

BIRD LIFE AMONG LAVA ROCK AND CORAL SAND

The Chronicle of a Scientific Expedition to Little-known Islands of Hawaii

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With Illustrations from Photographs by Donald R. Dickey and the Author

WHEN the United States annexed Hawaii, in addition to the eight large, inhabited islands* that form the territory as the tourist sees it, a chain of islets that extend from the main group toward the northwest for more than 1,300 miles was also acquired (see map, page 79). Uninhabited by man, except for a cable station at Midway, these have been little known. In 1909, through the interest of former President Roosevelt, these Leeward Islands of the Hawaiian group were set aside as the Hawaiian Bird Reservation, and placed under control of the Biological Survey of the United States Department of Agriculture.

From time to time parties have visited Laysan, an important bird rookery, to study its wonderful bird life, and perhaps en route have landed for a few hours at one or two other points. On the whole, however, the group, from a scientific standpoint, has been unexplored.

Early in 1923 arrangement was made with the Navy Department for transportation and other assistance, and a co-operative expedition was organized by the Biological Survey and the Bishop Museum, of Honolulu, for a complete scientific exploration of these outlying islands. On April 4 a party of 12 left Honolulu on a thousand-ton Naval mine sweeper, the U. S. S. *Tanager*, for a four months' cruise.

Our party included a botanist, an entomologist, a geologist, a conchologist, an ornithologist, one or more collectors of fishes, miscellaneous marine animals, and plants, students of ruins left by man, a topographer, and one or two general assistants.

All had cameras, and, in addition, Mr.

* See "The Hawaiian Islands," by Gilbert Grosvenor, LL. D., in the NATIONAL GEOGRAPHIC MAGAZINE for February, 1924.

Donald R. Dickey, of Pasadena, Calif., an expert in motion and still photography of birds, accompanied the party to Laysan Island. As the representative of the Biological Survey, the direction of the work of the scientific party fell to me.

RELICS OF A VANISHED POLYNESIAN COLONY FOUND ON NIHOA

Though rough and inhospitable to the voyager (see page 76), the first island in the chain, Nihoa, proved of great interest.

Polynesians once had a colony of several hundred persons here. Level house platforms made of flattened stones rose one above the other in a little valley that, during rains, evidently contained water.

The steep slopes, now clothed with bushes, had been terraced with great labor to permit cultivation of the sweet potato and dry land taro, and a cave or two showed signs of ancient occupancy. In our excursions over the slopes we found a number of stone bowls fashioned from porous volcanic rock.

Legend runs that in early times a fisherman living on Nihoa had a beautiful daughter, desired by a prince of Kauai. When the latter came to claim her, the girl ran up the steep cliff paths, the prince in pursuit. At the ragged border of the *pali* (cliff) she stopped and cried: "If you touch me I shall jump." But the prince, unable to control his ardor, stretched out his hand to seize her.

Instantly the girl sprang to her destruction, while the prince was turned to a leaning stone, which still stands on the brink of the precipice, where it may be viewed in corroboration of the story!

Small groves of a slender palm grew in some of the gulches, while a scrubby, woody-stemmed plant allied to our common lamb's-quarters clothed the slopes.

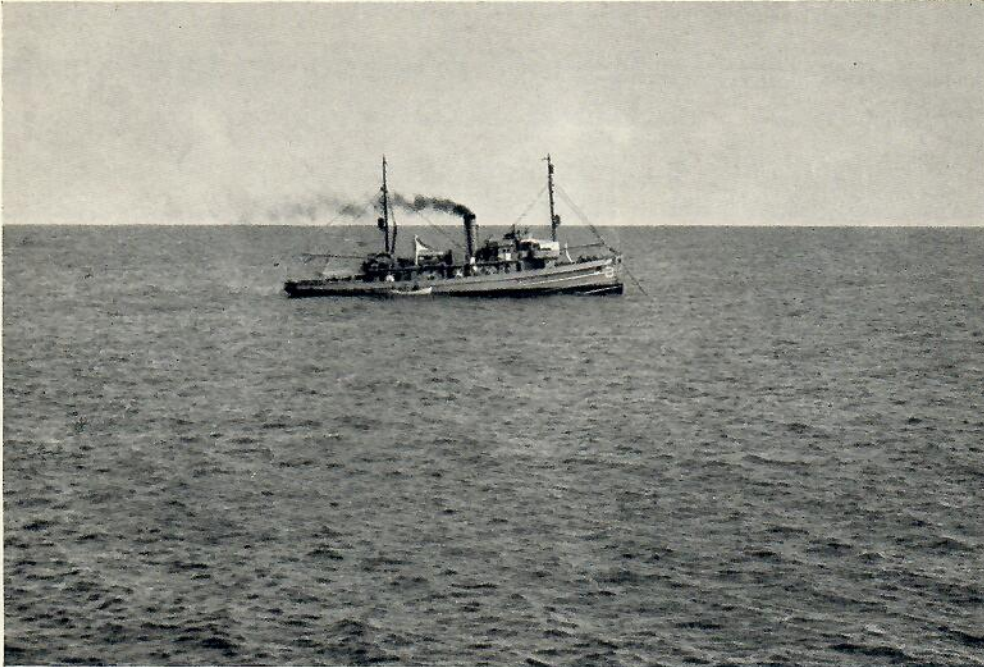
In these were flocks of the saucy Nihoa



Photograph by Alexander Wetmore

THE LANDING ROCK ON NIHOA (SEE PAGE 77)

In modern times few persons have succeeded in getting safely ashore on this rugged island, 270 miles from Honolulu. The landing of men, food, and equipment for scientific work required judgment and skill on the part of the officers and men of the *Tanager*. It was safe to approach the landing rock only as the surf welled slowly in, when bundles were tossed to the man on the rock and passed up the waiting line behind, while the surfboat backed away to safety. At frequent intervals huge waves, threatening destruction, broke over the party, submerging the entire rock shelf. On this island the expedition found the saucy Nihoa Finch (not a true Finch, but a strong-billed member of the curious Hawaiian family *Drepanididae*) and a Millerbird, a form new to science, both species being restricted to this barren rock and found nowhere else in the world.



Photograph by Alexander Wetmore

THE U. S. S. "TANAGER" AT ANCHOR OFF NECKER ISLAND

This thousand-ton ship of the mine-sweeper class played an important part in laying the mine barrage in the North Sea. In 1923 the *Tanager* was assigned by the Navy Department to transport a party of scientists from the Biological Survey, United States Department of Agriculture, and the Bishop Museum of Honolulu during an extended exploration of islands in the Hawaiian Bird Reservation.

Finch (not a true Finch, but a strong-billed member of the curious Hawaiian family Drepanididæ) and an occasional Millerbird (a form new to science), both species restricted in range to this barren rock, and found nowhere else in the world.

Hordes of Terns nested on the slopes, Boobies and Frigate Birds formed colonies in the bushes, and beautiful snow-white Love Birds nested in pairs on tiny ledges on the huge black cliffs. Albatrosses, found elsewhere near the sea, here nested on a flat 850 feet above the waves.

NECKER IS AN ISLAND OF MYSTERY

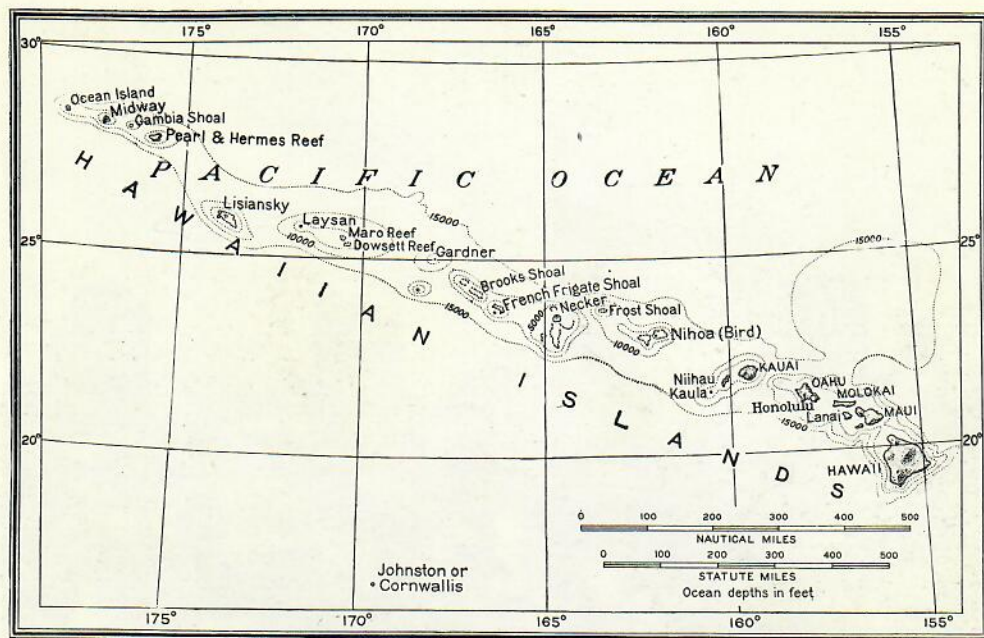
On November 4, 1786, the Frenchman La Pérouse sighted a rough, barren rock, west of the main Hawaiian group, which he named Necker Island in honor of the Swiss banker Jacques Necker, who at the time was busy in France with a futile attempt to stabilize the uncertain exchequer of an uneasy government. Though the

French exploring expedition remained in the vicinity of this rock for a brief time, no attempt was made to land, and the journal of La Pérouse comments mainly on the barrenness of the place.

From a distance Necker, where we had proceeded after completing work on Nihoa, appears as some misshapen, monstrous animal crouched amid the waves.

Though landing was simple, location of camp was difficult. We found a protected shelf 40 feet from the water, on which to tie the cook tent, while rough ledges above, partly protected by the overhanging cliff, furnished smaller platforms where the members of the shore party distributed their cots and scientific apparatus as best they might (see page 80). My own sleeping quarters were fully 70 feet above the water. We roosted at night like so many sparrows. Never have I occupied a rougher spot for a camp.

Nihoa was well known to the ancient Hawaiians, but Necker had no known native name, nor does it figure in the



Drawn by A. H. Bumstead

A MAP OF THE HAWAIIAN ISLANDS

In addition to the eight principal islands of the Hawaiian group (Hawaii, Maui, Kahoolawe, Lanai, Molokai, Oahu, Kauai, and Niihau), a chain of islets extends to the northwest for more than 1,300 miles. Of the latter, Niihoa, Necker, French Frigate Shoal, Gardner, Dowsett and Maro Reefs, Laysan, Lisiansky, Pearl and Hermes Reef, Midway and Ocean Islands were studied by the *Tanager* Expedition, led by Dr. Alexander Wetmore.

many legends of that people. There are found, however, on this isolated bit of rock, far below the horizon from distant Niihoa, many signs of occupancy by ancient, more or less primitive man.

A wonderful series of more than 40 *heiaus*, or stone temple platforms, rectangular in form, ranging from a few feet to 60 feet in length by half as wide, were found on the higher points of the island.

The floors of these ancient temples were smooth, except where a raised platform two or three feet wide had been constructed to a height of 12 or 15 inches across one of the long sides. At regular intervals along its back were blocks of stone a foot or more wide by three or four feet high.

That the platforms were ancient temples is shown by the discovery 30 years ago of crude stone idols, that lay prostrate where they had fallen from the erect border stones. Many of these were destroyed through the mistaken Christian

zeal of a royal edict, but fortunately a few have been preserved in museums.

In addition to the temple ruins, small shelter caves scattered over the sloping cliffs were found to contain occasional bits of stone bowls, a low retaining wall to level the floor, or the remains of a primitive fireplace.

NECKER MAY HAVE BEEN A POLYNESIAN PLACE OF PILGRIMAGE

There is on Necker no dependable water supply, nor are there food resources or sufficient space for the support of a permanent population. Obviously, then, worshipers came from a distance, possibly from Niihoa, perhaps from the formerly populous Napali cliffs of the island of Kauai.

May we not suppose that here flourished an ancient religion, followed in later years by a few initiates who kept alive on this remote rock altar fires of a cult whose sacred name was unknown to the general populace—a religion whose rites were so fearsome or so holy to the devo-



THE HEIAUS OR TEMPLES ON NECKER, NOW FREQUENTED ONLY BY BIRDS

Large upright stones stand on a raised shelf built at the back of each level platform. The birds in the photograph are young Laysan and Black-footed Albatrosses, with a young Blue-faced Booby in the center.



Photographs by Alexander Wetmore

THE WESTERN END OF NECKER ISLAND

Camp for the author's shore party was established on the cliff at the left, above the landing ledge. The two tents were used for cooking and storage. The men worked and slept on the small ledges above, wherever there was room for a cot or collecting equipment (see page 78).



Photograph by Alexander Wetmore

A LANDING ON THE ROUGH SHORE LINE OF GARDNER ISLAND

The amount of rise and fall of the waves may be judged from the surf on the rock in the background. To negotiate these landings successfully requires skill and experience on the part of steersman and boat's crew.

tees as to preclude their celebration in public, or their mention in story, so that with the decadence of the older people all knowledge of their form has disappeared?

Such ponderings are appropriate as one reclines at dusk on a rocky ledge high above the sea, with the wash and crash of waves as a background for the mosaic of sounds formed by the yelping of Terns, the croaking of circling Boobies, and the soft barking notes of gentle Pet-

rels among the rock crevices; or when one awakens as the first rays of dawn touch the clouds at the horizon, and untold thousands of Terns, as if at a preconcerted signal, rush out from the rocks in a vast cloud to greet approaching day.

Neither here nor on Nihoa did the *Tanager* party discover ancient human burials whose bones might aid in revealing who the early visitors to the islands were.

From Necker we continued west for a



Photograph by Alexander Wetmore

THE BLACK-FOOTED ALBATROSS FEEDS HER YOUNG BY REGURGITATION

This bird is the dark-colored "Gooney" that follows in the wake of trans-Pacific steamers. On their breeding grounds they live almost entirely upon small squid taken at sea.

brief stay among the 13 sand islands and the pinnacle rock that mark French Frigate Shoal. Beyond lies Gardner Island, an inaccessible rock, according to the United States Coast Pilot. If others had effected a landing here before our visit, there is apparently no record of the fact. The main rock, only 200 yards long, is composed of two peaks, the highest rising 170 feet, with a deep cleft between. A smaller rock is separated from the first by a narrow strip of water.

BIRDS WITH SAW-EDGED BILLS BITE EXPLORERS

We found only a single species of plant on this island, a fleshy-leaved form restricted to a handful of individuals, though I saw a good many heavy-spined seeds of a creeper (*Tribulus cistoides*) that grows commonly on low sand islands. These probably were brought here in the feet or plumage of sea birds that had come from Laysan or French Frigate Shoal. Though dropped on a barren rock without sufficient soil for

their growth, they served to illustrate how such spiny plants are transported to lonely islands.

Terns of five species rested both on the gentler slopes and on the steep ledges. Tropic Birds nested in holes below the summit, and the whole upper third of the island was given over to the Blue-faced Boobies, now on guard over their well-grown young.

These snow-white Boobies were as large as geese, and it was necessary to drive the squalling adults ahead of us, for when we passed them quietly they had a way of waddling up behind us and biting savagely with their heavy saw-edged bills. Their attack was often disturbing when one was picking a precarious path along some narrow ledge.

LAYSAN, THE ALBATROSS METROPOLIS

Traveling west from Gardner Island, one soon comes to Dowsett and Maro Reefs, named from ancient shipwrecks. These are mere coral rings marked by breakers and without visible land. Then,



Photograph by Alexander Wetmore

FRIGATE BIRDS, KNOWN ALSO AS MAN-OF-WAR BIRDS, SWOOPING DOWN TO SEIZE
FISH CAST IN THE AIR

These great birds are piratical in habit; they feed largely on squid or fish taken forcibly from
Boobies, Terns, or Shearwaters.



Photograph by Donald R. Dickey

A BIRD IN THE HAND

Steward George, of the *Tanager*, remonstrated daily with a certain Red-tailed Tropic Bird against its determination to make a nest in the cook shack, back of a case of Navy rations. To the end of a three weeks' stay on Laysan Island, George remained gentle; the Tropic Bird adamant, tame and broody! So, it is hoped that this bird forgave the party the bustle and clatter incident to the preparation and dispatch of sundry turtle stews, and that subsequently it raised its single youngster in the shade it sought.

over the horizon, beyond the dangerous jaws of these hidden traps, comes Laysan Island, 855 nautical miles from Honolulu.

Ever since its discovery, Laysan has been famed for its sea birds. Pilot books and the logs of navigators through these waters describe their hordes, and even the Hydrographic Office charts depict the low elevation of Laysan, with the air above filled with birds. Though only a mile and three-quarters long and a mile wide, it is the most pretentious of the islets in the Leeward chain.

An elevated rim, rising somewhat abruptly from the beach line to a height of 20 to 40 feet, incloses a shallow, oblong basin, in whose center is a saline lagoon with waters concentrated by evaporation under a blazing sun, until they are far more heavily charged with salt than the sea itself.

At an early date it was discovered that there were valuable deposits of guano on Laysan, or Moller, as it was then known, and for some years the island was of considerable commercial importance.

The nineties of the last century marked the height of the guano industry. A gradual decline began in 1900, and by 1908 shipments had ceased and the island was practically deserted, leaving a number of frame buildings clustered about the landing, a few hundred yards of rails laid across the sand, and three or four scattered piles of phosphatic rock dug out for shipment and then abandoned.

Through all these years Laysan had



Photograph by Alexander Wetmore

A CAST OF THE NET

A sheath knife is usually worn by swimmers in the waters adjacent to Laysan Island as a protection against sharks.

been literally covered by myriad sea birds, while the grass and shrubbery that clothed the island harbored five species of land birds restricted to its less than two square miles and known nowhere else in the world in a native state. These included a tiny flightless rail, a species of duck, a warbler, known as the Miller-bird, and two species of Drepanididæ (see also text, page 78), one as large as a sparrow, with strong robust bill, known as the Laysan Finch, or "Canary," and the other smaller, with slender beak, the Laysan Honey Eater, called from its coloration the "Redbird."

Laysan is the metropolis of the Laysan

Albatross, a beautiful bird as large as a goose, with snowy breast, black wings, and delicately tinted bill. With it is found the Sooty Albatross, the "Gooney," familiar to tourists on trans-Pacific steamers, of equal size, but with sober sooty-gray plumage.

MARAUDERS DECIMATE LAYSAN

For a part of each year these Albatrosses frequent the high seas, true seafarers, who see no land even during periods of storm. About the first of November they resort to remote, uninhabited islands where they gather in colonies, as have their ancestors for thousands of generations, for the purpose of rearing young.

On Laysan their return each year was an event in the life of the guano workers, heralded with as much excitement as the arrival of some famous traveler in settled communities.

Early visitors who came to Laysan, with considerable exaggeration, placed the numbers of Albatross in the millions; actually they ran to many thousands. Mated pairs of the Laysan species dotted the whole inner basin except where bushes prevented their nesting, while the Sooty Albatross colonized the barren sand beaches.

Unmolested for centuries on land, the birds of Laysan knew their only enemies in the sea, so that man on his arrival was accepted as a phenomenon of interest, to be treated without fear. Aside from a certain amount of eggging, and the pulling of the long, ornamental, central tail spikes of the Red-tailed Tropic Birds, the guano workers troubled the birds little except for the necessary infringement on their breeding areas.

When, in 1909, the entire Leeward chain, with the exception of Midway (which is under the jurisdiction of the Navy Department), was set aside as the Hawaiian Bird Reservation, it seemed that this action would provide final protection for the harmless, friendly hordes of sea birds that nested there. But other forces were at work. Fashion still demanded feathers for feminine adornment, and this trade, blocked for the time within the limits of the United States, turned to more distant fields.

Word came somehow to Honolulu that

poachers were at work to the westward, and in January, 1910, the revenue cutter *Thetis*, under Captain W. V. E. Jacobs, surprised and apprehended 23 Japanese on Laysan and near-by Lisiansky, engaged in killing the birds. One lot of plumes is supposed to have been shipped before the arrival of the *Thetis*, yet the wings and other feathers of more than a quarter of a million birds were still stored in the old buildings on Laysan.

The vast rookeries had been systematically decimated by men armed with clubs. Hand cars and the old rail line left by the guano workers had been utilized to bring the spoils to camp for preparation and treatment, and, as usual in plume-hunting operations, the ground round about displayed the sad accompaniments of decaying carcasses and dead or starving young, among which wandered a few bewildered or crippled birds.

Prompt action had, however, saved part of the bird colonies, and, free from further attack, the Albatross and Tern were left to regain something of their former numbers.

THE RABBIT MADE LAYSAN A DESERT ISLE

With danger from plume hunters eliminated, one might suppose that the bird colonies on this distant bit of American soil would flourish as in ages past, but further tribulation was in store. Disturbances to the supersensitive adjustment of Nature's forces through the coming or the temporary presence of civilized man are often strange and unexpected in their appearance and cumulative effects. As an instance, on Laysan tremendous damage has been wrought through the agency of the domestic rabbit, an animal that we might consider one of the most inoffensive of man's friends.

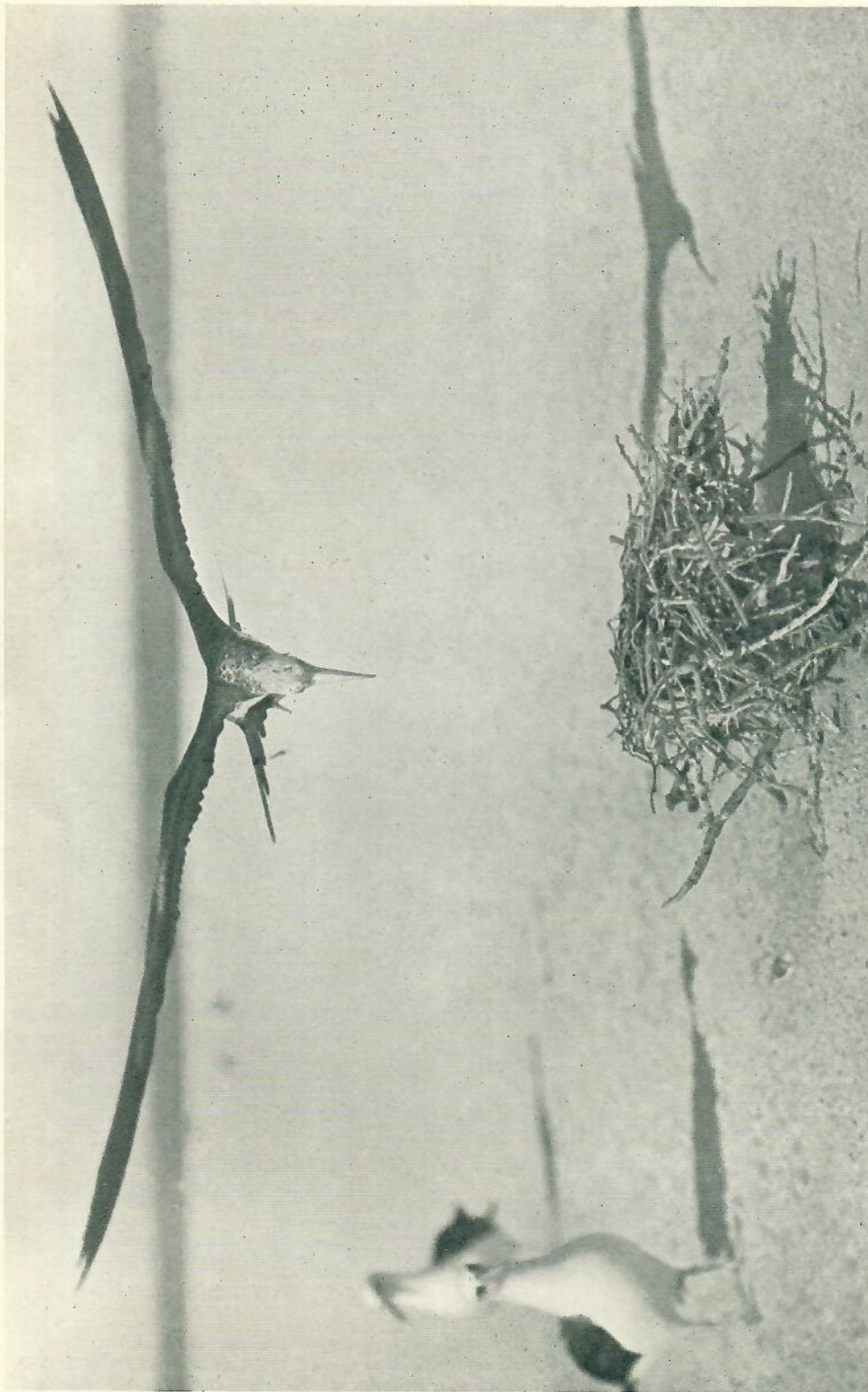
Some time in 1902 the foreman of the guano works brought to Laysan three or four pairs of rabbits, partly to amuse his children, and partly for the fresh meat that they would furnish. For a time the animals were kept about the houses, but gradually a pair or two wandered away, attracted by broad tracts of grass, succulent herbage, and protecting shrubs. Rabbit enemies there were none, as cats and dogs were forbidden because of their damage to birds.



THE SPIRIT OF LIGHT

© Donald R. Dickey

The quiet curiosity of the Love Tern is in striking contrast to the screaming threat of other Terns. One of the sailors of the *Tanager* actually had one of these gentle birds alight on his outstretched, motionless hand. This incident is evidence of that rare bird comradeship which remains to the author as his most intimate memory of Laysan Island.



POISED FOR THEFT

This air pirate (see, also, page 89) hovers on incomparable wings before swooping down to snatch a nest stick from neighbors of its clan, even as it snatches daily food, by threat or violence, from the unwilling Booby and Shearwater. In recent years the destructive rabbit has made nesting material a supreme desideratum of the Frigate Birds of Laysan Island.

© Donald R. Dickey



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THE FRIGATE BIRD OF THE SAILOR

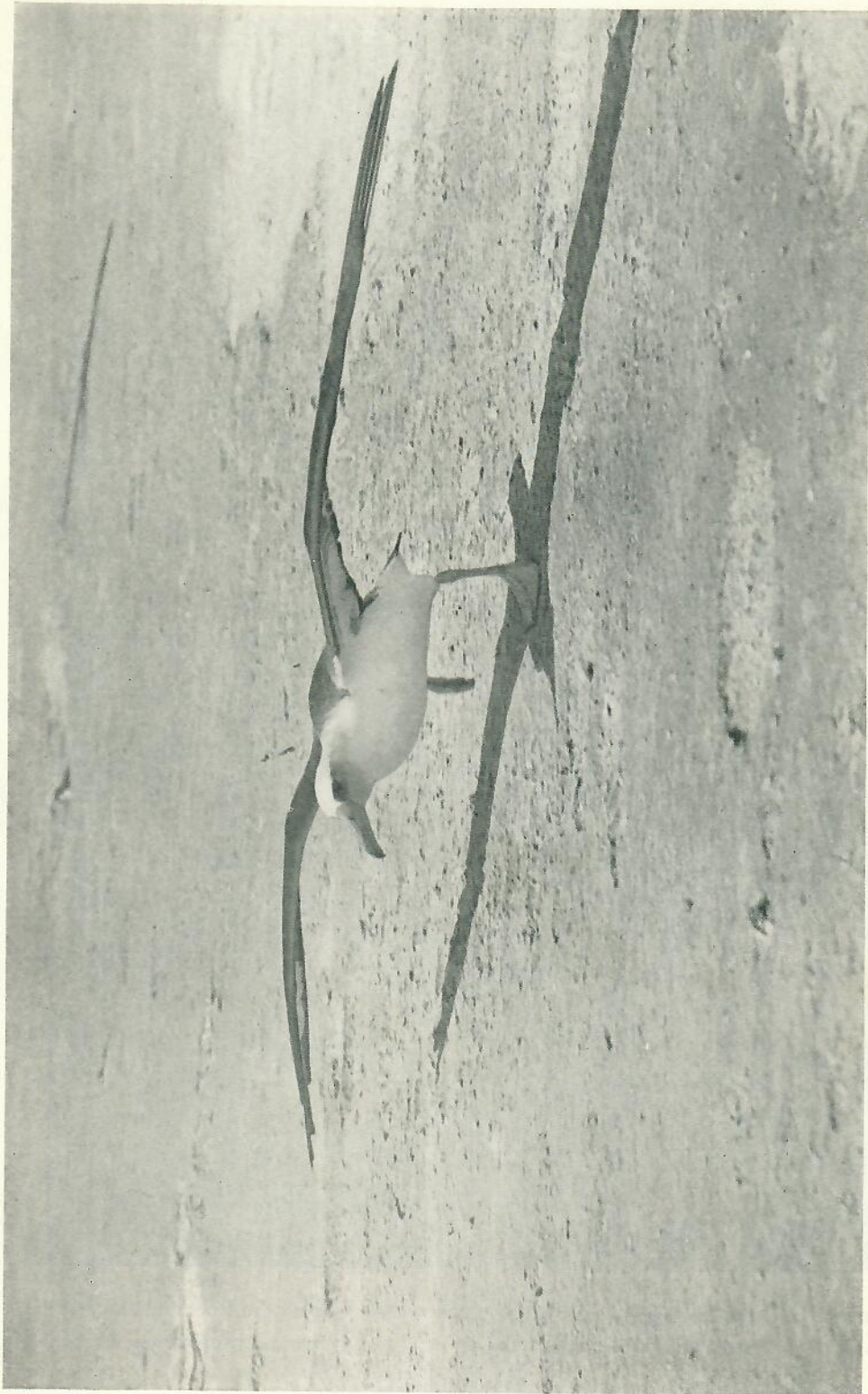
The female of *Fregata* retains a proper white and feathered throat throughout the year, but during the mating season the male develops a highly inflatable gular sack of flame-red, naked skin. With this weird and colorful throat pouch he wiggles his comic invitation from a chosen nesting site to the females soaring overhead. Then, as a lady yields and builds the nest he has visioned on the chosen site, this strangely decorative and otherwise useless toy balloon shrinks quickly to the texture and insignificance of a turkey's wattle, and the male Frigate Bird loses, for the season, one of the strangest of secondary sex adornments.



© Donald R. Dickey

GETTING UP SPEED

The Laysan Albatross gets under way with effort—with strenuous taxiing, with kicking legs, and scattered sands (see, also, page 91).



© Donald R. Dickey

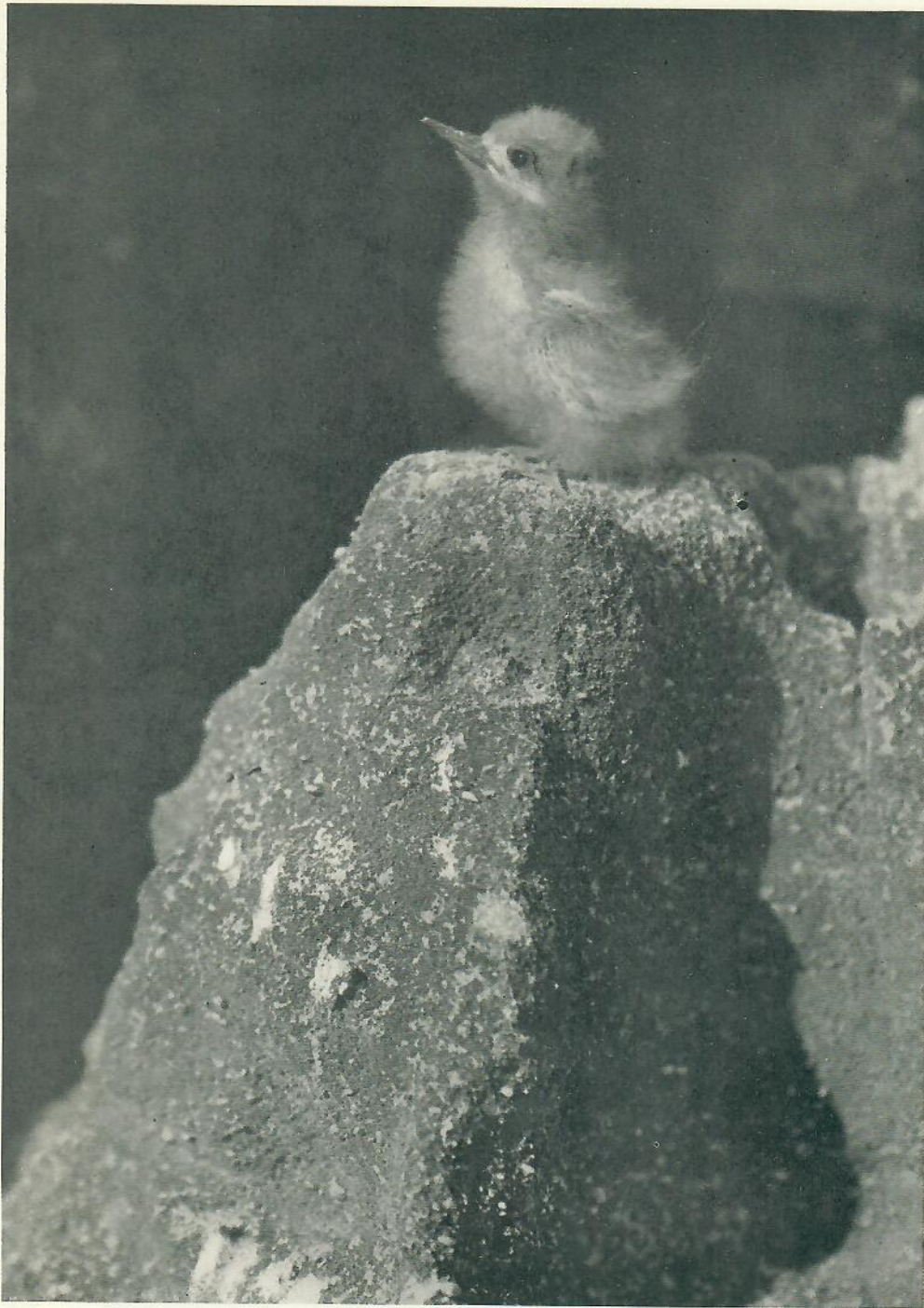
READY TO "TAKE OFF"

If any bird has an important aviation lesson to teach us, it is the Albatross, for its soaring grace intrigned the thoughts of man long before he dreamed of human flight. After centuries, it remains, perhaps, the best example of specialized adjustment to the complex of air current, mass, and gravity (see, also, pages 99, 96, and 102).



© Donald R. Dickey

THE RED-FOOTED BOOBY LOOKS OUT UPON THE WORLD FROM A SHOE-BUTTON EYE
This is one of the three species of Booby found by the *Tanager* Expedition on Laysan Island
(see, also, illustration, page 100, and text, page 103).



Photograph by Donald R. Dickey

A YOUNG LOVE TERN SITS IN MEDITATION: LAYSAN ISLAND

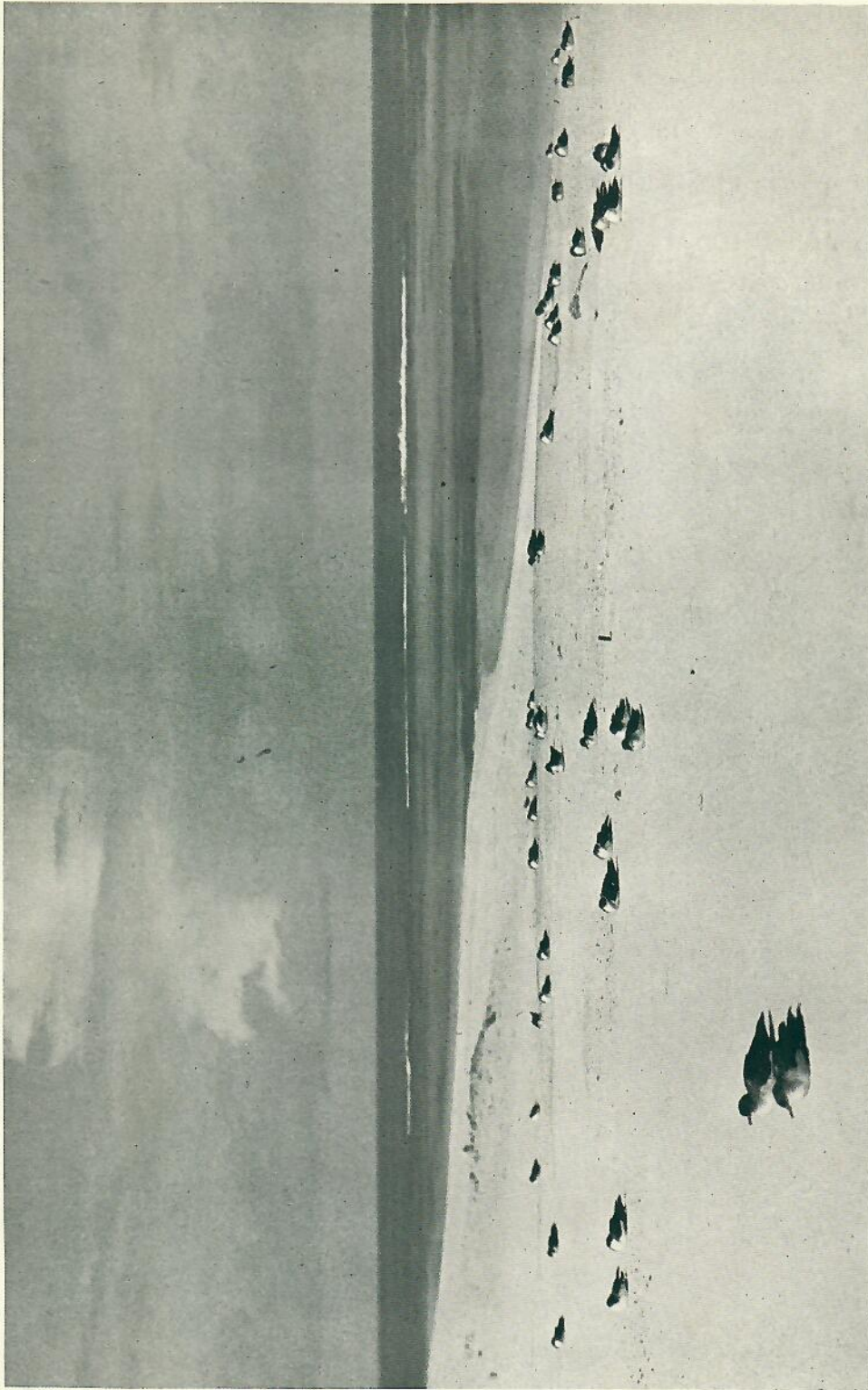
This species clings as tenaciously to precipitous limestone walls as did its ancestors to nestless, horizontal limbs (see, also, illustrations on pages 87 and 94).



Photograph by Donald R. Dickey

THE LOVE TERN'S NEST

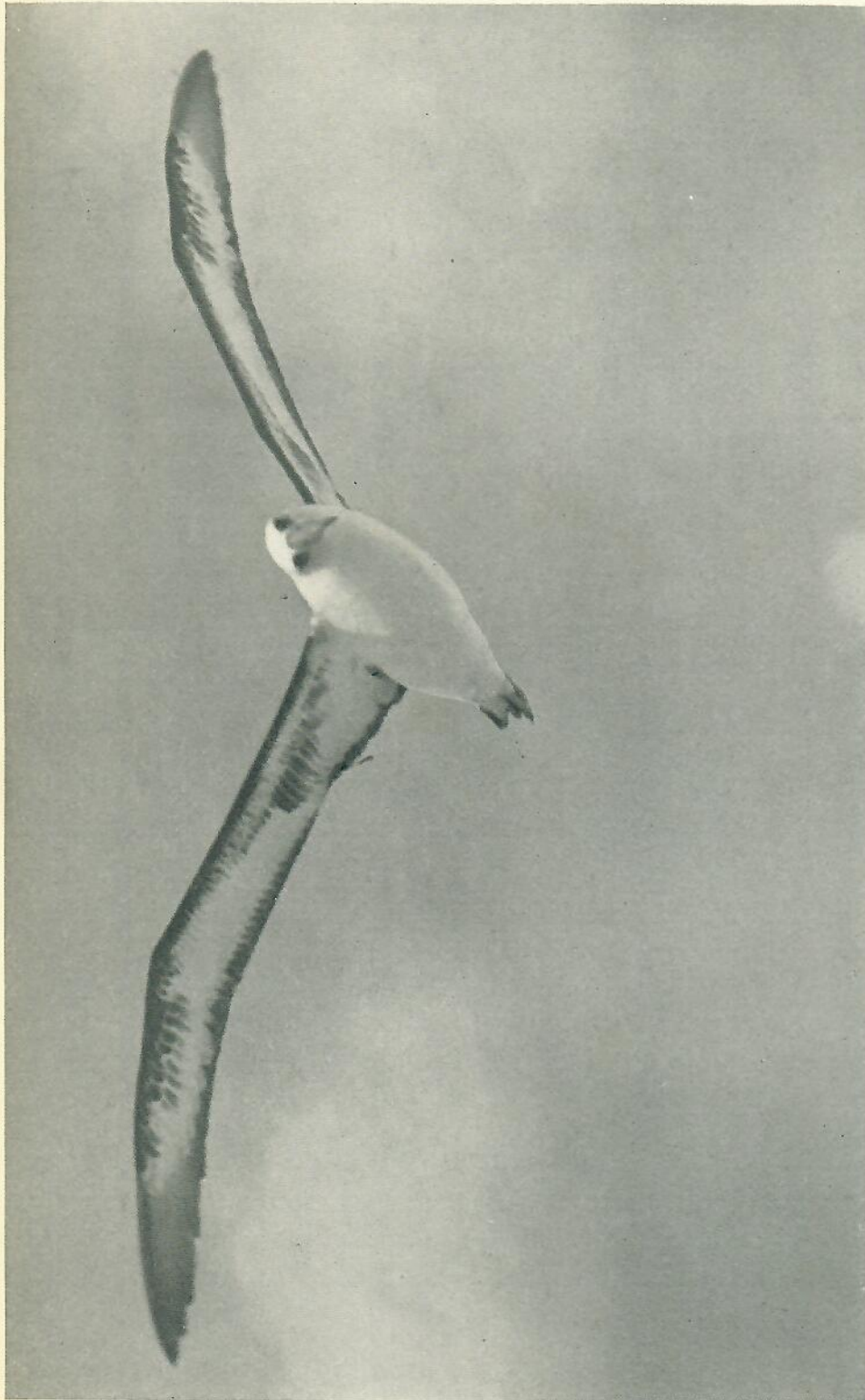
This gentle sea bird was wont, in the good old days of sturdy vegetation on Laysan Island, to balance its annual egg, nestless, upon a precarious horizontal limb—a strange arboreal habit for a Tern, doubtless originated by the species out of bitter experience with land crabs or some other enemy in its more southern metropolis. When the man-curse of the rabbits eradicated the bushes from Laysan, the Love Tern quickly adapted itself to the sudden ecologic change, and now lays its egg on the precipitous pinnacles and shelves of a rock ledge at the southern end of the island.



© Donald R. Dickey

A COLONY OF WEDGE-TAILED SHEARWATERS ON THE SANDS OF A SHELTERED COVE OF LAYSAN ISLAND

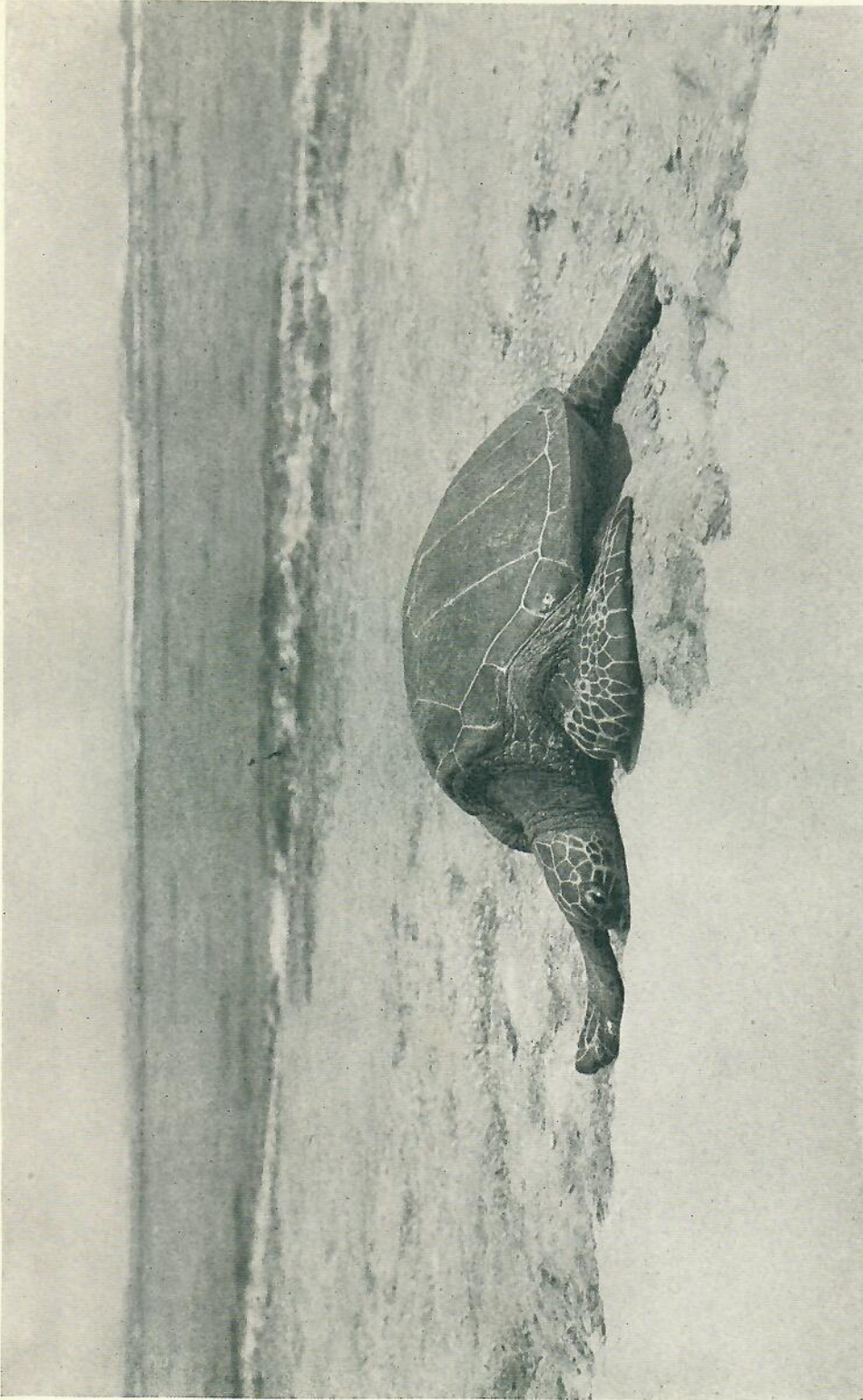
The scene typifies the calm spirit of an atoll in the Pacific. Despite the man-wrought change caused by the introduction of rabbits, in the spring sea birds still come to Laysan in countless thousands to nest (see text, page 86).



© Donald R. Dickey

A BIRD'S-EYE VIEW

Unlike the bird of Coleridge's lay, which "came to the mariner's lay, which "came to the mariner's hollo," the *Tanager* Expedition found the Laysan Albatross strangely shy of ships at sea. Once on land, however, these same birds accepted members of the party as peers, eyed them merely in curiosity, pried at the shiny tripod screws, investigated sleeve buttons, and actually cakewalked up to nibble gently at the author's fingers with bills that could easily have ripped an artery! Is not this familiarity on land but simple proof that these sea birds have never had a land enemy? At sea, sharks and other foes have doubtless harried them, but on land, on their nesting grounds, no single enemy has arisen to teach them sophistication. The tribal history of the Hawaiians bears out this obvious theory, for no record of these farther outlying islands antedates their discovery by historic navigators. No other potential bird enemies exist on these islands, where sea birds have doubtless nested for thousands of generations. What more natural than that they should to-day greet an itinerant naturalist merely as a curious, overgrown peer?



Photograph by Alexander Wetmore

A GREEN TURTLE ASLEEP ON A SANDY BEACH: LISIANSKY ISLAND

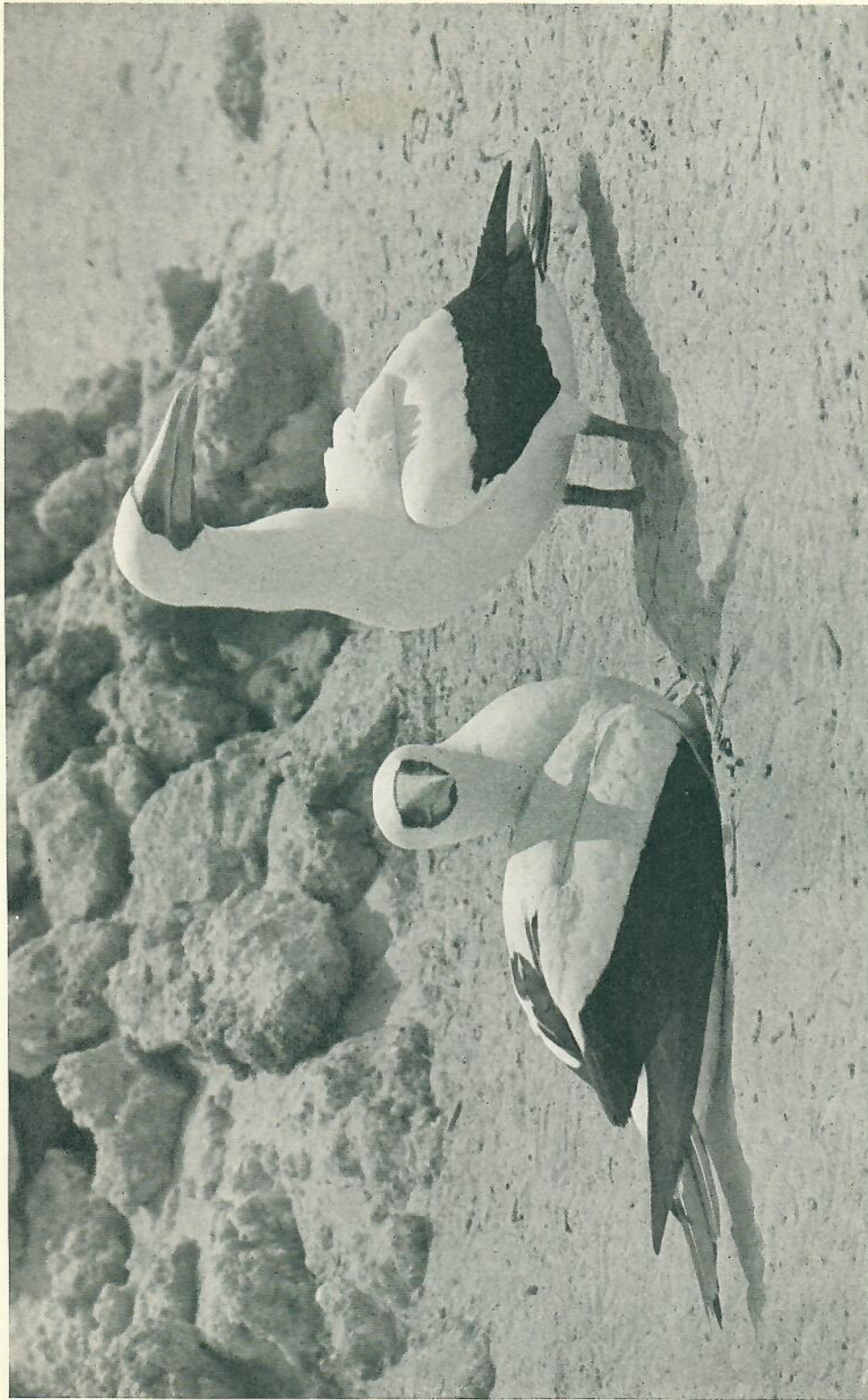
These grotesque creatures browse in submarine fields of algae until hunger is satisfied, and then crawl heavily out to sprawl in the sand, safe from enemies in the sea. On one occasion, the author, while walking 300 yards along the beach on Lisiansky Island, counted 80 of these creatures from fifteen inches to four feet in length. Others, feeding a few yards offshore, were hidden by ripples on the water and so escaped this casual census. Their only enemies seem to be sharks.



© Donald R. Dickey

THE RED-TAILED TROPIC BIRD

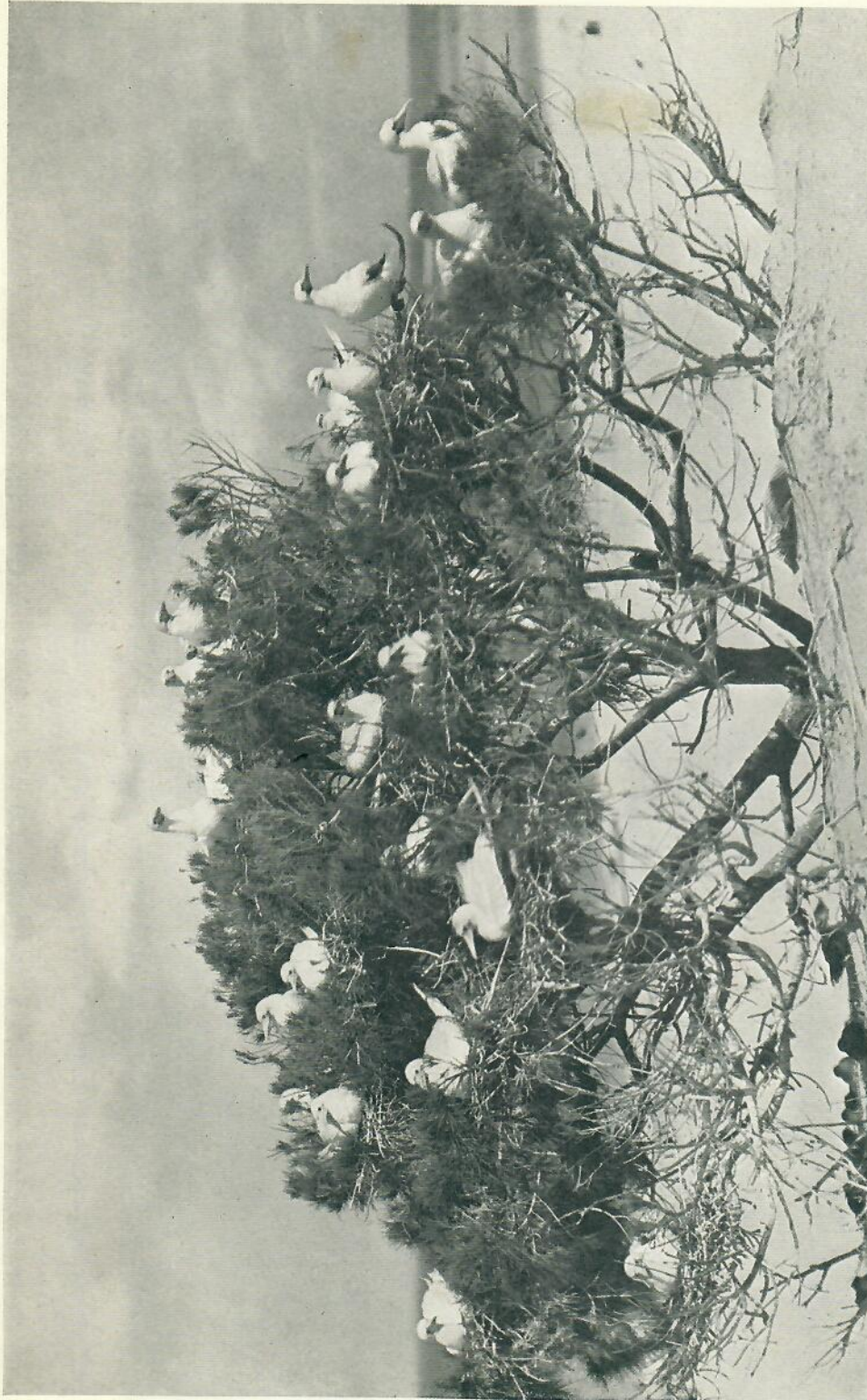
Seen against a Laysan sky, with plumage of snowy white, and bill and strangely specialized median tail quills of flaming red, this bird is a never-to-be forgotten picture of color and of life on Laysan Island.



© Donald R. Dickey

THE BLUE-FACED BOOBY OF LAYSAN CONTENTS ITSELF WITH A GUARDED HOLLOW IN THE SAND, IN WHICH TO INCUBATE TWO CHALKY EGGS

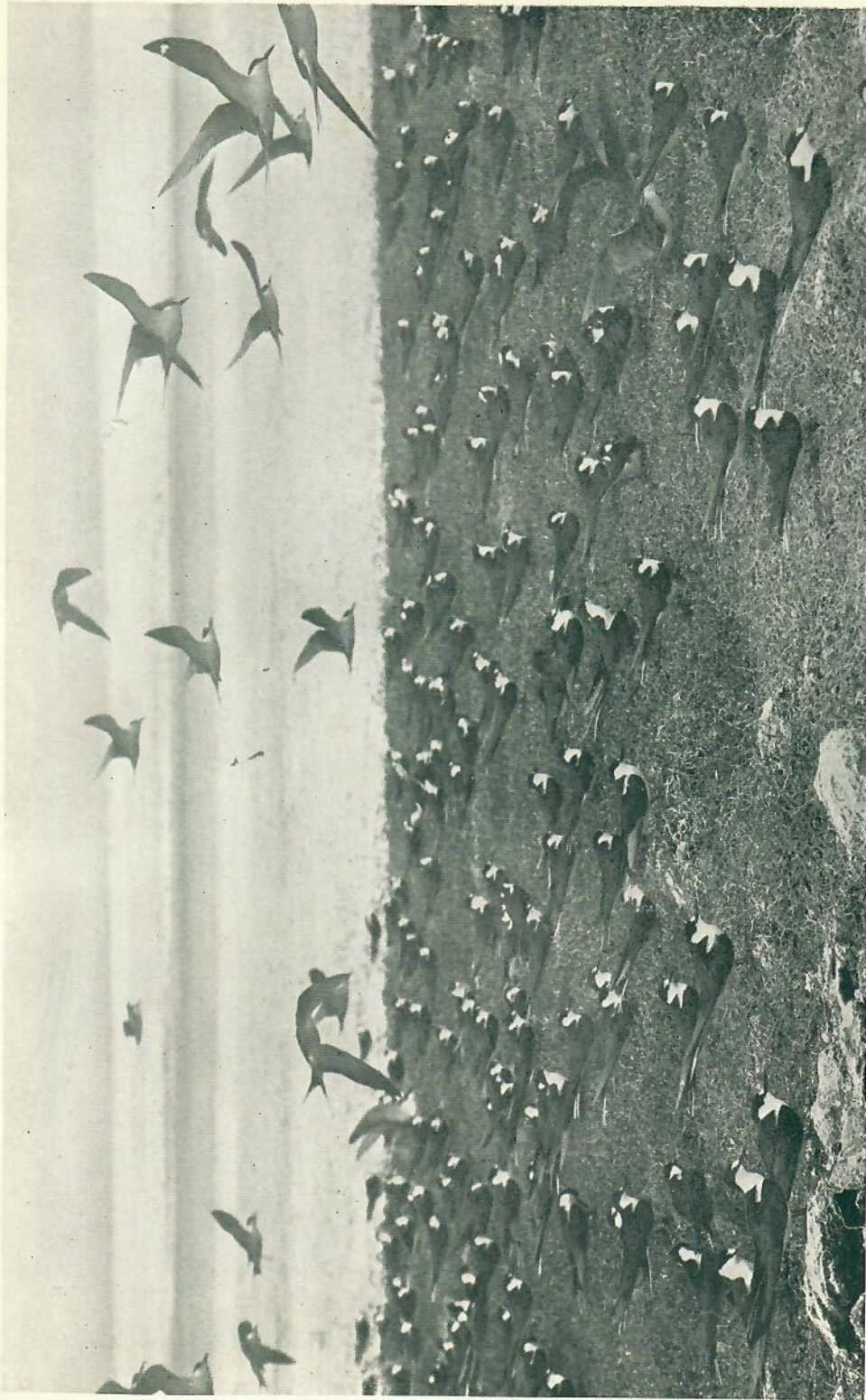
According to Dr. Loye Miller, one of our few authorities on avian paleontology, the strange factor of evolution which sealed up the nostrils of the Booby was operative at least as early as the Miocene Period. This trick of Nature saddled these birds with a bill expression which remains comic to this day.



Photograph by Donald R. Dickey

THE ONE REMAINING TENEMENT OF LAYSAN ISLAND

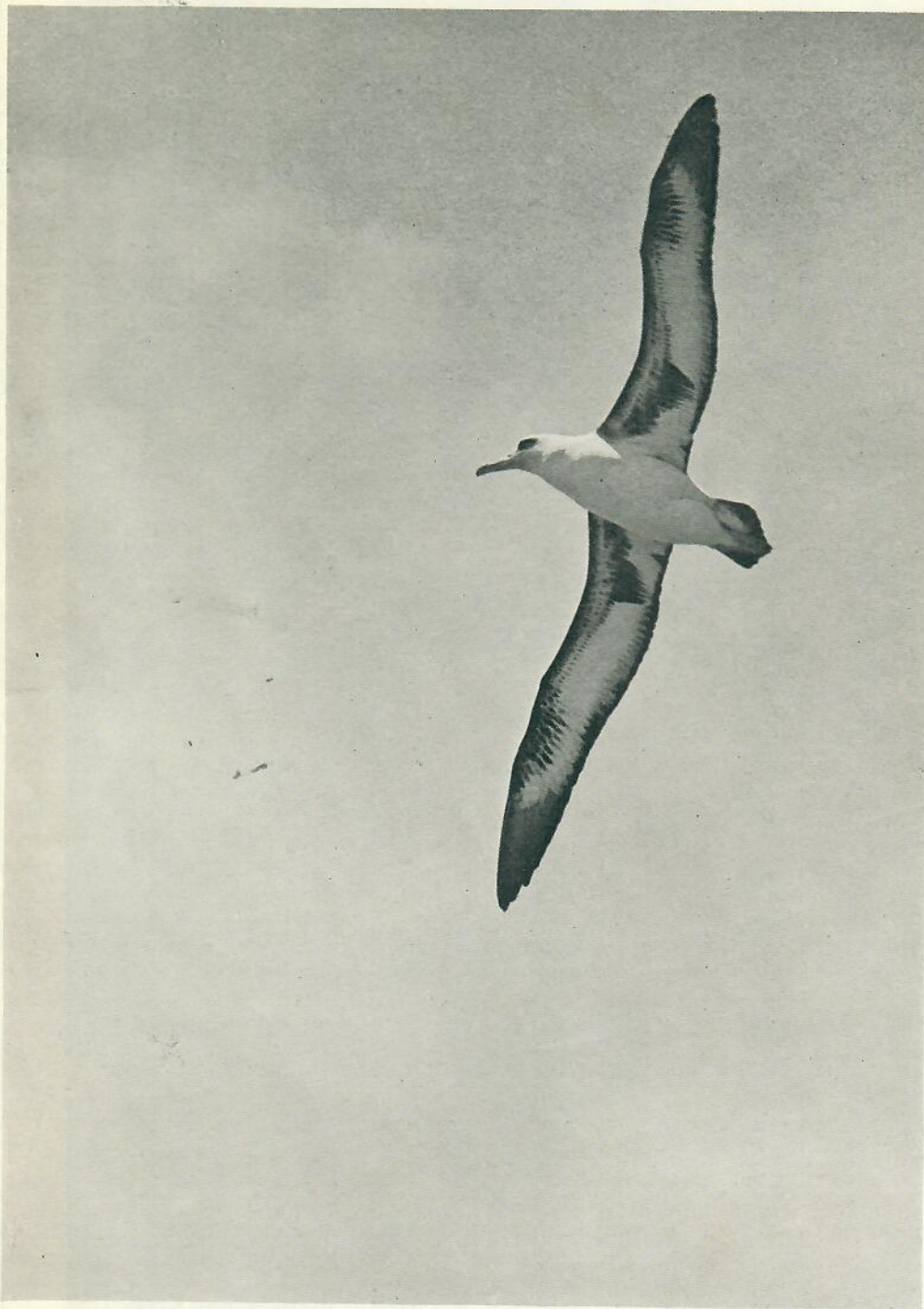
This ironwood has resisted the tooth of the devastating rabbit (see page 103) and the blast of consequent sand storms, until to-day Red-footed Boobies and Hawaiian Terns crowd in upon it as the only nesting site on the island reminiscent of their ancestral home.



Photograph by Donald R. Dickey

SOOTY-BACKED TERNS FACING THE NORTHEAST TRADES

About the central lagoon of Laysan Island a growth of fleshy *Sesuvium* still persists, despite the rabbits. On this cool carpet colonies of the Laysan Albatross (see pages 90, 91, and 96) and of this Tern congregate to nest.



© Donald R. Dickey

ALOFT IN A STIFF TRADE BREEZE

Once a-wing, the Albatross attains the ideal of banking and of soaring flight (see, also, pages 90, 91, and 96).

Albatross must have gazed with tolerant curiosity at these lop-eared invaders, with their curious hobbling gait, while no doubt many an irate Shearwater hustled them with much strong language (if tone of voice is any criterion the Wedge-tailed Shearwater is a master of profanity!) from the shelter of his nesting burrow.

With abundant food and a genial climate, bunny's increase was incredibly rapid.

NATURE'S BALANCE UPSET, DISASTER FOLLOWS

Early accounts of Laysan Island and photographs taken 20 years ago depicted it as a pleasant spot covered with green vegetation. Reports of damage to shrubbery had led us to expect some changes, but had not prepared us for the utter desolation that greeted Commander King and me when we landed in the little harbor and walked slowly up the sandy slopes to a point near the tumbledown buildings remaining from the guano workings.

On every hand extended a barren waste of sand. Two coconut palms, a stunted hau tree and an ironwood or two, planted by former inhabitants, were the only bits of green that greeted the eye. Other vegetation had vanished. The desolateness of the scene was so depressing that unconsciously we talked in undertones. From all appearances, Laysan might have been some desert, with the gleaming lake below merely a mirage.

Without the restraining influence of active enemies, rabbits had multiplied until they had absolutely stripped the island and then had slowly starved. Of the vast army of destroyers only a few hundred remained.

We had come prepared to eliminate the rabbits, so, with camp established, the work began at once. The destruction of the majority was simple, but the survivors became wary and it was necessary to hunt them out one at a time.

Perhaps the procedure appears heartless, but it was one of necessity. Left unchecked, the creatures might have eked out a precarious existence for a few years longer, but starvation was the inevitable fate in store for them, coupled with unending hardship for the multitude of other creatures associated with them. Further-

more, so long as rabbits remained on Laysan there was danger of their transportation elsewhere, with resultant injury to other pleasant spots.

Pursuit, therefore, was relentless and effective. A party sent to Laysan a year after our visit reported no sign of a single survivor.

In spite of the rabbits, a few dozen Laysan Finches still sang their sprightly songs about the buildings or hopped among the rocks near the lagoon. Three individuals alone of the little Honey Eater remained on our arrival; these perished during a three-day gale that enveloped everything in a cloud of swirling sand. The Millerbird had disappeared entirely, and of the Laysan Rail but two remained. The duck (properly called the Laysan Teal), never numerous in recent years, as it was killed for food, had about held its own, 20 individuals being present—a scant foothold on existence for its species.

The Albatross, though reduced in numbers, were still present by thousands, and with them were many Boobies, Frigate Birds, and hosts of Shearwaters and Terns. The White-breasted and Tristram's Petrels, small species that appear mainly at night, were the only sea birds that seem to have suffered. They had almost disappeared; drifting sand, no longer restrained by vegetation, had buried them alive in their earthen burrows dug for hiding places against the light of day, or to conceal their nests.

Let us hope for happier days when, with vegetation renewed, these birds may repopulate their former territory from colonies on near-by islands.

LAYSAN RABBITS DEVASTATE LISIANSKY

The island of Lisiansky, 120 miles west of Laysan, was named in 1806 by the Russian explorer, Urey Lisiansky, while en route from Sitka to Canton. For two or three days his seamen had noted flying birds and other signs of land and one evening, without warning, his ship grounded on a coral reef.

After two days' severe labor it was salvaged and Lisiansky went ashore on the island within the reef. He described it as covered with creepers and other vegetation, but a desolate place, whose soil was undermined by the burrows of



A BRISTLE-THIGHED CURLEW

This bird navigates nearly 3,000 miles of open sea from its Arctic nesting grounds to its winter resort in Polynesia.



Photographs by Donald R. Dickey

A BEAKFUL

The author found these Curlews consistently robbing the birds which nest on Laysan Island. No shore birds save those which visit Polynesia have ever been convicted of cannibalism.

a dovelike bird, with a mournful, moaning note (the Wedge-tailed Shearwater).

We sighted Lisiansky through an early morning haze, but came in slowly over uncertain shoals to an anchorage, so that it was afternoon before we landed.

The island is a parallelogram a nautical mile long by slightly less than a mile wide. A low ridge 40 feet high on the northeast marks the highest point, while the central portion forms a low basin bounded by a rim that protects it from the ocean. In an early stage this basin was in all probability a lagoon like that at Laysan.

Never have I seen a more desolate spot. Rabbits, brought from Laysan by misguided persons who thought to leave a food supply for possible castaways from shipwreck, had completely stripped the

island of its vegetation and then had died of starvation. Their bleached and weathered bones strewed the sands.

A few roots of grass and of pigweed had grown sufficiently deep to escape the incessant search of the starving four-legged pests and, with the final disappearance of the mammals, had begun a battle against the forces of wind and sand to recover the island.

Insect life had also practically disappeared, and land shells, abundant on most of these islands, were extinct. A species of rat had been reported as plentiful here, but it had also vanished and no specimens of it have been preserved for science.

A view of the life of the surrounding sea offered a welcome contrast to the dismal aspect of the land. We were struck in particular by the large number of sea turtles. Shallow coves along the beaches were filled with luxuriant growths of algæ, submerged fields of green kept in constant motion by passing waves. Amid these plants browsed dozens of turtles, at intervals thrusting their heads up for air, and then submerging to continue their feeding. When satisfied they crawled clumsily out on the sloping sands to lie in peaceful sleep (see page 97).

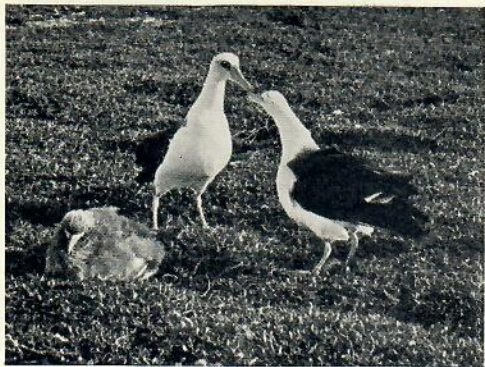
CABLE COMPANY TRIES TO BEAUTIFY LONELY ISLAND ROCK

Rough and stormy weather marked our stop at Pearl and Hermes Reef, where we found several low sand islands scattered over a broad lagoon. Colonies of the rare Hawaiian monk seal and many other creatures of interest were found here, and it was with regret that we terminated our brief stay and continued our journey.

The atoll known as the Midway Islands, usually abbreviated to "Midway" (see page 86), is now under lease to a cable company which here operates a relay station on the line between Guam and Honolulu.

Here reside 12 to 15 whites and an equal number of Orientals, who act as servants, in touch with the world only through the long undersea line that reaches both east and west. At intervals of three months a supply boat brings mail and stores from Honolulu.

At the time of our first visit we were received with delight, as the cable boat



"MAY I HAVE THIS DANCE?"



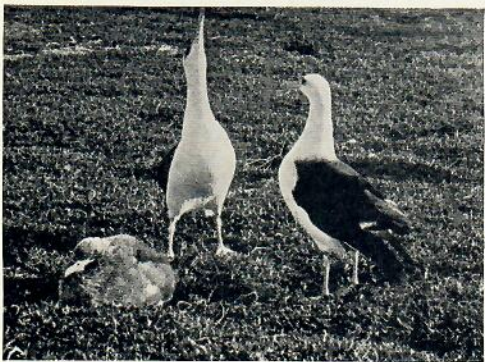
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NESIAN FASHION



"EXCUSE ME, PLEASE, WHILE I FIX MY
SHOULDER STRAP"



THE DANCE HAS INFINITE VARIETY, BUT



IT INVARIABLY ENDS IN GROANING EXALTATION

Photographs by Donald R. Dickey

PORTIONS OF THE FIRST MOTION PICTURE EVER MADE OF THE WEIRD DANCE OF THE
LAYSAN ALBATROSS

This dance doubtless originated as a corollary of courtship, but to-day it seems to have lost practically all sex significance. All through their stay on the island the birds dance, apparently for exercise or for the sheer joy of the fantastic measures. Throughout the colony, bird after bird seeks out a willing partner and takes up the dance in screaming exuberance.



Photograph by Alexander Wetmore

A YOUNG FRIGATE BIRD (SEE, ALSO, PAGES 88 AND 89): LAYSAN ISLAND

The great wings, that in a few weeks will bear it gracefully in the air, now hang below the breast.

had been out of commission and we brought the first mail that had been received in four and a half months.

The lagoon at this atoll contains two main islands, Sand, on which is located the cable station, and Eastern, a mile or more distant. Each is perhaps a mile long and rises well above the reach of the highest seas.

The cable company has worked steadily to improve conditions on what originally was a desolate spot of glaring sand and scattered bushes. The main buildings, four in number, are of steel and concrete, arranged at the corners of a little plaza. Earth, brought in sacks from Honolulu, covers the barren sand near the buildings and nourishes pleasant lawns, clumps of ornamental shrubs and flowers.

The whole is surrounded by a heavy protective windbreak of ironwood, or casuarina, trees between whose trunks one may catch glimpses of the clear green

waters of the lagoon. Tree-lined walks lead to the wharf and to a garden, where vegetables thrive, with abundant weeds imported with the garden earth.

A few sheep and a cow or two, high windmills in the background, and the introduced vegetation give a suggestion of some Argentine *estancia*, an illusion that is dispelled by a few minutes' walk that takes one to the bleak, wind-swept sands outside this artificial paradise.

As a unique feature of its bird life, Sand Island has a thriving colony of domestic Canaries which live at freedom in the shrubbery. In the mild and pleasant climate they have increased from a few pairs to several hundred individuals.

The Laysan Finch and the little Flightless Rail have also been naturalized here and on Eastern Island. A morning awakening in a comfortable room at the cable station, with a cheerful chorus of song from Canaries and Finches, offered a



Photograph by Alexander Wetmore

PROUD BOOBY AND CHICK

pleasant contrast to the matutinal salutation of a multitude of Shearwaters, heard through the canvas walls of a tent whipping in the steady trade winds, that was our portion elsewhere.

SHIP'S GIG TRAVELS 1,300 MILES FOR HELP

Though barely over the horizon from Midway, Ocean Island, the most northwestern point in the Leeward chain, is seen more seldom than any of the other atolls or islands in the entire Hawaiian group. On older maps other islands, marked as Patrocinio, Morrell, or Byer, are shown farther to the west, but modern surveys have failed to establish their existence.

Ocean Island consists of an irregular circle of coral four miles or so in diameter, with a semicircular fragment, known as Green Island, 1,800 yards long by 300 yards wide, at its eastern side.

Green Island, only 25 feet above the sea at its highest point, is so low that the atoll is a considerable menace to naviga-

tion in these waters. The surrounding reef has brought destruction to a number of ships.

Perhaps the most celebrated shipwreck at Ocean was that of the U. S. S. *Saginaw*, under Lieut.-Commander Montgomery Sicard, engaged in 1870 in deepening the channel into the lagoon at Midway. On completion of this work the *Saginaw* proceeded to Ocean Island, to verify its position, and to examine it for possible shipwrecked sailors.

A course was laid to bring them to this island at daybreak, but at three in the morning, with only brief warning, the *Saginaw* ran on the reef, and by dawn had been pounded in two by the surf.

The ship had struck near Green Island, the crew remained from the end of October, 1870, until January, 1871, living in part on the scanty stores saved from the ship, but mainly dependent on seals and sea birds.

Five men in the ship's gig made the perilous journey to Hanalei, Kauai, where they were wrecked in the surf as they at-



Photograph by Alexander Wetmore

THE CAMP OF THE AUTHOR'S SCIENTIFIC PARTY ON JOHNSTON ISLAND

tempted to land, and four of their number drowned; the survivor, William Halford, brought news of the plight of the *Saginaw* and a ship was dispatched from Honolulu to rescue her crew. The ship's gig, which made the perilous journey of more than 1,300 miles for aid, may be seen in the Naval Museum at Annapolis.

THE FIRST NATURALISTS TO VISIT OCEAN ISLAND

So far as I know, Green Island had not been visited previously by naturalists, so that our explorations were made with keen anticipation.

A shelving beach of coral and shell sand, 50 to 80 feet wide, extends entirely around the island. Inland we found series of low sand dunes grown with a peculiar shrub, sometimes known as beach magnolia (*Scaevola lobelia*). In the center of the island, sheltered by the dunes, were irregular openings grown with grass and creepers.

Ocean Island, like Pearl and Hermes Reef, is a stronghold of the Hawaiian monk seal that hauls and breeds unmolested on the beaches. Albatross are common, and we found the open inland meadows honeycombed with myriad Petrel and Shearwater burrows, so that every few steps we fell in to our knees

through the roofs of these hidden pitfalls.

The inner meadows are death traps for many Laysan Albatross that drop in here casually, deceived by the apparent security and protection from wind. A few seem able to rise on the wing without difficulty; others in running to gain the momentum necessary for flight (see pages 90 and 91) trip on long vines and creepers and fall headlong. Discouraged by successive occurrences of this sort, they walk about until weakened and finally die of starvation.

Among other creatures, we found here multitudes of rats, about one-fourth the size of our gray rat and related to the native Hawaiian rat, now extinct except for a little colony on Popoia Island, off the north shore of Oahu.

These rats on Ocean Island, long-tailed, brown-haired, heedless creatures, appeared at dusk in swarms, so that by morning the sand was laced with their tracks. They belong to a group whose forms are widely scattered in the Pacific, and may have been distributed from island to island as stowaways in the great sailing canoes of the Polynesians. Their spread by this means is as logical as the known spread of the gray rat by means of the sailing ships of the Caucasians.

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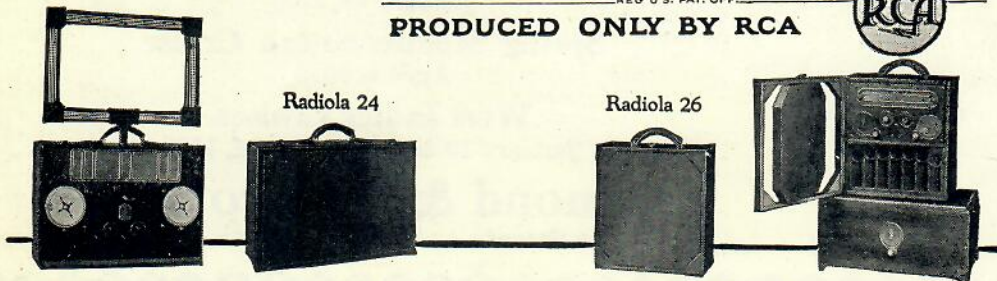
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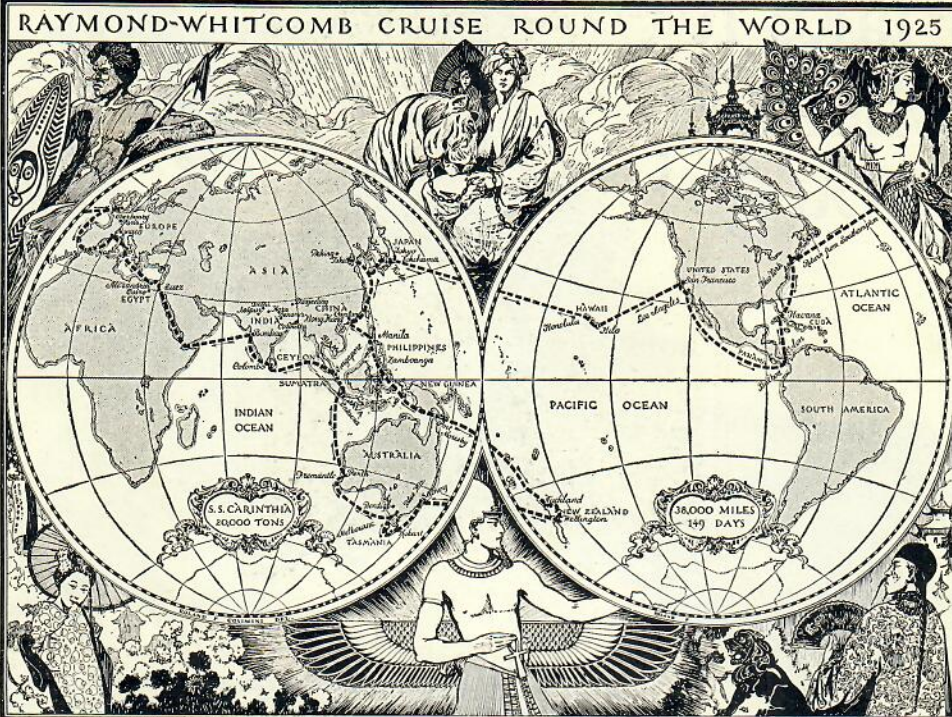


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