-footed albatross had a colony on the summit, dome-shaped plateau; Bulwer's petrel and wedge-tailed shearwaters occupied caves and burrows; red-tailed tropic birds hid beneath bushes; and the large frigate birds, three kinds of boobies, and five kinds of terns nested in all sorts of places from the ground to the crowns of the *loulu* palms. In addition to these sea birds there were two species of native land birds, the finch and the miller bird, both endemic species, found only on Nihoa, but related to species on Laysan.

The first historic discovery of Nihoa was by Captain Douglas, on the *Iphigenia*, who sighted the island at 3 o'clock on the morning of March 19, 1789. The bark *Columbia*, Captain Peter Corney, with 60 native Hawaiians on board, passed close to Nihoa on April 17, 1817, but did not land.

In 1822 Queen Kaahumanu, Premier of the Hawaiian Kingdom hearing about Nihoa during a visit to Kauai, dispatched two or three small vessels, with Captain William Sumner in command. He found the island and annexed it to the Hawaiian group.

On April 23, 1857, King Kamehameha IV and Governor Kekuanaoa landed from the schooner *Manuokawai*, Captain Paty, and again took possession of the island. This was following a visit of the French ship *Eurydice*.

Careful determinations of the position of Nihoa, or Bird Island, as it was called, were made by the United States Survey schooner *Fenimore Cooper*, Lieutenant John M. Brooke, in January, 1859.

In 1885 the steamer *Iwalani* made an excursion run from Honolulu to Kauai and Nihoa, with a party of about 200, chief among whom was

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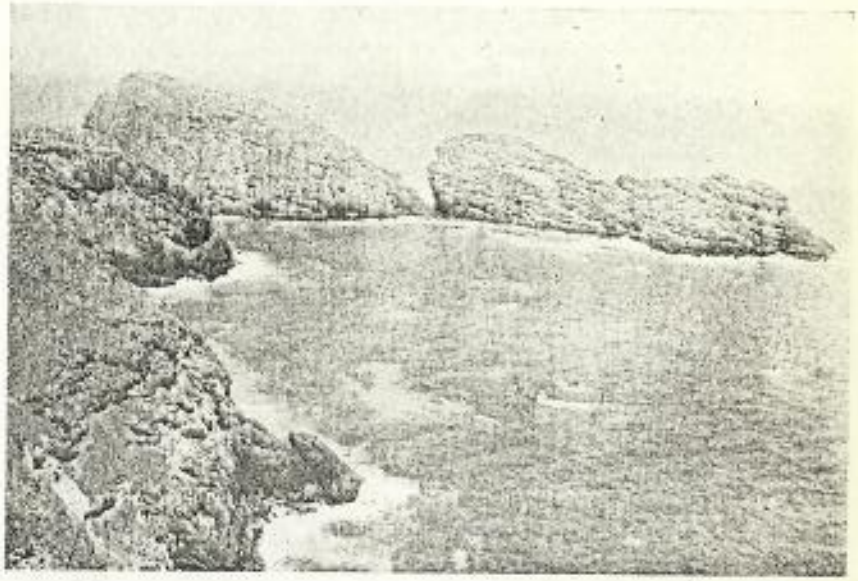

Shark Bay, Necker Island, looking west.
(Photograph by E. L. Caum, 1923)

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Princess Liliuokalani. In the party were Sereno E. Bishop, to make geological observations and a map; Sanford B. Dole, to observe the birds; Mr. Jaeger, to collect plants; and Mrs. E. M. Beckley, as representative of the Hawaiian Government Museum. While the excursionists roamed all over the island, Mr. Bishop laid out a base line and commenced making a survey, with the help of Mr. Rowell, who set out flags on the peaks. The survey was cut short, however, and the visitors had to take to their boats in a hurry, when someone carelessly set fire to the dry vegetation, and much of the slope was burned over. Much difficulty was experienced in getting back onto the ship, because of which but few scientific specimens were obtained. Among those preserved are a stone bowl, stone dish, and coral rubbing stone, now in Bishop Museum.

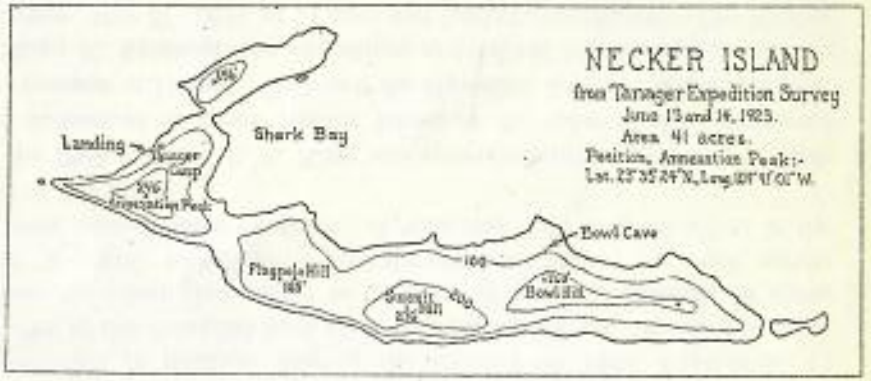
The British ship *Hyacinth* made soundings about Nihoa in September, 1894, but there is no record at hand as to observations on the island.

Carl Elschner states in his account of the leeward islands, that in 1910 several sailors from the U.S. Revenue Cutter *Thetis* swam ashore at Nihoa. Also that in 1913, Lieutenant W. N. Derby, known to many in Hawaii as the genial commander of the U.S. Coast Guard Cutter *Itasca* at the time the first colonists were taken to islands in American Polynesia in 1935, and a sailor swam ashore to secure rock specimens, the surf being too rough to land with a boat. The bit of sand beach appropriately has been called Derby's Landing.

The writer was a member of the scientific party which spent about ten days on Nihoa in June, 1923. Camp was made in a cave just above the landing place. Here were found two soya tubs, a bottle of soya, decayed rice bags, and Japanese straw coats, indicating that Japanese fishermen had camped there. C. S. Judd and H. S. Palmer made a plaintable survey map of the island, a copy of which is here reproduced. Dr. Alexander Wetmore, representative of the U.S. Biological Survey, made a careful study of the bird life, while several Honolulu scientists collected and studied the plants, insects, land shells, marine life, and geology.

The archaeological parties worked on Nihoa from July 9 to 13, 1924, clearing several terraces and house platforms and exploring a total of 66 archaeological sites. The numerous ethnological specimens which were discovered on the island, and which suggest at least a semipermanent residence at one time, are preserved in Bernice P. Bishop Museum.

CHAPTER 49
Necker Island*



Necker Island is a precipitous, narrow ridge of volcanic rock, about 1,300 yards long, east and west, by a tenth as wide. It is estimated to have an area of 41 acres. From the western end a narrow spur extends about 200 yards northward, like the bone point on a Hawaiian trolling hook. The main crest undulates in a series of five hills. The westernmost of these, called Annexation Hill, is 246 feet high; the next, Flagpole Hill, 185 feet; the middle one, Summit Hill, 276 feet; the next, Bowl Hill, 260 feet; and east of that a narrow ridge, slightly over 200 feet high. The spur, the highest point of which is 156 feet above sea level, forms with the main stretch of the island a shallow, rocky cove called Shark Bay. During the greater part of the time the water in this bay is too rough to provide a landing, as it faces both wind and current. West of the spur, however, is a small lee where landing can be made on rocky shelves in moderately calm weather.

This rocky islet, particularly its nearly vertical sides, appears from a distance to be bare of vegetation. Closer examination discloses that its rounded crest and narrow terraces on its flanks are sparsely carpeted with five species of low, nearly prostrate plants: a species of goosefoot shrub (*Chenopodium sandwicheum*), which also is common on forehills

(* Paradise of the Pacific, vol. 50: no. 1, pages 21-22, Jan. 1938.)

throughout the main Hawaiian islands and is known to the Hawaiians as aweoweo, is commonest on terraced slopes; a bunch grass (*Panicum torridum*), called on the main island kakonakona, is found on the north-slope, but very dry much of the time; purslane (*Portulaca lutea*), the common ihi weed, is common on the flat tops; a patch of pickle weed (*Sesuvium portulacastrum*) grows on the lower northeastern slope of Annexation Hill, where it can be reached by the spray from waves dashing into Shark Bay; and a few plants of the much-branching ohai shrub (*Sesbania tomentosa*) sprawl, vine-like, along the windswept crest. None of the plants reaches a height of more than two feet above the thin, rocky soil. There is no sign of half a dozen other species of plants which were carefully set out by the late Territorial Forester, Charles S. Judd in June, 1923. Apparently they could not stand the unfavorable conditions.

Dr. Harold S. Palmer, in 1923, estimated that the rainfall might be 20 to 25 inches a year. Two small seeps of water, strongly tainted with guano, together might furnish ten gallons of water a day.

The only inhabitants, larger than cockroaches and a native species of Rhynogonus weevil, related to the species on Nihoa, are birds. There are hordes of them, all sea birds. At certain times of the year their eggs cover every bit of level ground so thickly that it is difficult to walk without stepping on them. The birds rise in clouds at ones approach. Some species cry all day, and others moan and howl all night. The five days we spent on the island in June, 1923, seemed long enough to devote to such an inhospitable place.

And yet to the student of native culture Necker Island is perhaps the most interesting spot in the Hawaiian islands. By its very isolation and lack of hospitality it has preserved evidence of the culture of what is believed by Kenneth P. Emory, ethnologist at B. P. Bishop Museum, to have been archaic Hawaiians. On the main islands of the group this ancient culture has been overlain by the changes brought about by the incoming Ari'i and their priests who arrived during the twelfth and thirteenth centuries from the Society Islands. Only fragments remain on the main islands of the ditches, fishponds, and other stone structures, ascribed to the early Menehunes, who were the real, archaic inhabitants, not a fairy folk. But on Necker were some thirty-four temple platforms, which seem to find their nearest counterpart in the marae of southeastern Polynesia. Here also were found the famous stone images, beautifully carved stone bowls, adzes, sinkers, a grindstone, and human bones, all

mute evidence of at least semi-permanent residence by a Polynesian people. Those who are interested in this subject will find Emory's "Archaeology of Nihoa and Necker Islands" a well written convincing, and entertaining account.

Necker Island appears to have been unknown to the Hawaiians at the time of its discovery by La Perouse on November 4, 1786. This famous French navigator sailed within a third of a league of the island on his passage westward, noting the perpendicular cliffs, white with the droppings of birds, the absence of trees, and the violence of the sea, which made it impossible to land. He called it *Ile Necker*, in honor of Monsieur Jacques Necker, French Minister of Finance under Louis XVI.

John Turnbull, who visited the Hawaiian islands, December 17, 1802 to January 21, 1803, in the British ship *Margaret*, mentions in his account of the voyage that he had two Hawaiians, who had been engaged to dive for pearls on a reef in the leeward Hawaiian islands, had landed on Necker, and had their curiosity aroused by a "range of stones, placed with some regularity in the manner of a wall, and about three feet high." Apparently they were the first persons to set foot on Necker Island in modern times.

Lieutenant J. M. Brooke visited Necker during January, 1859, and determined its position. During the summer of 1859, Captain N. C. Brooks, of the Hawaiian bark *Gambia*, on a sealing and exploring voyage, passed the island, but makes no mention of landing, although he states that "a ravine makes down from the southeast end of the rock, where at some seasons there is water. A boat may land in good water at the foot of this gulch."

In 1894, Captain J. A. King was commissioned by Sanford B. Dole and authorized to annex Necker Island in the name of the Provisional Government of Hawaii. On board the Hawaiian steamer *Iwalani*, Captain William K. Freeman, the expedition arrived off Shark Bay on Sunday morning, May 27, 1894, at 11 a.m. and landed immediately. The landing party consisted of Captain King, Captain Freeman, Benjamin H. Norton, and nine sailors. A flagpole was erected on Annexation Hill, the Hawaiian flag hoisted, and Captain King read the annexation proclamation. In the course of their exploration of the island the party found some stone images and noted the stone platforms with their rows of upright stones. Fragments of six images were collected during the four hours spent on the island. Copies of seven photographs, taken at the

ime by B. H. Norton, engineer of the *Iwalani*, are now preserved in Bishop Museum.

On September 24, 1894, H.B.M.S. *Champion*, Captain Rooke, landed party on Necker Island. They collected four more images, two of which are now in the British Museum, London.

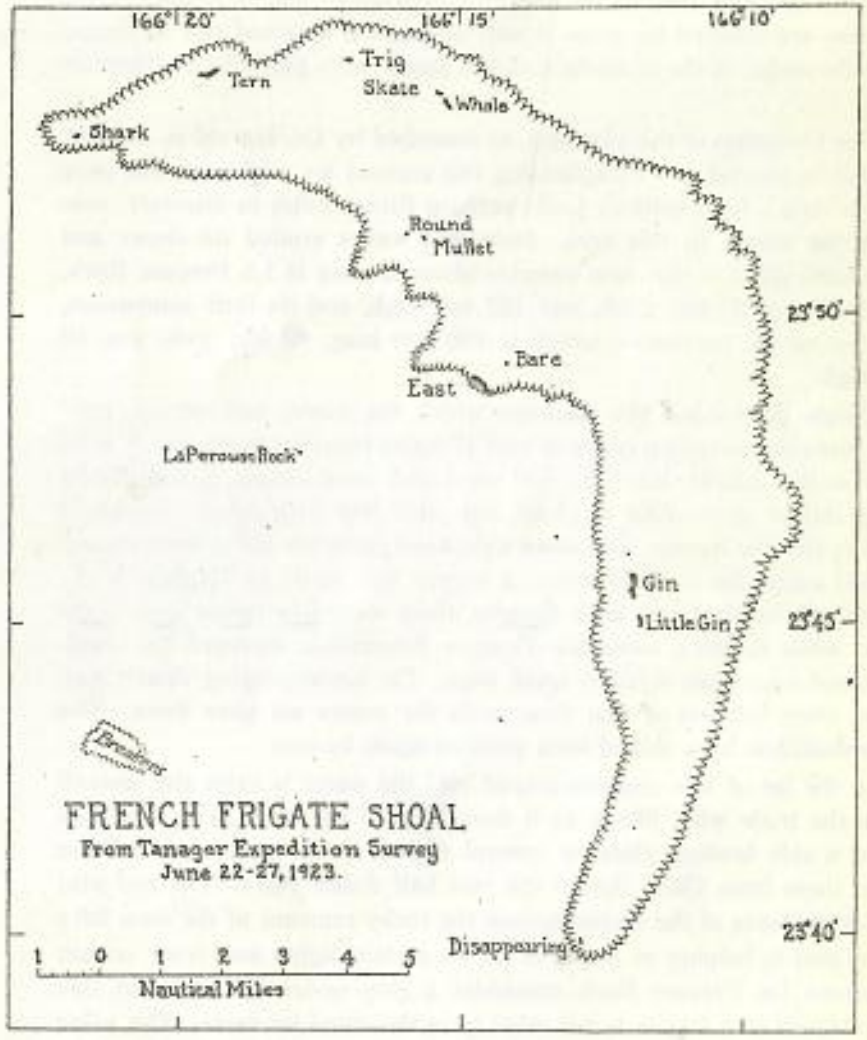
On July 12, 1895, Captain King headed another expedition to Necker, n the Revenue Cutter *Lehua*, to map the island and see if additional nages could be found. Dr. William T. Brigham, first director of Bishop Museum, went to make scientific observations, but discovered no addi-ional images. The survey and map were made by F. S. Dodge, of the Hawaiian Government Survey. Professor W. D. Alexander was also member of the party.

Several other landings were made during the following quarter cen-ury, including two by George N. Wilcox, two by officers of the U. S. Revenue Cutter *Thetis* (1910 and 1913), H. L. Tucker and excursion party in 1917, and the late Gerrit P. Wilder, warden of the Hawaiian Islands Bird Reservation, on the lighthouse tender *Kukui*, October 6, 1919. Mr. Wilder found the leg of an image.

The Tanager Expedition put two parties ashore between June 12 and 9, 1923. At this time a plane-table map was made by Charles S. Judd nd Dr. H. S. Palmer, and a careful study was made of the plant and nimal life by other members of the party. The *Tanager* made another isit to Necker, July 14 to 17, 1924, with a party which made a thorough rchaeological survey.

Officially Necker Island is part of the City and County of Honolulu, t having been one of the islands acquired by the United States from the Republic of Hawaii, July 7, 1898. On June 2, 1904, it was leased for ishing purposes for 21 years. February 3, 1909, it became a part of the Hawaiian Islands Bird Reservation, and as such it is administered jointly y the U.S. Department of Agriculture and the Territory of Hawaii. ts position is North 23° 34′ 41″, 164° 42′ 22″ West; 393 miles north-vest of Honolulu.

CHAPTER 50
French Frigate Shoal*



(* Paradise of the Pacific, vol. 49: no. 7, pp. 15, 30, July, 1937.)

French Frigate Shoal consists of a crescent-shaped reef on a circular platform about eighteen miles in diameter, located 480 miles northwest of Honolulu. This reef forms a barrier against winds and currents around the north and east sides of the platform. The south and west sides of the platform are covered by water which averages a hundred feet in depth. Near the center of the platform stands a small rocky pinnacle, La Perouse Rock.

The formation of this platform, as described by Dr. Harold S. Palmer, is noted in chapter 46. Paraphrasing this account we might say that once upon a time a high volcanic peak, perhaps fifteen miles in diameter, rose above the waves in this area. Rain and waves eroded its slopes and coast until all of it that now remains above the sea is La Perouse Rock, 500 feet long, 80 feet thick, and 122 feet high, and its little companion, 350 feet to the northwest, which is 100 feet long, 40 feet wide, and 10 feet high.

Corals grew upon the platform which the waves had carved, until they formed a sweeping curve of reef 17 miles from tip to tip and 5 miles wide in the middle. On this reef sand and coral debris is continually being shifted from place to place and piled into little islets; elsewhere there is shallow lagoon. We know that these islets are being built up and washed away, for in 1859, when a survey was made by Captain N. C. Brooks of the Hawaiian bark *Gambia,* there were five rather large coral islets, while in 1923, when the *Tanager* Expedition surveyed the shoal, we found more than thirteen small ones. The accompanying sketch map shows their location at that time, with the names we gave them. The islets doubtless have shifted their position again by now.

In the lee of this crescent-shaped reef the water is calm and smooth when the trade wind blows, as it does most of the time. This has been found a safe landing place by several flights of sea planes which have flown there from Oahu during the past half dozen years. The reef also breaks the force of the waves against the rocky remnant of the once lofty dome, and is helping to preserve it. In certain lights and from certain directions La Perouse Rock resembles a ship under full sail, but this resemblance to a frigate is not what gave the shoal its name. The name really should be "French Frigates Shoal," as we shall see from the account of its discovery.

The gallant French navigator, Jean Francois de Galaup comte de la Perouse, with his two vessels, *Broussole* and *Astrolabe,* was westward

bound from California on a voyage of discovery. The presence of large numbers of sea birds—boobies, man-o'-war birds, and terns—had put them on the alert for a sight of land, and on November 4, 1786, they had discovered Necker Island. After making a survey of the shoals to the west of this lonely rock, the two vessels proceeded westward. "Since our departure from Monterey," runs the entertaining narrative, "we had never experienced a finer night, or a more pleasant sea; but this tranquillity of the water was among the circumstances which had nearly proved fatal to us. Toward half past one in the morning we saw breakers at the distance of two cables length a-head of my ship. From the smoothness of the sea they made scarcely any noise, and some foam only, at distant intervals, was perceptible. The *Astrolabe* was a little farther off, but she saw them at the same instant with myself. Both vessels immediately hauled on the larboard, and stood with their heads south-southeast; and as they made way during their maneuver, our nearest distance from the breakers could not, I conceive, be more than a cable's length."

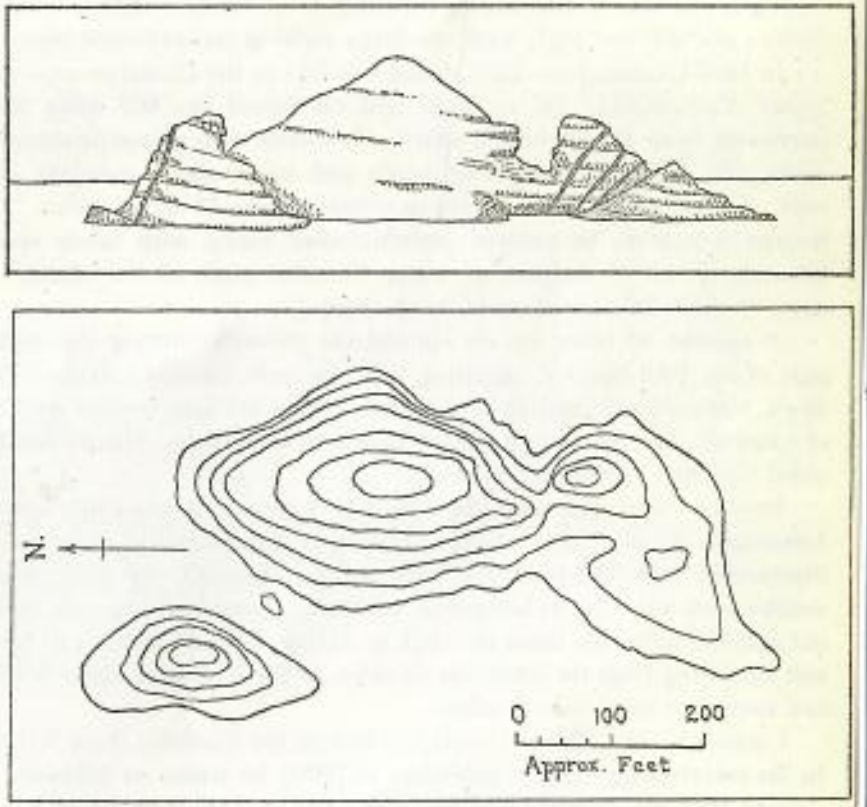
La Perouse goes on to describe how the next day a careful survey was made of the shoal, which the discoverer named "*Basse des Fregates Francaises,* shoal of the French Frigates, because it had nearly proved the final termination of our voyage." This discovery was made on November 6, 1786.

Until recently, the history of French Frigate Shoal (the name is that officially adopted by the United States Geographic Board, October 1, 1924) has been a quiet one. Occasional vessels stopped, but most of them gave the dangerous spot a wide berth. The Provisional Government of Hawaii leased the area for twenty-five years from February 15, 1894, but little use was made of the place. On July 13, 1895, it was formally annexed for the Republic of Hawaii by Captain J. A. King. It was included among the islands acquired by the United States, July 7, 1898, when Hawaii became a Territory. In 1909 it was made a part of the Hawaiian Islands Bird Reservation. Officially it is part of the City and County of Honolulu, but it has been administered jointly with the U.S. Department of Agriculture.

In 1923 the sand islets had a total area of about 46 acres, of which 17 acres were covered with a sparse growth of grass and other low vegetation, a total of six species of herbs and vines. Their highest elevation was 10 to 12 feet; most of the islets were lower. Their population consisted of thousands of sea birds, most of them terns.

With a calm sea it was quite possible to land on the southwest side of La Perouse Rock. But the precipitous slopes were so crumbly and slippery with bird guano that no one cared to climb to the top. Rock samples showed that this remnant core consists of olivine basalt, very similar to that which makes up much of the rest of the great chain of volcanic mountains, the summits of which form the islands of the Hawaiian group.

CHAPTER 51
Gardner Pinnacles*



(After H. S. Palmer)

Probably the most barren and hardest to land on of all the islands of the Hawaiian chain are the Gardner Pinnacles, located 588 miles northwest of Honolulu and 108 miles northwest of French Frigate Shoal the nearest island neighbor. The position of these pinnacles is North 25° 01′, 167° 59′ West.

These isolated, barren rocks were discovered on June 2, 1820, by the American whaler *Maro* of Nantucket, under command of Captain

(* From Paradise of the Pacific, vol. 50: no. 3, pages 11, 36, 37, March, 1938.)

Joseph Allen. Incidentally this vessel has the distinction of being the first of the many whalers to enter Honolulu harbor. Apparently Captain Allen did not make a landing on Gardner Pinnacles, for he greatly overestimates the size of the island, reporting it as being a mile in circumference and 900 feet high, with two large rocks at its southwest point.

In 1857 Captain John Paty visited Gardner in the Hawaiian exploring vessel *Manuokawai*. He reported that the island lies 607 miles west-northwest from Honolulu and that it "is merely two almost inaccessible rocks, 200 feet high, extending north and south about one-sixth of a mile. A bank extends off to the southwest some 15 or 20 miles. The bottom seemed to be covered with detached rocks, with sandy spaces between; I had 17 fathoms of water 10 miles south of the island," he says. "I think fish are plentiful on the bank."

A number of other vessels sighted the pinnacles during the middle part of the 19th century, reporting them by such names as Man-of-War Rock, Pollard Rock, and Pollard Island. There are also various spellings of Gardner, but the United States Board of Geographic Names has decided Gardner Pinnacles is official.

Positions were given for the island by Captain Stanikowitch and by Lieutenant Brooke, U.S. Navy. The latter describes the island as an inaccessible rock 170 feet high, with a base about 600 feet long, and a smaller rock close to its southwest extremity, from which a reef makes out one-half mile. He notes the bank as having 17 to 20 fathoms of water and extending from the island on all sides, to the westward about 5 miles and southwest more than 8 miles.

Captain F. D. Walker visited Gardner in the *Kaalokai*, June 9, 1891. In his entertaining "Log" (published in 1909) he writes as follows:

"At noon we sighted Gardner Island, and at 2:30 were up to it.

"Gardner Island is simply a rock one hundred and seventy feet high, or thereabouts, densely covered with birds. Hundreds of frigate birds sailing majestically around it, watching with keen interest the results of the tropic birds' labors . . ." He goes on to describe at length the manner in which these "highway robbers" of the bird islands harass the smaller birds as they return from fishing, and make them drop their hard-earned food, which they immediately swoop down on and catch in mid-air.

"We fired a gun and the reverberation was like distant thunder. The whole colony of birds arose, and the air was clouded with them." Captain Walker continues.

"There is no anchorage. The swell of the ocean breaks heavily even when the sea is calm. On the island's precipitous sides, the backwash or reflux rushes out a long way, making an experiment to land a very dangerous undertaking. To the westward there are a few detached rocks about seventy feet high. I could find no outlying dangers in our cruise around it, and as we could find nothing interesting or instructive to be gained, we took our departure at dusk and shaped our course for Maro Reef."

Professor Harold S. Palmer, of the University of Hawaii, in Bernice P. Bishop Museum Bulletin 35, 1927, describes the topography and geology of the island. He was not a member of the Tanager Expedition party which landed in May, 1923, but bases his descriptions upon field notes, sketches, and collections made by Dr. Stanley C. Ball, of the Bishop Museum staff. He says:

"Gardner consists of two islands which from the west or east appear as a single island, flanked by smaller northern and southern peaks. The smaller, northern peak belongs to the lesser island, which lies some 50 yards west of the north end of the larger island. A small, jagged rock rises a few feet above sea level in the channel between the two islands. Landings were made on both islands. Though it was necessary to swim to the smaller island, it was possible to land directly from the surf boat onto the larger island, one or two men jumping ashore each time the waves brought the boat in and before it was fended off . . ."

He goes on to describe the geologic formation of the island in some detail. All of the rocks observed on Gardner were fine-grained, dark basalt, except some weathered material thought to be tuff. All this was of volcanic origin. In cracks were found vein-like fillings of light-colored phosphate material; and there were crusts of lime. Bird droppings were everywhere.

Dr. Palmer suggests that Gardner Pinnacles are the remains of an island which was formerly much larger, perhaps intermediate in size between Kahoolawe and Lanai, with an area of about 80 square miles. This island has been carved away by wind, rain, and waves until only the hard core of its volcanic dome remains. The island is at present surrounded by submarine banks which extend off from it about 5 miles on the east, north and west, and 10 to 12 miles on the south. This great oval has an area of about 125 square miles. The accompanying sketch

map and profile are based upon those published by Dr. Palmer from Dr. Ball's field observations on the island.

The botanists of the Tanager Expedition were able to take the day off. The steep slopes of Gardner Pinnacles are bare of vegetation, except for small pockets of purslane (*Portulaca*), and algae on the lower, moist surfaces. The late Gerrit P. Wilder collected a small sample of the *Portulaca*, but the specimen refused to dry, which is usual with this fleshy herb, and it is not positively known which of two species of purslane it is.

The insect collectors of the party apparently also took a holiday, although Dr. Ball and Major Chapman Grant managed to collect two small flies, a moth, the case of another moth, and one earwig. They also reported seeing mites, spiders, centipedes and isopods among the loose rock, but unfortunately did not catch any.

Of archaeological remains there were none. In fact, it is doubtful if many persons have set foot upon the steep, slippery slopes, which are so hard to approach.

Official estimates of the heights of the three conical pinnacles, two on one base and one on the other, are 90, 100, and 170 feet, the water passage being between the 90 and 170 foot peaks. But nautical charts give the maximum height as 190 feet.

The island became an "integral part of the United States" on July 7, 1898, and a part of the Hawaiian Islands Bird Reservation on February 3, 1909. Officially it is a portion of the Territory of Hawaii and of the City and County of Honolulu, helping with Pearl and Hermes Reef, to the westward, and Palmyra, far away to the south, to make Honolulu the city of largest dimensions in the world. Administration is jointly divided between the Honolulu City Fathers and the United States Department of Agriculture's wildlife bureau, who rule over population of birds and little else.

CHAPTER 52
Laysan Island*

In some ways Laysan Island is the most fascinating and in some ways the most unfortunate of all the tiny dots of land in the "little end of Hawaii." In former days it supported the largest albatross rookery of the entire chain. Although at no time during its recorded history did it reach an elevation of more than fifty feet above sea level, still on it once grew groves of sandalwood trees, dense thickets of bushes, and native fan palms, beneath whose shade there evolved five species of land birds, endemic to this island and not known elsewhere. And all this on an area of but two square miles of sand and coral.

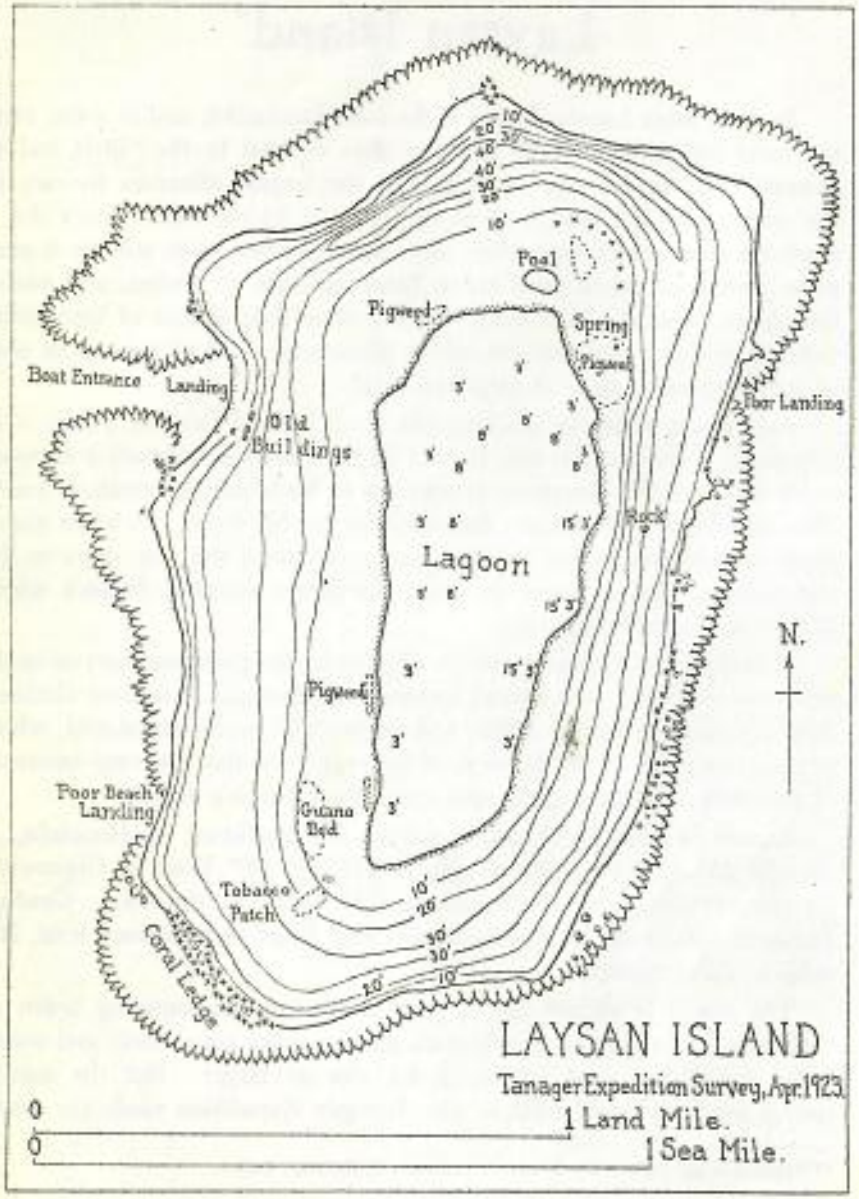
As a result of all the sea bird life, great beds of valuable guano were deposited. This material was formed by the chemical interaction between coral sand and the droppings of myriads of birds during countless years. Man found that guano was a fine fertilizer for his crops. So when guano deposits were located on Laysan, man soon found the way there to dig and ship it; and, as usual to upset the nicely adjusted balance which Nature had established there.

Poachers also were attracted to Laysan by the great numbers of birds, and ruthlessly they slaughtered hundreds of thousands for their feathers. And for good measure, rabbits and guinea pigs were introduced, which so completely ate off the remains of the vegetation that the very existence of the birds was threatened, and some kinds became extinct.

Laysan is located 790 sea miles to the northwest of Honolulu, in latitude 25° 42' 14" North, longitude 171° 44' 06" West of Greenwich. Its nearest neighbors are Lisianski, 115 miles to the west; Gardner Pinnacles, 202 miles to the southeast; and Pearl and Hermes Reef, 260 miles to the northwest.

The island is shaped like a large Hawaiian poi-pounding board or oval serving dish, about a mile wide by two miles long, north and south. Some authorities have estimated its size as larger. But the careful survey made in April 1923 by the Tanager Expedition made the maxi-

(* Paradise of the Pacific, vol. 50: no. 5, pages 21, 28-30, May, 1938.)



mum length 9375 feet and greatest width 5580 feet, which in land miles is one and four-fifths by a trifle over one. The accompanying map is from this survey, after the original by Major Chapman Grant.

The surface is composed of loosely packed coral sand, with beds of coral reef and phosphate rock on the south and west sides. The beaches rise abruptly from the water's edge to a height of 15 to 18 feet, then flatten out to a maximum height of 30 to 40 feet, and then slope gradually downward to a central depression, part of which is occupied by a salty lake without connection with the sea. The surface of this lake is somewhat above sea level, and its depth formerly was more than fifteen feet. But so much sand has drifted into this basin, while the island was denuded of vegetation, that now it is probably much shallower.

William Alanson Bryan has suggested that Laysan once was a small atoll, the whole of which was elevated with reference to ocean level. It is surrounded by coral reefs, which on the western side are indented to form a snug landing place for small boats, with a safe anchorage off shore, so long as the trade winds blow and this is the lee side.

This island is reported to have been an American discovery, but the details are not available. Not knowing of the earlier visit, Captain Stanikowitch, who sighted the island on March 12, 1828, named it Moller Island after his ship.

On May 1, 1857, Captain John Paty annexed the island to the Hawaiian kingdom in the course of his famous fifty day voyage of discovery aboard the Hawaiian schooner Manuokawai. Said Captain Paty in his report:

"This is a low sand island 25 to 30 feet high, 3 miles long and 1½ broad. The surface is covered with beach grass, and half a dozen palm trees were seen. It has a lagoon in the center (salt) 1 mile long and half a mile wide, and not a hundred yards from the lagoon abundance of tolerable good fresh water can be had by digging two feet. Near the lagoon was found a deposit of guano.

"The island is literally covered with birds; there is, at a low estimate, 800,000. Seal and turtle were numerous on the beach, and might easily be taken. They were evidently unaccustomed to the sight of man, as they would hardly move at our approach, and the birds were so tame and plentiful that it was difficult to walk about the island without stepping on them . . . Fish, too, are plentiful."

In 1859 Lieutenant J. M. Brooke visited Laysan in the ship Fenimore Cooper, and drew a map of the island, on which two palm trees are marked on the east shore of the lagoon. The map now is preserved in the Territorial Survey Office in Honolulu. Later the same year Captain N. C. Brooks visited Laysan in the bark Gambia. He gives brief notes concerning the island, stating that it "is covered with a luxuriant growth of shrubs," and that "there are five palm trees on the island, and I collected 25 varieties of plants, some of them splendid flowering shrubs . . "

On March 29, 1890, Laysan was leased by the Hawaiian Kingdom for a period of twenty years to the North Pacific Phosphate and Fertilizer Company. The period of active guano digging lasted from 1892 to 1904. During this time numerous vessels visited Laysan. The Hawaiian schooner Liholiho made regular trips during 1892-93; the American bark Irmgard, in 1893; the American bark Planter, in 1894 and again in 1898; the American schooner Robert Lewers, in 1894; the Hawaiian schooner Ka Moi, in 1895; the American bark C. D. Bryant, in 1895 and 1897; the German bark H. Hackfeld in 1896; the Hawaiian schooner Norma, in 1896 and 1899; the Hawaiian schooner Waialeale, in 1898; the American bark McNear, in 1899, and others, made the hazardous run up through poorly charted reefs, to carry away loads of guano, or to take provisions to the little colony of guano diggers. Not all vessels survived the trips. The wooden bark Ceylon was wrecked on Laysan in July, 1902.

On May 1, 1904, the schooner Robert Lewers made a last trip to Laysan for the final cargo of guano for Hackfeld and Company, which firm gave up the lease shortly after this. The manager of the guano digging, Max Schlemmer, continued to live on the island until November, 1915.

About 1903 Captain Schlemmer introduced rabbits to Laysan, partly, it is said, to augment his food supply, and partly, according to Professor Homer Dill, to start a rabbit canning business. The first stock included Belgian hares and large white domestic English rabbits. The result of this cross produced a breed which would have delighted the heart of a geneticist. At all events, they bred prolifically, for within six years the island was overrun with them. They ate off much of the green vegetation. They lived anywhere and everywhere, under bushes, in holes with the shearwaters and petrels, and in burrows of their own.

Domestic Guinea pigs also were introduced by Captain Schlemmer, but although they bred well, their destructiveness was as nothing compared with the rabbits. Conditions became much worse on Laysan than those described on Lisianski (chapter 53). Literally every green leaf on the island was devoured, except the tobacco patch. Without vegetation to hold the sand and to afford shelter for the birds the island quickly became an almost uninhabitable desert, and the great populations of birds were threatened with extinction.

On top of all this came the feather collectors, parties of Japanese who slaughtered great numbers of Laysan albatross and other birds for their plumage, with which to trim hats. Lovers of bird life in Hawaii complained to Washington, and in February 3, 1909, President Theodore Roosevelt, by executive order, set aside all of the islands from Kure to Nihoa, with the exception of Midway, as the Hawaiian Islands Bird Reservation, a sanctuary within which it is unlawful to kill or molest the birds. Thus, when a party of Japanese poachers landed on Laysan and Lisianski in the spring of 1909, they were promptly arrested by the revenue cutter Thetis and taken to Honolulu for trial.

In 1911 a scientific party from Iowa State College visited Laysan to study the bird life and gather material for what has been made a splendid habitat group of sea birds. The party consisted of Professor Homer R. Dill, H. C. Young, C. J. Albrecht, photographer, and C. A. Corwin, artist, who spent 42 days on the island, and William Alanson Bryan, who joined the party for six days. The Thetis took the party to Laysan on April 24 and called for it again June 5.

Professor Bryan, at the time of his previous visit to Laysan in 1902, had estimated the bird population as close to ten million. In 1911 his estimate was about a tenth that much. This was born out by the actual bird census made by the Iowa party. They found the number to be 1,016,224, by species as follows: sooty terns, 333,900; grey backed terns, 50,000; noddy terns, 5,500; Hawaiian terns, 3,000; white terns, 75; Laysan albatross, 180,000; black-footed albatross, 85,000; Bonin Island petrels, 1,000; Sooty petrels, 3; red-tailed tropic birds, 300; bluefaced boobies, 65; red-footed boobies, 125; Christmas Island shearwaters, 75,000; wedge-tailed shearwaters, 100,000; frigate or man-o'-war birds, 12,500; Laysan teal, 6; Laysan flightless rails, 2,000; wandering tattlers, a very few; bristle-thighed curlew, 250; Pacific golden plover, 2,000; turn-stones,

2,500; Laysan honey eaters, 300; Laysan finches, 2,700; and a few miller birds. (These do not add up to the total given.)

Various other scientific expeditions visited Laysan. The first of these was Henry Palmer's visit in June, 1891, collecting birds for the Hon. Walter Rothschild of Tring, England. This collecting trip formed the basis of the first volume of Rothschild's Avifauna of Laysan and the neighboring islands, published in London in 1893. George C. Munro, of Honolulu, was Palmer's assistant, and he has penned an interesting account of his ten days observations on the island in "Myriad-nested Laysan", Asia for October, 1930, as well as numerous notes in issues of the Elepaio, official organ of the Honolulu Audubon Society.

The next scientific visit was that of Dr. H. H. Schauinsland, in 1896. He collected many interesting specimens, most of which were worked upon by German scientists. He described his visit in an entertaining little book, "Drei Monate auf einer Koralleninsel", published in Bremen in 1899.

The U.S. Fish Commission's ship Albatross visited Laysan in 1902, and a very complete record of the bird life is presented by Dr. Walter K. Fisher, in the Fish Commission Bulletin for 1903.

Carl Elschner presents observations in 1915, especially an analysis of the salinity of the lagoon, which he found to be 9.1% chlorides of sodium and potassium.

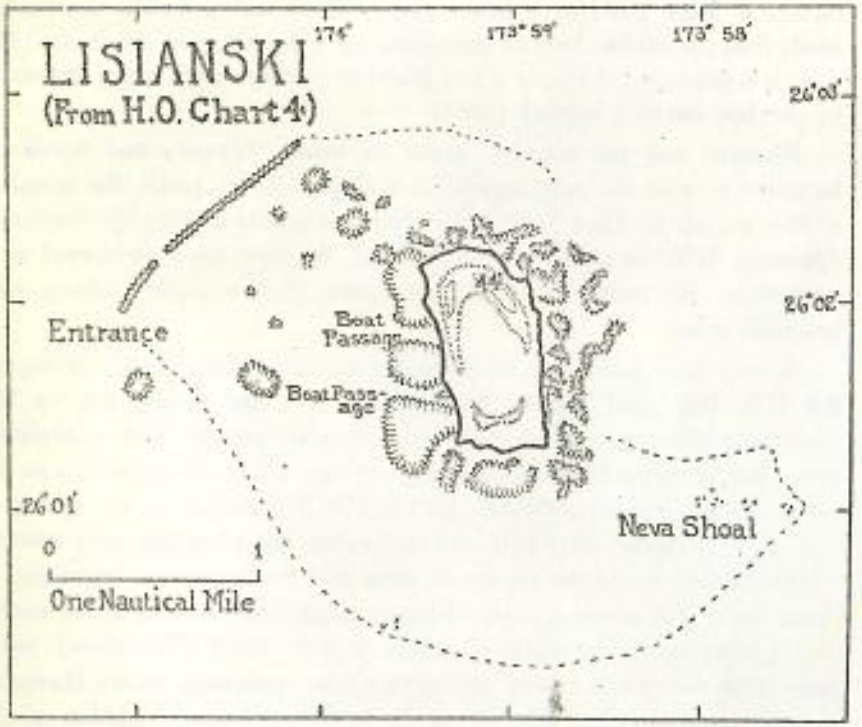
The Tanager Expedition parties spent more than a month on Laysan during the spring of 1923. This expedition was sponsored jointly by the U.S. Biological Survey, the Navy Department, and B. P. Bishop Museum. One of its main objects was to kill off the remaining rabbits, which was done. The scientists found that the island had been transformed into a desert of sand. Only four species of plants remained of the 26 species previously reported. A report on the vegetation in Bishop Museum Bulletin 81, also summarizes the earliest notes made by C. Isenbeck, physician on the Moller in 1828, and later accounts.

Fish have been reported as extremely abundant about Laysan. Crawfish and other forms of marine life also abound along the reef. Large turtles, formerly common along the beaches, still visit the island occasionally to lay eggs and sun themselves. This was the type locality for the native Hawaiian seal, *Monachus schauinslandi*, now rare. Max Schlemmer reported killing seven during fifteen years residence on the island.

Of insects, the species which breed in dead birds are especially abundant. These include blow flies, ants, and dermestid beetles, which must have been exceedingly abundant at the time that hundreds of thousands of birds carcasses were thrown out on the sands to rot. They were reported as very troublesome in 1911, and they came back in numbers in the packages of specimens collected by the Tanager Expedition.

Now that the enemies of the island are no more, and that new plants have been set out to take the places of those which became extinct, the island is beginning to "comeback". A scientific party, return on Templeton Crocker's yacht Zaca, in December, 1936, reported that conditions, while not yet back to pre-poacher and pre-rabbit optimum, were greatly improved. So we have hopes that, after many misadventures, Laysan once more may become a "Paradise Isle of the Hawaiian Islands Bird Reservation."

CHAPTER 53
Lisianski Island*



Lisianski Island lies about 905 nautical miles northwest of Honolulu and 115 miles west of Laysan, its nearest neighbor. It is a low, flat sand and coral island, about a mile and a quarter long, north and south, by three-quarters of a mile wide. A V-shaped ridge of sand on the northern half, reaches a height of 30 to 40 feet. On the south is a narrow crescent of sand dune, 20 feet high. Between is a depression, lower even than the rim, ten feet above sea level, which surrounds the island. Formerly this basin is thought to have contained a lagoon or shallow lake. The island is situated on the northern edge of a large reef platform which extends several miles to the south.

(* Paradise of the Pacific, vol. 36: no. 2, pp. 31, 33, Feb. 1924.)

The spelling Lisianski (not Lisiansky) was officially adopted by the United States Geographic Board, October 1, 1924. Other names by which the island has been called include: Pell, Lassion, and Sapion; and Laskar, Lasan Rays, and Neavas also probably apply.

The island was discovered at 10:00 p.m. on October 15, 1805, when the Russian exploring ship *Neva*, commanded by Captain Urey Lisiansky, grounded on one of its reefs on the eastern side. Only by throwing overboard the guns and other heavy objects was the vessel refloated. Hardly were they again in deep water when a sudden squall once more drove them onto an even more dangerous reef. By discarding cables, anchors, and the rest of their heavy objects, the *Neva* again was floated before the evening of the 17th. The next day, fortunately, was calm and all the heavy articles were recovered safely.

Going ashore on the 18th, Captain Lisiansky found numerous birds, large seals, turtles, and quantities of fish. The sandy surface, he noted, was full of holes (shearwater burrows) which were concealed by creeping plants. No fresh water was found. A quantity of shells, coral, sponges, and other specimens was collected, and huge redwood logs were seen on the beach. In his journal Captain Lisiansky says that "this island promises nothing to the adventurous voyager but certain danger." He concludes his account of it by saying: "To the southeast point of the bank where the vessel grounded, I gave the name of Neva; while the island itself, in compliance with the unanimous wishes of my ship's company, received the appellation of Lisiansky."

A dangerous shoal, 7½ miles S.E. by ½ S. from the east side of the island, was reported by Captain Stanikowitch in 1827.

Captain John Paty, in the course of an exploring expedition to the islands N.W. of Oahu, on the Hawaiian schooner *Manuokawai*, visited the island on May 11, 1857. He reported the surface covered with coarse grass, and also the finding of fresh water by digging five feet at the center of the former lagoon basin. Birds, fish, seal, and turtle, he said, were abundant, but not so plentiful as at Laysan. He gave directions for approaching the island from a point west of the south end, steering into a lagoon-like area within the reef through a narrow break marked by two large patches of breakers, north and south of each other and three quarters of a mile apart. Within the reef and in the lee of the island good anchorage was to be found in 4 to 8 fathoms of water one half to one and a half miles from the beach. The detached rocks which surround the island and

which are numerous in this lagoon-like area, make a careful lookout necessary. On the island he found some wreckage on which the name "Holder Borden" was carved. This vessel was wrecked in November, 1844, on what was called Pell's Island. As no island has been found in the position given by Captain Pell of the whaling ship *Delaware*, it has been concluded that Pell and Lisianski were one and the same.

In 1859 Lisianski was visited by Captain N. C. Brooks, in the Hawaiian bark *Gambia*. He furnishes navigators with considerable information about the surrounding reefs: A bank extends several miles to the south, shoaling from 19 to 8 fathoms near the reef. The island should not be approached from the south, Brooks states. On the east and north sides the reef is about a mile from the island. On the west it extends in a curve to 2½ miles, with a lagoon within. The *Conahassett*, as well as the *Holder Borden*, was lost on this reef, according to Brooks. He recommends that the best approach is from the north and west, and gives detailed directions. A two-foot tide was reported, as well as a strong current, the direction depending upon the wind. The low, southern part of the island, he said was overgrown with shrubs (which probably means *Scaevola*). He reported finding a notice, dated April 27, 1859, left by the ship *San Diego*, taking possession of the island for parties in San Francisco.

On June 29, 1891, Captain F. D. Walker visited Lisianski in the schooner *Kualokai*. He reported in his entertaining "Log" that much of the island was covered with low scrub brush, behind a beautiful sand beach 100 feet wide. Seals were sleeping on the beach, large mullet swam in shoals, everywhere, and bird life was plentiful. "The island is a little paradise, or could be made one, at a moderate cost," he writes. He estimated that a thousand tons of good guano remained in the dry lagoon. Contrast these accounts with reports of conditions a quarter of a century later.

The island was leased by the Hawaiian kingdom to the North Pacific Phosphate and Fertilizer Company for 20 years from March 29, 1890. Carl Elschner, who visited the island in 1915, reported that some guano had been shipped, but only the best, much phosphatized sand and soil remaining in the depressed area.

At some time prior to Elschner's visit, rabbits had been introduced, probably from Laysan, whence they had been brought by Max Schlemmer. Left to themselves and without enemies, the rabbits had thrived for a time,

multiplying in geometric proportion, as rabbits can. Soon the food supply began to be inadequate for the huge population. Writing in the Honolulu Advertiser for June 1, 1923, the late Lorrin A. Thurston presents a vivid picture of what must have taken place. There was a frantic search for food; then the rabbits became cannibals, the old devouring the young. He depicts a grewsome scene of a last newborn skinny rabbit being devoured by the last starving mother rabbit.

Elschner saw the island at about its worst. "Dreary and desolate," he called it, with the only vegetation a single tobacco patch, the remnant of that set out by Max Schlemmer, and two poorly-looking specimens of *Ipomoea*. With no plants to hold the sand, the birds were threatened with extinction. No fresh water was obtainable, shallow wells yielding only brackish water.

It may have been this, or a similar account, which finally prompted the U.S. Biological Survey, custodian of the bird reservation, to "do something about it." They cooperated with Bernice P. Bishop Museum and other scientific institutions in Hawaii in sending an expedition to the northwestern Hawaiian islands, on the U.S.S. *Tanager*, in the spring of 1923. Many rabbits were killed off on Laysan, but when the party reached Lisianski they found the rabbits all dead and the vegetation beginning to come back. There was a patch of bunch grass (*Eragrostis*) at the northwest corner and a few scattered plants of pickle weed (*Sesuvium*), purslane (*Portulaca*) and a local variety of a low, branching, native Hawaiian annual (*Nama*). The late Gerrit P. Wilder, honorary warden of the bird reservation, planted seeds of *Barringtonia* trees at that time, but none is known to have survived.

The only other important event in Lisianski's history has to do with the slaughter of birds. The trouble began (or rather, first became noticed officially) early in 1904, when a party of over 75 Japanese landed on the island. The presence of the party was reported by Captain Niblack of the U.S.S. *Iroquois* in April, 1904, and the U.S. Revenue Cutter *Thetis*, Captain O. C. Hamlet, was dispatched on May 8, to bring them off. It reached Lisianski June 16, and found the party well housed in four thatched-roof shacks, but with only a little rice and dried tern meat left, and consequently not at all unwilling to leave. Several hundred packages of dried bird's wings could not be removed at the time and were left on the island.

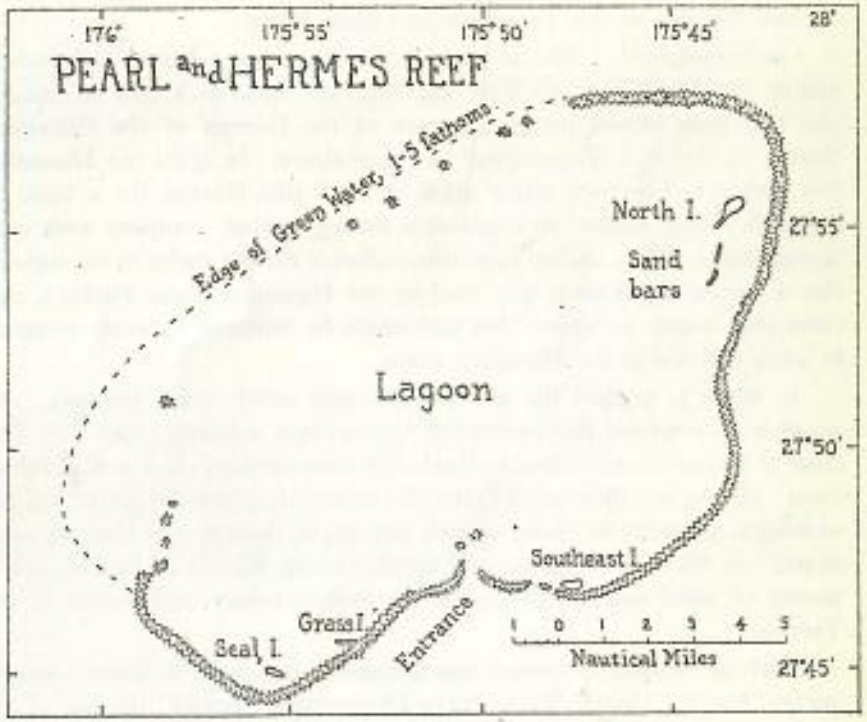
The leader of the bird poachers told Acting Governor Atkinson that the party had been stranded on the island when the schooner, *Aju*, sank. He said that they had put up a signal of distress, seen by the *Taiyo Maru*, which had spared them some provisions and removed one of their party. With such a story, and as no law was found which protected the birds, there was no prosecution. Both the Territorial and the Federal Governments thought that they ought to claim the bird feathers, which were valued at $20,000; but before Captain Weisbarth, who had been sent to get them, could reach the island, they all had been removed, probably by the schooner *Wiji Maru*, which had been active in bird-killing, and had been warned away from Midway in June. This vessel later was wrecked on Pearl and Hermes Reef, part of the crew being found on Lisianski in September, 1904, together with part of the crew of the *Tanzi Maru*.

Reports of such slaughter of birds stirred up extensive interest in bird protection. An appeal was made to Washington, and in 1909 President Theodore Roosevelt initiated a joint resolution in Congress, which set aside the islands from Nihoa to Kure, with the exception of Midway, as the Hawaiian Islands Bird Reservation.

So it was that, when the U.S. Revenue Cutter *Thetis* visited these islands in January, 1910, and found 15 Japanese bird killers on Laysan and 8 on Lisianski, they were promptly arrested, brought to Honolulu on February 2, and turned over to the United States Marshall, charged with poaching.

Today, with poaching at an end, the rabbits exterminated, and the vegetation again spreading over its low sandy surface, Lisianski once more is becoming a populous bird sanctuary.

CHAPTER 54
Pearl And Hermes Reef*



The discovery of pearl oysters in the lagoon of Pearl and Hermes Reef, by Captain William Greig Anderson in 1927, did more to put this lonely atoll on the map of the Hawaiian archipelago than any other event during the 105 previous years of its history. "Bill" Anderson was the skipper of the *Lanikai*, an auxiliary schooner engaged in catching fish for the Hawaiian Tuna Packers. His finding a large bed of a species of pearl oyster which has been named *Pinctada galtsoffi* opened up a new but short-lived industry for the Territory. A new concern, the Hawaiian Sea Products Co., Ltd., was quickly organized. They purchased the

(* Paradise of the Pacific, vol. 49: no. 10, pp. 19, 30, Oct. 1937.)

Lanikai. With permission of the Governor of Hawaii they erected several buildings on one of the small islets in the lagoon, and with the help of Filipino divers they gathered several tons of pearl shells. These were brought to Honolulu, about 1,100 miles away, and sold to manufacturers of pearl buttons in San Francisco and New York.

On February 3, 1909, as part of the Hawaiian Islands Bird Reservation, Pearl and Hermes Reef had been set aside as a bird sanctuary, and had been placed under the care of the Bureau of the Biological Survey of the U.S. Department of Agriculture. In 1929 the Hawaiian Sea Products Company made application to this Bureau for a lease to the atoll. They wanted to establish a fishing station, complete with cold storage plant. They wished to obtain exclusive fishing rights to the lagoon. But a similar application was filed by the Hawaiian Tuna Packers, and there was reason to believe that this might be followed by other requests to work lagoons in the Hawaiian chain.

In order to protect the newly discovered pearl oyster bottoms from possible destruction, the Territorial Government requested the U.S. Bureau of Fisheries to outline methods for their conservation and development. Acting on their advice, the Territorial Legislature passed an act making it unlawful to "take, collect, molest, or destroy any kind of pearl oyster" in Hawaiian waters, and appropriating $2,500 to provide for a survey of pearl oyster fisheries in the waters under jurisdiction of the Territory.

Such an amount of money was altogether too small to finance such a survey, but the United States Navy Department "loaned" the use of the U.S.S. *Whippoorwill*; the Bureau of Fisheries made their expert, Dr. Paul S. Galtsoff, available; and with the assistance of two Honolulu boys, Northrup S. Castle and John F. Reppun, and two Filipino divers, who previously had been employed in the lagoon, the survey was made during the summer of 1930.

An entertaining account of the survey and its findings can be read in Dr. Galtsoff's report, which was published by Bernice P. Bishop Museum as Bulletin 107, 1933. Only the recommendations which resulted need be recounted here. These were:—

"1. To forbid commercial fishing for pearl oysters in Pearl and Hermes Reef for a period of not less than five years. 2. To resurvey the bottom of Pearl and Hermes Reef in 1935. 3. To establish at Pearl and Hermes Reef a pearl oyster reserve from which oysters could be taken

only by permission of the Government and exclusively for the purpose of transplantation and cultivation. 4. To continue biological observations on the rate of growth, spawning, and setting of this species. 5. To employ a marine biologist capable of carrying out these studies. 6. To encourage the cultivation of pearl oysters in the Territory of Hawaii by private citizens." Most of these have been forgotten. Thus ended, for the time, the pearl oyster industry begun at Pearl and Hermes Reef. But the oysters are still there, and some day they may be sufficiently abundant to allow some to be harvested.

The rest of the atoll's history is not at all spectacular, except for its curious discovery on the night of April 26, 1822. According to the account published in *The Friend* for October, 1876, page 86, the *Pearl* and the *Hermes*, two English whalers, were cruising these waters in company. On that fateful night both ran aground on the reef within ten miles of each other. The crews of both ships made their way to one of the small islands in the lagoon and established a camp. After much labor and many hardships, they built out of the wreckage a 30-ton vessel which they named the *Deliverance*, and navigated it safely to Honolulu. The carpenter, James Robinson, later established a shipbuilding business at what is now part of Pier 13. He built Robinson's wharf, and was the first of a distinguished Honolulu family.

Captain John Paty visited the atoll, May 19-20, 1857, mapping it and determining its position. Captain N. C. Brooks, cruising in the bark *Gambia*, in 1858, stopped and made observations, reporting 12 small islands. In 1867 the atoll was surveyed by the U.S.S. *Lackawanna*, producing a chart which shows but two islands.

On February 15, 1894, it was leased by the Provisional Government of Hawaii for a period of twenty-five years to the North Pacific Phosphate and Fertilizer Company, which made little use of it. On February 3, 1909, it was made part of the Hawaiian Islands Bird Reservation. In 1912 it was visited by the U.S. Revenue Cutter *Thetis*. Carl Elschner, a chemical engineer who accompanied this trip, makes various geological observations in a popular account published serially in the Honolulu Advertiser in 1915 and reprinted as a 68 page booklet. He makes the statement that the sand islets in the lagoon seem constantly to be shifting in number, structure and location, the highest having an elevation of but twelve feet.

In April, 1923, Pearl and Hermes Reef was visited and explored by a scientific party on the U.S.S. *Tanager*. Dr. Alexander Wetmore, then of the U.S. Biological Survey Bureau studied the birds while several Honolulu scientists collected plants, insects, and marine animals. The reef and lagoon were mapped, showing four islets with vegetation and several sand spits. This map differs in several respects from that reproduced with this chapter, which is adapted from the maps published in Dr. Galtsoff's report. Scientific reports concerning this expedition were published by Bernice P. Bishop Museum.

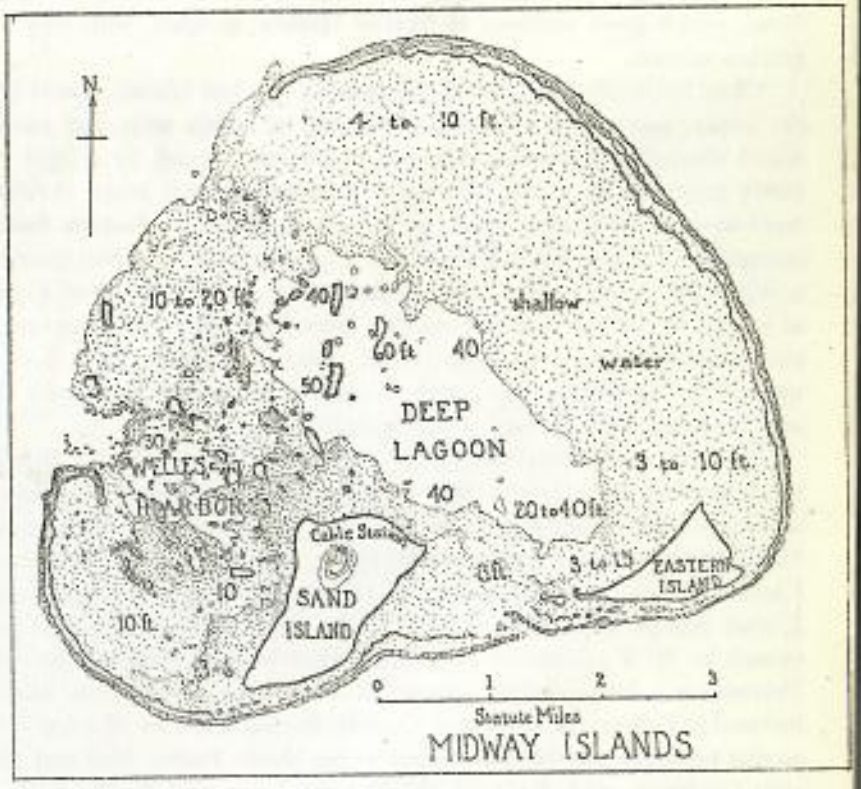
The reef encloses a lagoon which measures seventeen miles long by ten miles wide, or about 43 miles in circumference. The reef is continuous on the east side, but on the south there are some breaks: the main entrance, deep enough to admit small vessels, at least a short way into the lagoon, and a pass for small boats near the Southeast Islet. The northwestern third of the rim consists of a line of coral head and patches of reef, interspersed with deeper water. Within the lagoon are depths up to 104 feet, with extensive reef formations, some extending for two or three miles in a nearly straight line, others forming miniature atolls.

The islets are devoid of trees, except for some ironwoods (*Casuarina*) planted in 1928, which may not have survived. In 1923 the three southern islands were found to be very small, hardly more than ten feet high, supporting only bunch grass and low herbs. North Island, although larger, had on it only the same kinds of plants, eleven species in all. There was a slight depression in the eastern part of southeast island in which fresh water collected after rains: Brackish water could be obtained by digging shallow wells.

The sand bars were bare of vegetation, and appeared to be constantly shifting their position under the action of wind and wave.

The rich marine life was studied by the Tanager Expedition in 1923; by Dr. Galtsoff in 1930, and by Dr. Victor Pietschmann, a Bishop Museum fellow from Vienna, in 1928.

CHAPTER 55
Midway Islands*



Midway Islands have become the most famous locality in the northwestern part of the Hawaiian archipelago. This atoll crowns the summit of one of the last peaks in this huge mountain chain. It is 1150 nautical miles (1300 statute miles) northwest of Honolulu, 90 miles beyond Pearl and Hermes Reef, and 50 miles east of Kure, the final island of the chain.

The atoll consists of a nearly circular rim of coral reef, about 5 miles in diameter, enclosing a lagoon, the central portion of which ranges in depth from 25 to 50 feet, surrounded by a considerable expanse of shal-

(* Modified from Paradise of the Pacific, vol. 50: no. 6, pages 7, 29, 30, June, 1938.)

lower water. Much of the reef, especially on the northeast, forms a continuous flat-topped wall, six to fifteen feet wide and standing some five feet out of the water. Some of it consists of irregular rocks, just about reaching the surface, and the west side, to the north of Seward Road, which gives entrance to Welles Harbor, is open, with only a few patches of reef.

Close to the southern rim of the atoll lie two low islands. Sand Island, the larger, measures a mile and a half long by a mile wide, and has a hill which reaches a maximum elevation of 43 feet, topped by a light. Formerly composed of nearly bare sand, man has planted grass, shrubs and trees upon it until now much of it is well wooded. Eastern Island is triangular in shape, about a mile and a quarter long by three-quarters of a mile wide. Composed of more compact soil, it has supported a growth of low scrub, including native species, since long before its discovery, and consequently it has been called Green Island. Between these two there used to be a small passage, with a break in the south reef, such that a row boat might get through into the lagoon.

Midway was discovered July 8, 1859, by Captain N. C. Brooks of the Hawaiian bark *Gambia*, and by him called Middlebrook Islands. An account of this discovery, reprinted from the Polynesian of August 13, 1859, appears in the Paradise of the Pacific for October, 1936, on page 23. Captain Brooks took possession of the two islands in the name of the United States, a peculiar proceeding in view of the flag of his vessel, owned by B. F. Snow of Honolulu. Had he given the editors of the Polynesian a less glowing account of the new discovery, we would be inclined to believe the story that Captain Brooks kept the discovery secret so that he might sell the information to the North Pacific Mail and Steamship Company, who were on the lookout for a mid-Pacific coal depot for their vessels on the oriental run.

However that may be, the Pacific Mail Steamship Company did learn about the atoll, and eight years later succeeded in having the American government send the U.S.S. *Lackawanna* to make a careful survey. With considerable ceremony, on Wednesday, August 28, 1867, in compliance with the orders of the Secretary of the Navy, formal possession was taken of what was termed Brooks' Island. Wrote Captain William Reynolds, commander of the *Lackawanna*:

"It is exceedingly gratifying to me to have been thus concerned in taking possession of the first island ever added to the dominion of the United States beyond our shores, and I sincerely hope that this will by

no means be the last of our insular annexations. I ventured to name the only harbor at this island after the present Honorable Secretary of the Navy [Welles], and to call its roadstead after the present Honorable Secretary of State [Seward]."

In 1870 the United States Congress appropriated $50,000 to be spent in blasting a 600-foot wide ship channel through the reef into the lagoon, doubtless at the insistence of the Pacific Mail Steamship Co., and based on observations made by the *Lackawanna*. The U.S.S. *Saginaw* was detailed to carry divers and equipment to Midway, arriving there on March 24, 1870. Dredging operations proceeded during the summer of 1870, but weather was so bad that at the end of seven months little had been accomplished, the funds were nearly exhausted, and the project had to be given up.

The story of how the *Saginaw* was wrecked on Kure Island, on its way back to Honolulu, is told in chapter 56. A full account of this has been given by George H. Read, in his book the "Last cruise of the *Saginaw*."

On November 16, 1886, the little fishing schooner *General Seigel*, Captain Jacobsen, at anchor in Welles Harbor, was hit by a sudden gale and went to pieces on the reef. The gruesome adventures of its seven castaways, and how one of their number, Adolph Jorgensen, was left behind by his companions, is a well-known story, made famous by "John Cameron's Odyssey." So also is the story of the manner in which, when Jorgensen was about to be rescued by the 467-ton schooner *Wandering Minstrel*, that vessel also was wrecked in almost the same spot. Five of the crew made off in one of the boats and were never heard of again. John Cameron, Jorgensen, and a Chinese boy, in another of the boats, succeeded in making the trip from there to Jaluit via Mille Island, 1540 miles away in the Marshall Islands. Captain F. D. Walker, his wife, three sons, and the remainder of the crew, who didn't die, lived for fourteen months on the islands until rescued by the fishing schooner *Norma*, March 16, 1889, and returned to Honolulu, April 7, 1889. If we believe John Cameron's Odyssey, Captain Walker appeared to have intentionally wrecked the *Wandering Minstrel* on Midway, and Jorgensen was not such a bad fellow, just a little *pupule*. On the other hand, if we accept the statements of Captain and Mrs. Walker (one version of her account appears in the Paradise of the Pacific for November, 1936, pages 27-29), Jorgensen was a killer, and Cameron was but little better.

Naturalists visited Midway around the turn of the century: Henry Palmer, bird collector for Hon. Walter Rothschild, in July, 1891; and William Alanson Bryan, in August, 1902. The latter gives the last account of observations made on the island prior to the Cable Company installations, made later that same year and during 1903.

The schooner *Julia E. Whalen* was wrecked on Midway, October 22, 1903, while bringing supplies to the newly established cable station. The British bark *Carrollton*, with a load of coal from Newcastle for Honolulu, was lost on Midway, December 28, 1906. The crew was rescued by the cable ship *Restorer*. The Pacific Mail S.S. *Mongolia* went aground on the western side September 16, 1906, but succeeded in getting off again even before the arrival of the ships *Buford, Iroquois*, and *Restorer*, which went to her aid from Honolulu.

One might ask why so many wrecks have occurred on Midway. The reason is that the atoll is very low and hard to see, and also that it is subject, especially in the winter, to sudden and severe storms. Although only about 400 miles further north than Honolulu, Midway is no longer in the tropics, and has a much more temperate climate, which in winter becomes quite cold. This, together with the heavy winds, which drive loose sand into every nook and corner, rule out this island as a winter resort. But in summer the climate is delightful. The position of Midway is given as 28 degrees 12 minutes 52 seconds north latitude and 177 degrees 22 minutes 46 seconds west longitude.

Perhaps the outstanding fact about the natural history of Midway is the great change which Sand Island has undergone through the efforts of man. When the cable station was established there were no trees or shrubs and scarcely any herbs on the island to hold the shifting sand in place. Daniel Morrison went to Midway as superintendent of the cable station in 1906, remaining until 1921. He imported a coarse grass (*Ammophila arenaria*) from the wind-swept beaches near San Francisco, and with it succeeded in holding the sand in place. He set out ironwood trees (*Casuarina equisetifolia*) in 1907 as windbreaks, and numerous other kinds of ornamental and useful trees, shrubs and herbs. Ship loads of soil (an estimated 9,000 tons) were brought from Honolulu and used to encourage the 3-acre vegetable gardens and other useful growth. Mr. Morrison also imported canary birds and Laysan finches in 1906, and fostered the flightless rails, which also had been introduced from Laysan. The island has been turned into quite a beauty spot, with livestock, poultry, lawns, and airy spacious quarters for the cable personnel, and now a

good hotel to attract the visitor, who also might be interested in the excellent fishing.

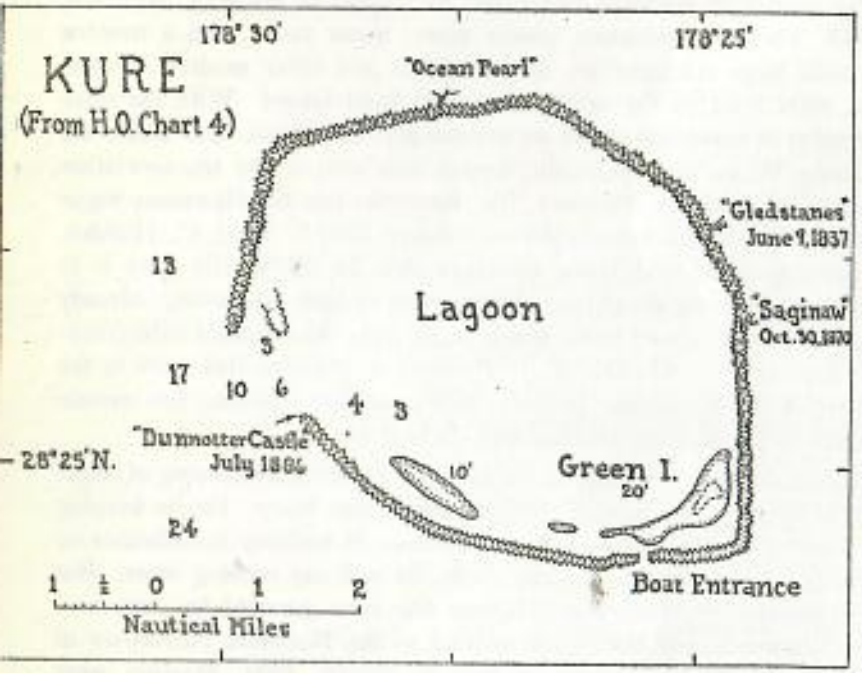
The *Tanager* expedition, which explored the northwestern Hawaiian islands in 1923, obtained a few specimens from Midway. To these have been added notes and specimens by Dr. D. R. Chisholm and others. The writer has a lengthy record of the plants, birds, insects, and fishes of the island and its adjacent waters, some of which have been published in Bishop Museum Bulletins 26, 27, 31, and 81, and other publications.

Pan American Airways established an airport at Midway, beginning in 1935. Shops, warehouses, power plant, water tanks, and a modern hotel with large refrigerators, electric lights and other modern conveniences, were built on the northeast end of Sand Island. With the commencement of rapid and direct air service between Manila and California via Guam, Wake, and Honolulu, danger was seen of the transportation of insect pests and plant diseases. To counteract this the Hawaiian Sugar Planters' Association established an "insect filter." Fred C. Hadden, entomologist, went to Midway on November 24, 1936. His duty is to inspect and fumigate the clipper planes going in both directions. Already he has headed off insect pests which might have done considerable damage to agriculture in Hawaii. C. E. Pemberton describes this work in the Paradise of the Pacific for January, 1937; and Mr. Hadden has written an interesting article on Midway and its bird life.

During the past few years there has been a sudden awakening of interest in Midway on the part of the U.S. Army and Navy. But in keeping with our decision not to include any mention of military installations or of efforts of the enemy to destroy these, we will say nothing more. But this is not the first time that Midway has been guarded by American forces. Edwin North McClellan, writing in the Honolulu Advertiser of September 16, 1927, reminds us that in March, 1904, Marines were ordered to Midway to "protect property and guard the cable employees from marauders who might visit the islands to kill the sea birds." A detachment arrived on Midway on May 2, 1904, and set up two six-pounders; but they were withdrawn in the spring of 1908.

By Executive Order, dated February 14, 1941, Midway was made a national defense area. It had been under the jurisdiction of the United States Navy Department since January 20, 1903; and never officially had been part of the Territory of Hawaii. But it is a vital link in the national defense.

CHAPTER 56
Kure Island*



Kure, more familiarly known as Ocean Island, is the northwestern-most island of the Hawaiian Archipelago. It is 1200 miles northwestward of Honolulu and 56 miles west of Midway Islands.

It is an atoll, circular in outline, the reef being about 15 miles in circumference or 6 miles in greatest diameter. There is an opening through the reef on the southwest side, but only small craft can enter. Along the south side of the lagoon are one small island and two sand banks.

Green Island is about a mile long by less than half a mile wide. It occupies the southeast corner of the lagoon. It is somewhat crescent-shaped, and is bordered all around by a nearly continuous line of sand

* Paradise of the Pacific, vol. 49: no. 8, pp. 12, 30, Aug. 1937.)

dunes, which rise steeply from the waters edge to a height of up to twenty feet above the sea. The dunes are highest on the northeast end, those on the south and east reaching an elevation of only about ten feet. Within there is a trough-like depression, the floor of which is about eight feet above sea level. The western point terminates in a long sand-spit.

The dunes and most of the interior of Green Island are covered with a dense, almost impenetrable stand of beach Scaevola, a much branching, coarse shrub, with large, glossy green leathery leaves, small white "half flowers", and pithy white fruits the size of small marbles. On Green Island this shrub reaches a height of five to six feet. The shrub is called "naupaka kai" by the Hawaiians, and is a familiar low beach plant on the main islands. It has been nicknamed "beach magnolia" by persons on Midway. It is an abundant, widespread littoral plant throughout the Pacific. Toward the eastern end there is an open grassy area of about twenty acres, surrounded by the barrier of Scaevola. Here are found most of the other species which make up Kure's flora of thirteen kinds of vascular plants.

Between Green Island and the lagoon entrance there are generally two other islets, lying close to the southern reef. They are low mounds of sand and broken coral, usually devoid of vegetation. In 1923, when the atoll was visited and explored by the Tanager Expedition, the more western was about a mile long by a quarter of a mile wide, and ten feet high. The shape of all three islets differ on maps made at different periods, such as that made by the U.S.S. *Lackawanna* in August 1867, and that by Captain Brown, of the ship *Gledstanes*, published in the *Hawaiian Spectator* for July, 1838. This would suggest that much shifting of sand has been done by storms.

The southern portion of the reef is scarcely awash at low tide. But most of the rest of its circumference is covered with a line of coral boulders which protrude above the water. The waves break heavily on the northern and eastern curve of the reef during normal trade wind weather. At such times vessels may anchor off the west side in eight to twelve fathoms of water. At times of storms the reef must present an awesome sight.

Captain Kure, a Russian navigator, is said to have discovered the atoll, but no authentic account of this is available. The British ship *Gledstanes*, Captain Brown, was wrecked on the weather side of the reef, July 9, 1837. The whole ship's company lived on Green Island

until December 15. Then Captain Brown and eight seamen sailed east-southeast in a schooner which they built with great toil from fragments of the wreck. After many hardships they reached Honolulu and, through the help of the British Consul, a vessel was sent to Kure which brought off the rest of the officers and crew. On September 24, 1842, the American whaleship *Parker* also was wrecked on Kure, the crew being rescued in a similar manner in May, 1843.

In the history of Kure the most remarkable shipwreck was that of the U.S.S. *Saginaw*. This vessel had been sent to Midway in March 1870, with a party of divers and engineers who were to dredge a passage through the reef into the lagoon. After the $50,000 appropriated by the United States Congress for the job had been spent, with the work only part done, the plan was abandoned. Before returning to San Francisco Captain Sicard decided to visit Kure to see if there had been any more shipwrecks on the island. The night of October 28-29 was clear and the wind fair, as the *Saginaw* steamed slowly across the intervening fifty miles, planning to arrive at daybreak. At 2:30 a.m. the engine was stopped. A short time later the lookout sighted breakers ahead, and the engine was started in reverse. But within a few minutes the steam connection burst, and in a very short time the helpless vessel had drifted onto the east reef. The waves pounded so hard that soon the hold was full of water, and at 5:00 a.m. word was passed to abandon ship. All of the 93 members of the crew and dredging party were gotten safely ashore, but comparatively little was salvaged from the ship before she broke up, except some water-soaked food and a small boiler, which later was very useful in distilling water. Lieutenant Talbot and a volunteer crew of four, two of whom were divers, set off in the specially decked and fitted Captain's gig. They made the voyage to Kauai in thirty days, after incredible suffering, having encountered three severe gales in which they lost their oars and provisions overboard. They were so weak that, in trying to get ashore near Hanalei the boat capsized and all but William Halford, the coxswane, were drowned. He succeeded in getting word to Honolulu, so that, through the kindness of the Hawaiian Government, the steamer *Kilauea* was dispatched on December 26, reached Kure on January 3, 1871, and brought the remainder of the party safely to Honolulu on the 14th.

The *Dunnottar Castle*, a British ship, was wrecked on Kure July 15, 1886. The crew managed to reach Kauai by boat, but several lives were lost in making a landing. As a result of this, King Kalakaua sent Colonel J. H. Boyd as his Special Commissioner to Kure. On September 20, 1886 he took possession of the island, then called Moku Papapa, for the Hawaiian government. The King caused a rude house to be built on the island, with tanks for holding water and provisions for any other unfortunates who might be cast away there. But the provisions were stolen within a year, and the house soon fell into ruins.

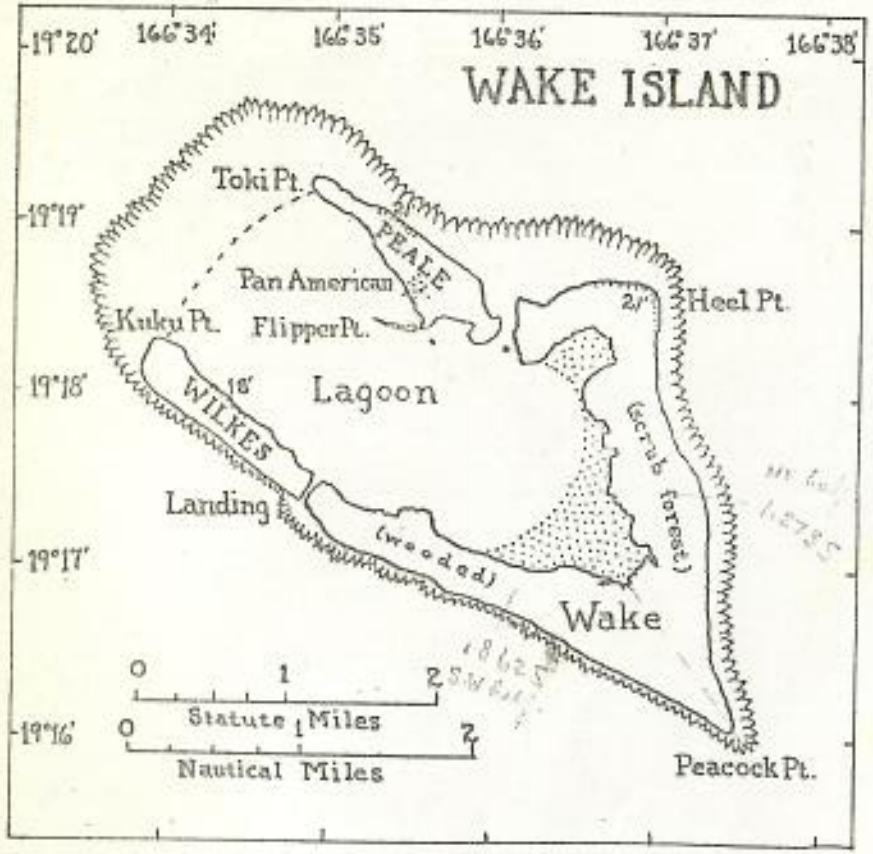
The provisional Government of Hawaii leased the island to the North Pacific Phosphate and Fertilizer Company for 25 years from February 15, 1894; but no extensive guano digging was done.

Kure was one of the islands acquired by the United States on July 7, 1898, when Hawaii became a Territory. In April 1909 it was made part of the Hawaiian Islands Bird Reservation.

Bird life is less abundant on Kure than on other islands of the chain. The island is overrun with rats, but they could hardly account for the scarcity of sea birds, as a peaceful balance generally is established between this kind of "Polynesian rat" and sea birds. The Hawaiian or hair seal, *Monachus schauinslandi*, was frequently found on Kure, and turtles are said to be common. Thirty-five species of insects were identified from specimens collected by the Tanager Expedition, which visited the atoll in April, 1923, and made a careful biological survey. The accounts of this survey are to be found in publications of B. P. Bishop Museum (see bibliography).

CHAPTER 57

Wake Island



Wake is a V-shaped atoll in the northwestern Pacific, north of the Marshall Islands and lying between Midway and Guam. No two authorities agree on its exact distance from other localities. Since Pan American has flown the distances between Midway, Wake and Guam many times, we will accept their figures for these stretches and add some of our own for two others:—

	Direction	*Nautical miles*	*Statute miles*
Wake to Honolulu	N.85° E.	2004	2308
Wake to Midway	N.60° E.	1029	1185
Wake to Guam	S.75° W.	1309	1508
Wake to Tokyo	N.55° W.	1723	1985

The atoll consists of three islets, Wake islet, the largest, on the southwest, has the shape of a V, the arms of which are about two and three-quarters land miles long. Each arm is continued as a separate islet, there being a narrow channel between it and the end of the arms of the V. The western ends of the two islets are connected by a sweep of flat reef, which continues as a narrow border around the three islets. Enclosed is a rectangular lagoon with depths up to fifteen feet. This measures about two and a half miles northwest—southeast by one and a third miles wide. The southeastern portion of the lagoon becomes shallower until it ends in a large expanse of hard white sand which dries at low tide. The entire atoll measures about two and a half by five miles.

Names were given to the two smaller islets by Dr. Alexander Wetmore and other members of the U.S.S. Tanager Expedition, on July 27, 1923. The southwestern islet they called Wilkes, in memory of Lieutenant (later Commodore) Charles Wilkes, leader of the United States Exploring Expedition, which visited and fixed the position of the atoll, December 20, 1841. The northwestern islet was named in honor of Titian Peale, artist with the same expedition.

The atoll also has been known as Halcyon or Helsion. According to Dr. William T. Brigham (Index to the Islands of the Pacific) it may have been the same as San Francisco Island, discovered by the Spanish explorer, Mendana, October 4, 1568. The official discovery, however, was made by Captain William Wake in the British schooner *Prince William Henry*, in 1796. The island was seen in 1823 by Captain Gardner, in the whale ship *Bellona*. He described it as being 20 to 25 miles long, with a reef extending two miles from the east end and with detached rocks on the west (probably those on the curving reef). He noted that it appeared well covered with trees. It was also seen by Capt. James Hunnewell from the *Mentor*, Dec. 29, 1824. Halcyon Island was said by Capt. Kotzebue to have been an American discovery, located at about 19° 23′ N., 165° 33′ E. But after unsuccessful search for it by Captain Sproule of the barque *Maria*, Captain Brown in the *Morning*

Star, and the U.S. Exploring Expedition, the conclusion was reached that Halcyon was the same as Wake. Captain F. W. Beechey, R.N., in H.B.M. ship *Blossom*, tried to locate Wake in March, 1827, but without success.

Following the careful mapping of the island by Wilkes in 1841, several vessels are recorded as having sighted Wake. These included Capt. Sproule, in the bark *Maria*, in 1858; and Dr. William T. Brigham "from the masthead of the ship *Oracle* in 1865."

On March 4, 1866, the Bremen bark *Libelle*, under command of Captain Tobias, went ashore on the east reef. On board were several prominent passengers and a cargo valued at over $300,000. Among the passengers were Madam Anna Bishop, Miss Phelan, M. Schultz and Charles Lascelles, of an English opera troupe, a Japanese traveller named Kisaboro, and Eugene M. Van Reed, whose account of the experiences appears in the Friend (Honolulu) for September, 1866. Following a hazardous night on the ship, during which waves broke over the vessel, passengers and crew were landed the following day with great difficulty through the breakers. After three weeks on the island, without finding source of food or water, it was decided to try to reach the Marianas Islands in open boats. On March 27 they set out, passengers in the 22 foot longboat, twenty-two persons, under command of the First Mate, and the Captain and remainder of the crew in the gig, with what provisions and water they were able to salvage. After thirteen days of frequent squalls, short rations, and tropical sun, the longboat reached Guam. The Captain with eight persons, in the twenty foot gig, were not heard of again, although a schooner from Guam went in search. The passengers were strong in their praise of the courtesies received from Francisco Moscoso y Lara, Governor of the Marianas Islands.

Several vessels went to Wake to salvage the cargo, which included several hundred flasks of quicksilver. The sloop *Hokulele*, with a party headed by T. R. Foster, left Honolulu May 9, 1867, reached Wake on May 31st, left there June 22, and returned to Honolulu July 29, with 247 flasks of quicksilver. A brig from China salvaged another 248 flasks at about the same time. Thomas Foster, Captain English, and eight Hawaiian divers landed at Wake from the Hawaiian schooner *Moi Wahine* in September, 1867. Three days after their arrival their schooner, with Captain Zenas Bent in command, mate Wight, and a crew of five, was driven to sea by a gale and not heard of again. The salvage party

was rescued by the English brig *Cleo*, Captain Cargell, in March, 1868, and returned to Honolulu on April 29, with 240 flasks of quicksilver, some copper, anchor and chain.

In 1883 the German warship *Leipzig* passed close to Wake and a careful determination of its position was made.

During the Spanish-American war, several vessels going to and returning from the Philippines stopped and raised the American flag. One of these, perhaps the earliest (according to the World Almanac), was July 4, 1898, by General F. V. Green, commanding the second detachment Philippine expedition, from the S.S. *China*. Another, also in July, 1898, was by General Merritt, from the U.S. Army Transport *Thomas*. This may have been made in the little cove near the eastern end of Wilkes islet, for on August 2, 1923, just inland from this landing place, the writer found a section of flagpole, about 18 or 20 feet long, on which was burned in block letters, "U.S.A.T. Thomas."

The formal annexation of the island by the United States took place on January 17, 1899, according to an account by Commander Edward D. Taussig in the Naval Institute Proceedings for June, 1935. He commanded the U.S.S. *Bennington* which made the voyage from Honolulu to Wake for that purpose. The landing was made in the cove noted above, and at 3:22 p.m. the American flag was hoisted by Ensign Wettengell and a salute of 21 guns fired from the *Bennington*. The position of the flagstaff was determined, from observations on the ship, to be: 19° 17′ 50″ North and 166° 31′ East. The account continues:

"After the salute was fired the flag was nailed to the masthead with batten, and a brass plate with the following inscription was screwed near the base of the flagstaff:

United States of America
William McKinley, President;
John D. Long, Secretary of the Navy.
Commander Edward D. Taussig, U.S.N.,
Commanding U.S.S. *Bennington*,
this 17th day of January, 1899, took
possession of the Atoll known as Wake
Island for the United States of America."

During the next decade an occasional American ship stopped, but there is very little recorded history. During this time the island was visited by Japanese poachers, collecting the feathers of sea birds for millinery purposes. Two camps were established: one on the eastern

end of Wilkes Islet, where the Tanager Expedition in 1923 found a single wooden shack and a grave; and one across the lagoon near the eastern end of Peale islet, where there was a more extensive camp. This is described in the writers field notes for July 31, 1923 as follows:

"Back to the Japanese camp for lunch." (It was good field practice to combine lunch eating with careful examination of particular spots, when possible). "The camp consists of the remains of two large frame buildings with galvanized iron roofs, about 18 feet wide, one 20 feet long, one 30 feet long; two smaller buildings; one tank, and one storehouse, raised on posts which are guarded with tin. Scattered about were a number of barrels, boxes, two large clay water jars, tin cans, and metal kettles. Saw part of a Sydney newspaper, a pile of oakum, bamboo frame with lath trays. There was also a boat, a little larger than a skiff. Made a copy of a Japanese inscription inside the bunk house." This later was translated to read something about leaving the island, with the date, November 13, 1908.

In 1912, the U.S.S. *Supply* stopped at Wake Island. A whaleboat landed some men who planted coconut palms brought there from Guam. No sign was seen of these in 1923.

The Tanager Expedition made an extensive biological survey of Wake from July 27 to August 5, 1923. Their camp was along the ocean beach opposite the landing place at the eastern end of Wilkes Islet. A map of the atoll was made by James B. Mann and Professor Harold S. Palmer, to which the writer added determinations of latitude and longitude, made from a boulder near the camp. Meanwhile soundings were made from the U.S.S. Tanager, under command of Lt. Comdr. Samuel Wilder King, now Hawaii's delegate to Congress. Although the vessel worked as near to the reef as it dared, at only one spot was it possible to reach bottom with 100 fathoms of line; this was about 1500 feet off Heel Point, where a sounding of 85 fathoms was made.

A total of twenty-one species of flowering plants have been found growing naturally on Wake. Much of the surface of all three islets was (in 1923) covered by scrub forest, twelve to twenty feet high. Some of the forest was so dense that one could not walk through it with speed or comfort. In places, such as the middle portion of the northern arm of Wake and the western ends of Wilkes and Peale, there were areas where the trees were lower and scattered and the undergrowth scrubby, as if here the sea occasionally broke across the rim at time of storms.

The dominant tree on the islands was the *Tournefortia* or tree heliotrope, now known to scientists as *Messerschmidia argentea*, a species widespread on Pacific Islands. It grows to a height of about 20 feet, with an umbrella-shaped canopy of rosettes of large leaves, covered with silvery hairs. Even larger in size, but confined to the northwestern end of Wake islet was the "buka" tree (so-called by the Gilbert islanders), *Pisonia grandis*, with massive trunks of very soft wood and sticky flowers and fruit. On Wilkes islet, and apparently spreading rapidly along the lagoon beach to the east and north, were tall, wiry bushes of *Pemphis acidula*. In the interior of Wake were small clumps of *kou* trees, *Cordia subcordata*, a hard wood tree, much prized in some regions for wood work, but here so scrubby as to be worthless.

Growing over trees, rocks and bushes, and forming tangles on the ground, was a kind of morning-glory vine, *Ipomoea grandiflora*. There also was a small clump of the goat's foot or beach morning-glory, *Ipomoea pes-caprae*, about the ruins of the Japanese camp on Peale islet. The rest of the undergrowth consisted of low shrubs, herbs, and grass. Some species, such as *Boerhaavia diffusa*, two kinds of purslane (*Portulaca lutea* and *oleracea*), *Lepidium*, and the *ilima* bush (*Sida fallax*), were of rather general distribution. Other kinds of plants were confined to certain places: pickle weed (*Sesuvium portulacastrum*) forming meadows at the head of arms of the lagoon, a few small patches of *Scaevola*, a single patch of a wild cotton (*Gossypium hirsutum* variety *religiosa*) east of the extreme northeastern bay of the lagoon, and beach heliotrope (*Heliotropium anomalum*) in places on the ocean beach. A small patch of tobacco, found near the Japanese camp was doubtless introduced. Two weeds, *Amaranthus graecizans* and *Phyllanthus Niruri*, collected since 1935, probably arrived with Pan American Airways parties, who also introduced several ornamental and garden plants. The three kinds of grass found on Wake are *Digitaria Gaudichaudii*, found native on Guam; the widespread wiry grass, *Lepturus repens*; and Bermuda grass, *Cynodon dactylon*, which follows man to far-away places.

The bird life on Wake consisted of about a dozen species of sea birds, half a dozen or more migratory species, and the flightless rail. The rail, *Rallus wakensis*, was the only native land bird, and was by far the most interesting species. It stood about 8 or 9 inches high, like a small cockerel or bantum rooster; upper parts dark ashy-brown, underparts similar, barred with white, and chin and upper throat whitish. It had wings about four inches long, but these were so soft as to have little or no power of

flight. It is not at all unlikely that since then this species has become extinct, due to the experiences through which the island has passed. In 1923 the sea birds were of the usual species: petrels, red-tailed tropic bird, boobies, frigate, and terns, already described for islands of the Hawaiian chain and the central Pacific. To the Pacific golden plover, bristle-thighed curlew, wandering tattler, turnstone, sanderling, and sandpiper, doubtless could be added other migratory species of the western Pacific.

Persons who lived on Wake complained of trouble with rats. The species studied in 1923 was a close relative of the Hawaiian rat, another of the *Rattus concolor* group, widely distributed in the Pacific. The extermination of this rat on Wake was made the subject of much study by the Department of Agriculture experts. Their work was complicated by the presence of the flightless rail, the status of which they did not want to disturb by trapping, shooting, or poisoning.

To those of us who camped on Wake in 1923, as much a pest as the rats were the hermit crabs. One large, red-legged species, *Dradanus punctulatus*, got into our provisions, ran off with our soap, and combined the activities of pack rats with those of being the garbage department for the island.

In a report on the insects of Wake (Bishop Museum Bul. 31, 1926), the writer enumerated 44 species. Some were native species, described as new by collaborators in that publication; others were species widespread on Pacific islands. Nearly all, except cockroaches, a sphinx moth, and the *Hypolimnus butterfly*, were rather small in size. None was harmful to man, there being no mosquitoes, blood-sucking flies, or venomous species, although a single drywood termite was found in one Japanese shack.

In 1940 additional specimens of insects were collected by Torrey Lyons, garden expert for Pan American Airways. These included such pests of garden crops as tomato loopers, a leaf-cutting bee, and scale insects, some of which followed man to the island.

In 1935 Wake Island was placed under jurisdiction of the U.S. Navy Department by Executive Order, and that same year Pan American Airways established a modern airport, using the south shore of Peale islet, just west of Flipper Point as the sight of pier, shops, water tanks, and modern hotel.

By Executive Order of President Franklin D. Roosevelt, dated February 14, 1941, Wake was made a national defense area. Its recent history is known around the world.

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