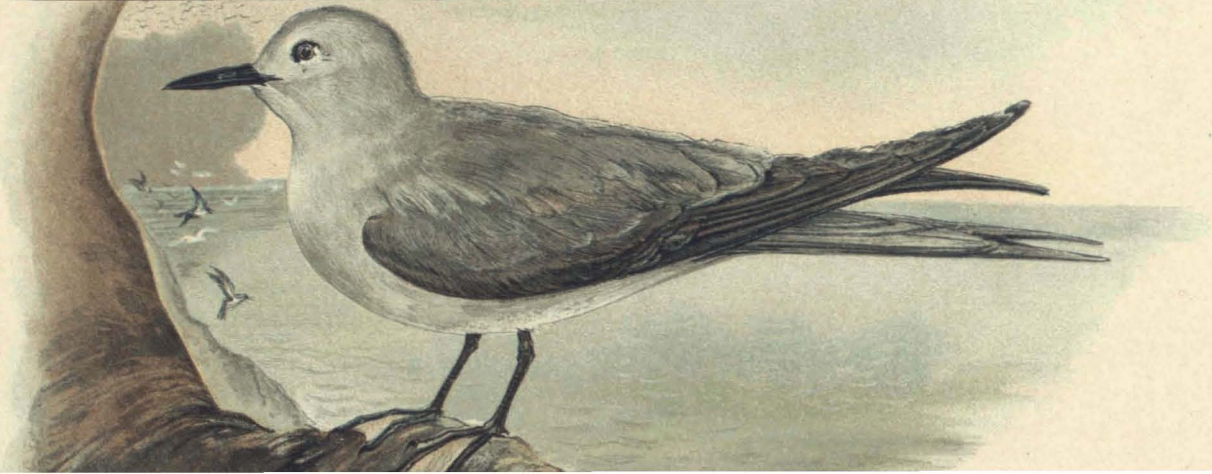
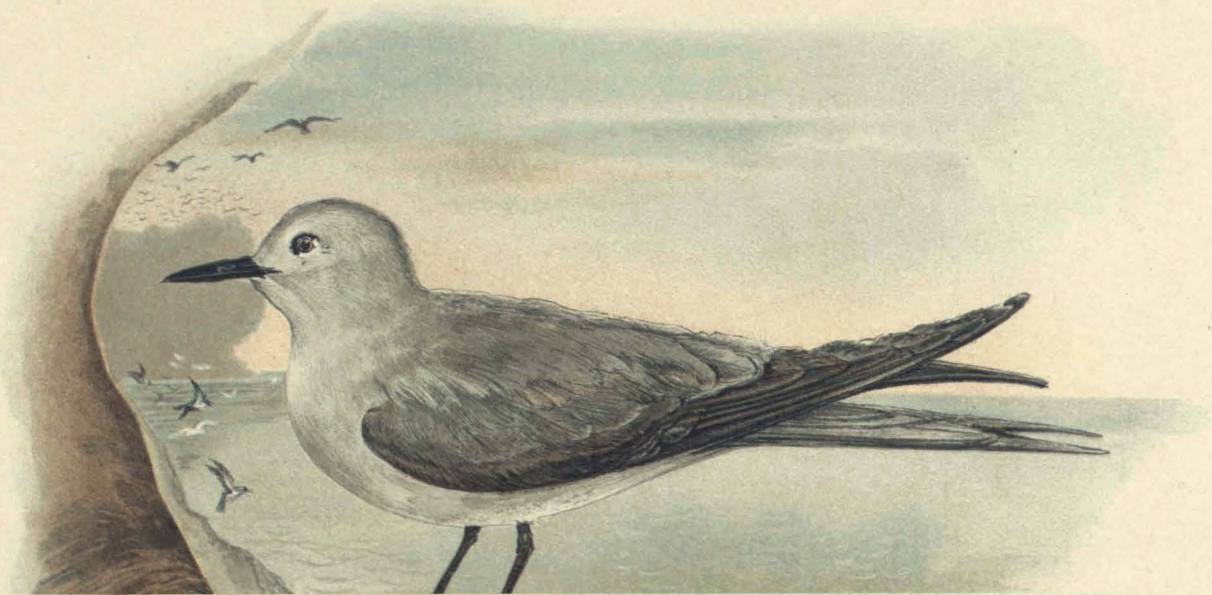

BIRDS OF LAYSAN AND THE LEEWARD ISLANDS,
HAWAIIAN GROUP.

By WALTER K. FISHER.



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INTRODUCTION.

From March to August, 1902, the U. S. Fish Commission steamer *Albatross* was engaged in deep-sea explorations among the Hawaiian Islands. During May these investigations were extended westward along the chain of reefs and islets which reach out from the main group in the direction of Japan. I have referred to these as the Leeward chain. The Hawaiian group can very conveniently be divided into two parts—the Windward Islands, including the main large members from Hawaii to Niibau and Kauai, and the Leeward Islands or “chain,” comprising the westward extension, sometimes known as the “Bird Islands.” Beginning at the east, they include Bird Island, Necker, French Frigate (or Brooks) Shoals, Gardner, Laysan, Lisiansky, Midway, Cure, and Morell, together with numerous sunken reefs.

The *Albatross* went only as far as Laysan, lat. $25^{\circ} 42' 14''$ N., long. $171^{\circ} 44' 06''$ W., about 800 miles from Honolulu. The vessel arrived here May 16 and remained till the 23d. On the return voyage she stopped at French Frigate Shoals, Necker and Bird islands, but a landing was made only on Necker. During the stay at Laysan Mr. John O. Snyder and the writer were detailed by the naturalist in charge of the expedition, Dr. Charles H. Gilbert, to make observations on the bird life of the island and collect such specimens as seemed desirable.

The results of this week's investigations on the island—one of the most remarkable bird islands in the world—make up the greater part of the following report. I have included also notes gathered at other islands of the Leeward chain visited, besides the few published records for those we did not visit. This makes the paper fairly complete for the Leeward group. The main Hawaiian Islands are not touched upon.

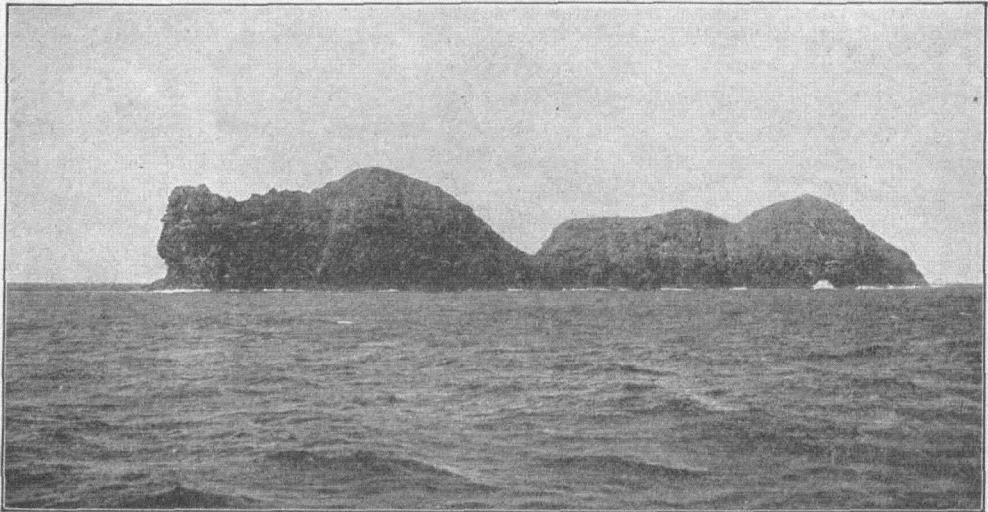
The number of species breeding in the region indicated is not great, there being among the sea fowl only eighteen and of the “land” birds five, including a rail and a duck. On Necker a new tern, of the genus *Procelsterna*, was discovered. This was found to inhabit also French Frigate Shoals and Bird Island.

The following report is in no sense a systematic treatise on the ornithology of the region, but merely a running account of the birds as we saw them during our brief sojourn. Only such technical notes have been included as seemed worthy of permanent record. Systematically, the ornithology of the group has been handled by Mr. Rothschild in his handsomely illustrated “Avifauna of Laysan,” based upon material collected in 1891 by Henry Palmer on Laysan, Lisiansky, and Midway islands and the French Frigate Shoals. Mr. William Alanson Bryan's “Key to the Birds of the Hawaiian Group” covers this region also; this book is for the Hawaiian Islands what Ridgway's “Manual” is for North America. Wilson and Evans's “Aves

Hawaiienses" also includes, second hand, the ornithology of the group. Mr. H. W. Henshaw's "Birds of the Hawaiian Islands," which has recently appeared (1902), is the best work we have on the natural history of Hawaiian birds; it also includes references to the Leeward group. In 1896, Dr. H. Schauinsland spent three months on Laysan and many valuable bird notes are included in his "Drei Monate auf einer Koralleninsel," from which I have several times quoted.

The photographs^a which illustrate this paper were taken by myself, except those of Bird and Necker islands, which are by Mr. Snyder.

In describing the shapes and colors of eggs, as well as the hues of birds, I have used Robert Ridgway's "Nomenclature of colors for naturalists."



Necker Island from the south.

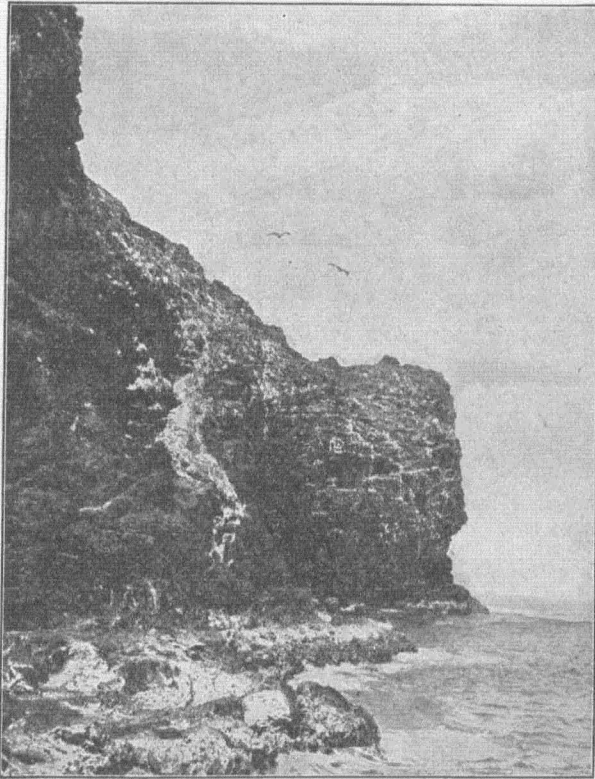
Both on the Laysan trip and during the preparation of this report I have received many kindnesses from several gentlemen. I wish especially to acknowledge my obligations to Mr. Max Schlemmer, of Laysan, formerly of Waimea, Kauai, who, during our sojourn on Laysan, with kindly hospitality entertained Mr. Snyder and myself and rendered numberless favors to all connected with the ship, doing everything in his power to make our visit scientifically a success, as well as a pleasure long to be remembered. Mr. Schlemmer takes the best of care of the birds on the island and has a genuine interest in their welfare. I wish likewise to thank Dr. Charles H. Gilbert, naturalist in charge of the expedition, who placed the entire week at Laysan at my own disposal, and, by kindly encouragement, made this report possible. Acknowledgments are due also to Mr. John O. Snyder, who shared with me the unique experience on Laysan, and who has contributed several photographs to this report; to Mr. William Alanson Bryan, of the Bishop Museum, Honolulu, for the use of specimens and books in the museum; to Mr. Witmer Stone,

^a For the information of those interested in such things, I might record that Cramer "Crown" 4 by 5 plates were used, Voigtlander collinear lens, Series III, and Graphic box. These make a very convenient and satisfactory outfit. In very few of the pictures was the lens stopped down to any extent.

of Philadelphia, for comparing the type of *Procelsterna saxatilis* with that of *P. cinerea* (Gould) and for looking up measurements and literature; to Mr. Robert Ridgway for the loan of specimens; and to Dr. L. Stejneger and Dr. C. W. Richmond for advice on a question of nomenclature.

NARRATIVE.

The *Albatross* left Honolulu for Laysan Island shortly after noon, May 10. We steamed westward, keeping south of the general trend of the long line of islets and reefs which extend west-northwest beyond Kauai. The following day, when perhaps



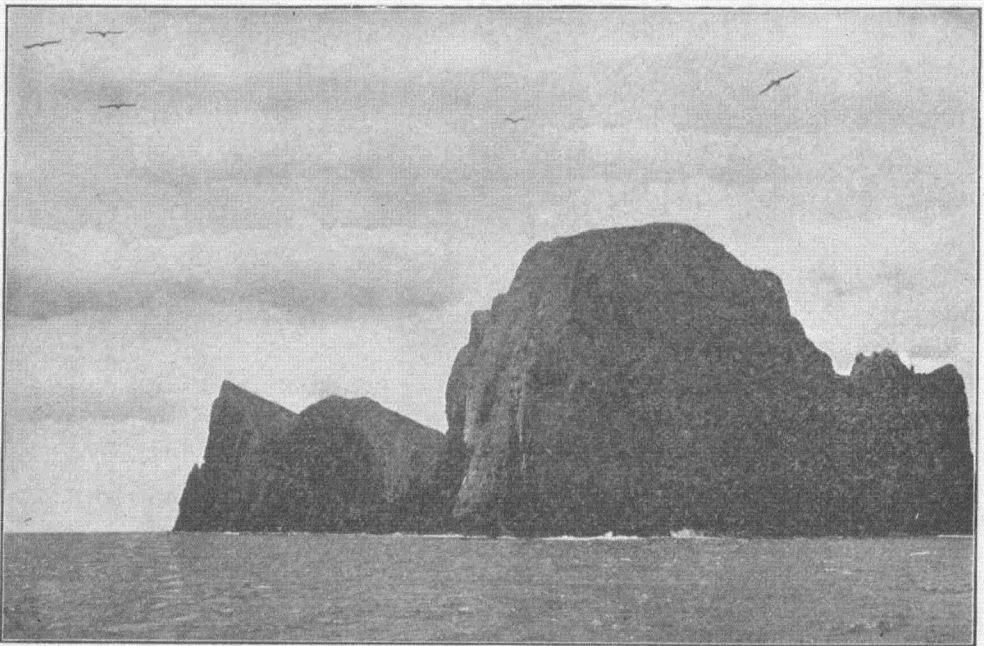
North side of Necker Island.

50 miles southwest of Niihau, a flock of mynahs (*Acridotheres tristis*) appeared in the neighborhood of the vessel and flew in narrowing circles around us. Finally several perched on the fore-topgallant yard, and early in the afternoon their number had increased to eleven. Late in the afternoon they left the ship.

It is of interest to find such a land-lover as the mynah so far out at sea, and it shows also that before long the chain of Leeward Islands may become gradually colonized by them. Birds continued scarce till the day before we arrived at Laysan. Occasionally a *Sula cyanops* or an *Anous stolidus* came within our limited prospect, and on the 13th we passed a flock of terns, presumably the sooty, which were excitedly fishing for something. That same evening they flew about in the moon-

light, uttering their sharp, querulous cries, which, once heard, are long remembered. I believe these terns belonged to the large colonies on the French Frigate Shoals, to the northward.

On May 15, when perhaps 75 miles east of Laysan Island, we encountered several species. The black-footed albatross (*Diomedea nigripes*) was fairly common, and I saw a few of the white species (*D. immutabilis*). The sooty and gray-backed terns (*Sterna fuliginosa* and *S. lunata*) were seen all day, and likewise the uau kane (*Puffinus cuneatus*) and red-tailed tropic bird (*Phaëthon rubricauda*). The presence of these birds is of interest in indicating the kinds which habitually go farthest from their nests in search of food.



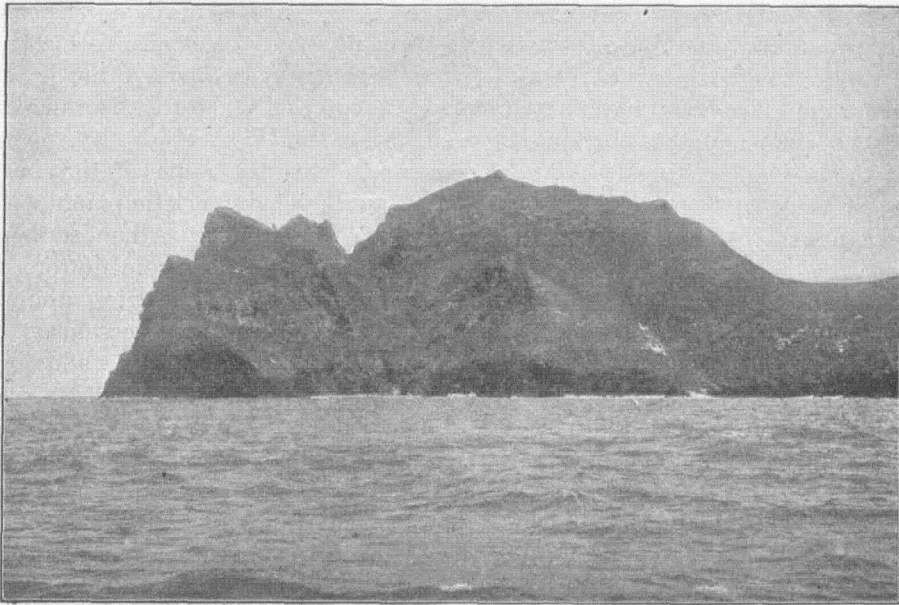
Bird Island from northwest.

About 5 o'clock on the morning of the 16th Laysan was sighted, and shortly afterwards was clearly visible to the westward, lying long and low on the horizon, with a cloud of sea birds hovering over it. All around us sooty terns were screaming, and gave some hint of the noise which that far-away company was making, but which as yet we could only conjecture. The light-house on the west side rose above the low island, and we were greeted with the Stars and Stripes, which Mr. Schlemmer joyally keeps waving over this tiny spot of land. Long heavy rollers had set in from the northwest, so that, when we arrived off the little settlement on the west side, landing seemed risky. Although one of the party went ashore, a general landing was not accomplished till the following day.

Laysan is a rudely quadrilateral island, perhaps not exceeding 30 feet above sea level in its highest portion toward the north. It is 3 miles long by $1\frac{1}{2}$ broad, and

is formed like a shallow platter. In the center is a lagoon not connected with the sea, which occupies about 100 acres and teems with brine shrimps. The island is considered to be an old atoll which has been elevated. A fringing reef surrounds it, with a passageway on the west side opposite the light-house.

The island has just been compared to a platter; if one stands on the highest part at the north he will see that the land slopes up abruptly from the broad, sandy beach, forming a narrow, grass-covered slope on the north, east and south sides, and a low bluff followed by a level stretch on the west. Thus the highest ridge of the island is relatively very close to the shore. From this ridge or divide the land slopes off gradually to a plain surrounding the lagoon. The narrow littoral slope is clothed with short, wiry grass, trailing morning-glories (*Ipomœa insularis* and *I. pes-capræ*)



South slope of Bird Island.

and other plants that love the spray-laden air. The inner slope is covered with tall, bushy grass that grows in separate tussocks, and several species of shrubs, one of which (*Chenopodium sandwicheum*) covers considerable areas. This grassy portion comprises the greater part of the island, and is succeeded near the lagoon by a narrow zone of juncus. Following the juncus is another belt of a pretty pink-flowered sesuvium, a favorite haunt of the Laysan honey-eater (*Himatione freethi*).

We now arrive at a flat surrounding the lagoon, covered with thin chips of phosphate rock and destitute of vegetable life. This is what might be considered the high-water plain of the lagoon. It is the favorite lurking-place of bands of golden plover (*Charadrius dominicus fulvus*) and wandering flocks of turnstone (*Arenaria interpres*). Some distance from the southwest corner of the lagoon is a little pond of fresh water—or only a trifle brackish—surrounded by a luxuriant growth of juncus, and forming a favorite rendezvous for Laysan teal and bristle-thighed curlews;

and near it are extensive clumps of chenopodium bushes which the little noddies (*Micranous hawaiiensis*) and Laysan finches (*Telespiza cantans*) find particularly favorable for nesting sites. Here also are old piles of broken phosphate rock which teem with birds.

From the top of one of these little hillocks a fine outlook is obtained to the southward over the largest albatross rookery on the island. The ground is bare and nearly flat for a quarter of a mile, and the gony (*Diomedea immutabilis*) has taken almost complete possession. Although the white albatross is distributed fairly evenly over the whole island, with the exception of the beaches, they appear more numerous in this locality. The central portion of the island is very nearly level, and in many places the lime rock has been uncovered for considerable areas. It is here that the best deposits of commercial phosphate rock are found. The ordinary carbonate of lime of the old coral rock, by long exposure to superincumbent deposits of organic matter, mostly in the form of bird excrement, seems to have been largely changed into phosphate of lime. The upper slopes of the island are sandy, and the glare here on a hot summer day is intense. The rock is much deeper beneath the surface of this portion of the island.

At the present writing I have not been able to learn the names of the species of grasses and sedges we brought away.^a A few of the characteristic plants were not in flower and their definite identification was scarcely possible. A handsome portulaca-like plant, *Sesuvium portulacastrum*, with small reddish-purple flowers, forms extensive beds near the lagoon, as if carefully cultivated. Growing abundantly among these plants is the succulent *Portulaca lutea*, with yellow blossoms. *Heliotropium curassavicum* Linnæus is likewise common near the same place, and *Tribulus cistoides* Linnæus, a creeping plant with handsome yellow flowers, occurs over all the island and is largely visited by the red honey-eaters. *Ipomœa insularis*, a showy morning-glory, is common everywhere, twining up the shrubs and bushy grass. A beach species, *I. pescaprae*, was found near the shore. The large-flowered *Capparis sandwicheana* D'C. had just come into blossom sparingly and was also abundant. *Chenopodium sandwicheum* D'C. likewise is a shrub in great abundance and largely used by nest-building species for their homes. Several other shrubs were without flowers, and I do not know where they belong. Most of the species mentioned above are wide-ranging forms.

Two very striking facts at once impress the visitor—the great numbers of birds and their surprising tameness. The effect of this is at first nearly overpowering. Birds are everywhere, and the noise is sometimes deafening. When we made our way through a populous colony of sooty terns we had to exercise much care to avoid crushing their eggs and treading on the birds, which struggled panic-stricken before us with the old ruse of a broken wing, and then, taking flight, swarmed over our heads. If we would converse, it was necessary to shout.

Turning toward the center of the island we were obliged to cross a wide area covered with tall grass and completely honeycombed with the burrows of petrels (*Æstrelata hypoleuca*). Through the roofs of these tunnels the pedestrian is continually breaking, sinking in the soft soil up to the knee. From out the shadows of the tussocks young albatrosses, uncouth and awkward, snapped their beaks at us,

^aSee appendix for names of plants collected.

and occasionally losing their balance from overhaste, fell forward on their chins. This proceeding usually made them actively sick.

Few of the birds seemed frightened, and with the exercise of a little care we were able to approach most of the species as close as we wished. It was certainly gratifying to be able to walk up to an albatross or a booby and watch it feed its young, and to record this domestic duty with the camera. It might, perhaps, be difficult to convey the pleasure I experienced when, standing in a group of albatrosses, one came up and peered into my face, and finding my intentions good proceeded to examine inquisitively the polished top of my tripod. Many of the young albatrosses would allow themselves to be stroked after a ludicrous show of displeasure, and would soon appear as if they had known us always. The little rails scampered hither and thither, like diminutive barnyard fowls, but soon returned craning their necks to discover why they had retreated. When we sat working, not infrequently the little miller-bird (*Acrocephalus familiaris*) came and perched for a moment on our table and chair backs, and the Laysan finch and rail walked about our feet in busy search for flies and bits of meat. The beautiful little red honey-eater visited us each day at meal time, and sought for "millers" in the crannies and seams between the boards. Thus, wherever we went we were free to watch and learn and were trusted by the birds. It seems a most touching and unique experience, and one which demonstrates all too forcibly the attitude of wild creatures which have not yet learned that man is usually an enemy.

Our visit could scarcely have been better timed. Had we been earlier we would have missed the nesting of the smaller land birds, and, if later, the terns would have all hatched young, and the same is true of the boobies and frigate birds.

The following species were found either with eggs (*) or with young (†):

<i>Sterna fuliginosa</i> .*	<i>Diomedea nigripes</i> .†	<i>Fregata aquila</i> .*†
<i>Sterna lunata</i> .*†	<i>Æstrelata hypoleuca</i> .†	<i>Anas laysanensis</i> .*†
<i>Anous stolidus</i> .*	<i>Puffinus nativitatis</i> .*	<i>Porzanula palmeri</i> .*
<i>Micranous hawaiiensis</i> .*†	<i>Phaëthon rubricauda</i> .*†	<i>Himatione freethi</i> .*
<i>Ygys alba kittlitzi</i> .*†	<i>Sula cyanops</i> .*†	<i>Telespiza cantans</i> .*
<i>Diomedea immutabilis</i> .†	<i>Sula piscator</i> .*†	<i>Acrocephalus familiaris</i> .*

The following, though breeding species, were not laying:

<i>Puffinus cuneatus</i> .	<i>Oceanodroma fuliginosa</i> .
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The following migrants were present at the time of our visit:

<i>Charadrius dominicus fulvus</i> .	<i>Heteractitis incanus</i> .
<i>Arenaria interpres</i> .	<i>Numenius tahitiensis</i> .

With such a vast bird population, numbering doubtlessly many hundreds of thousands, it is not surprising that there should be some method in their distribution and that the various species are found more or less in colonies. For reasons best known to themselves many of the species have chosen definite localities. Thus, *Diomedea nigripes* is found breeding on the sand beaches on the north, east, and south sides, but not elsewhere. *Sula cyanops* is restricted to the narrow, littoral, sedge-covered slope on the same sides. *Sterna lunata* chooses the summit of the littoral slope all the way around the island. *Sterna fuliginosa* encircles the islet in a wide band, from the divide along the inner or lagoon slope, inside the ring of *lunata* settlements. *Æstrelata hypoleuca* burrows where the sand is deep throughout the area covered with tall grass, down to near the open plain, where in favorable

places it is replaced by *Puffinus cuneatus*, which thus encircles the lagoon in a ring inside of the immense *Estrelata* colony.

The distribution of other forms is about as regular as these. Not only is there a horizontal distribution, but also a vertical. The number of breeding birds is so prodigious that favorable space is at a premium, and several species live one above the other. Thus, in burrows beneath the ground are found *Estrelata* and *Puffinus cuneatus*, and above them *Sterna*; while in bushy areas *Phaëthon* and *Puffinus nativitatis* may take the place of *Sterna*. Still higher, in shrubs, *Telespiza* and *Acrocephalus* make their nests, the topmost branches being occupied by *Sula piscator*, *Fregata aquila*, and *Micranous hawaiiensis*. As Dr. Schauinsland puts it, "the comparison with series of flats in large towns is opportune."

The birds do not all breed in greatest numbers at the same time, but there is a certain succession. This has been well stated by Dr. Schauinsland, whom I quote in translation:

In spite of this excellent use of all the space at their disposal, the birds which have chosen Laysan for their breeding home would not be able to find satisfactory places if they all arrived at the same time. They are therefore obliged to take turns, so that some species of sea birds leave the place as soon as their young are strong enough to fly, and while the former occupant is leaving the newcomers already begin to arrive. Thus there is a constant coming and going, and it follows that breeding species are found at almost every season of the year, a fact which is remarkable even in the tropics where the breeding season is generally less regular than in our latitudes. In this way a most definite succession, which probably dates back thousands of years, takes place year after year in the arrival and departure of certain species.^a

During the seven days that the *Albatross* remained near Laysan, Mr. Snyder and myself remained on shore, the guests of Mr. Max Schlemmer, to whom the success of our visit is largely due. We were thus able to verify our few observations on the habits of the birds many times, and Mr. Schlemmer gave us valuable hints as to the location of the land birds' nests. He also presented us with a small collection of eggs. Various members of the party came ashore at different times, and a survey of the island was made by the officers of the ship. Much of our time was necessarily taken with the preparation of specimens, but as often as possible daylight hours were given to photography and observation, while the less interesting but necessary labor of caring for skins was left till after sundown.

On the evening of May 23 the *Albatross* weighed anchor, and on the afternoon of May 28 arrived at French Frigate Shoals. This is an extensive reef under a few fathoms of water, with four sand islands projecting above. The shoal is rudely crescent-shaped, the hollow toward the south, and on its southern edge is a lava rock rising 120 feet above the sea. The larger islands are covered with vegetation, but we were unable to land on account of rough water on the shoal.

Birds were plentiful, especially around the tall rock. Early in the morning terns fairly swarmed over the largest sand islet. We saw here for the first time a graceful little gray tern, *Procelsterna saxatilis*, which was later captured on Necker Island. It was undoubtedly nesting on the tall rock. Other birds which were positively identified were: *Sterna fuliginosa*, *Sterna lunata*, *Gygis alba kittlitzi*, *Anous stolidus*, *Diomedea immutabilis*, *Diomedea nigripes*, *Puffinus nativitatis*, *Sula cyanops*, *Sula piscator*, *Sula sula*, and *Fregata aquila*.

^a Drei Monate auf einer Koralleninsel, p. 49.

We left the vicinity of the shoal on the evening of May 29, and arrived near Necker Island (latitude 23° 35' N., longitude 164° 41' W.) the afternoon of the next day. Necker Island is a dark, forbidding, rather precipitous rock of volcanic origin, attaining a height of 300 feet. It is about seven-tenths of a mile long and is shaped like a rude fishhook, the shaft extend nearly east and west, the barb being a rugged peninsula pointing toward the northeast and inclosing a rocky and turbulent cove.

The island is entirely composed of lava, mostly of a sooty gray or black, with streaks of dull dark-red through it. The sides of the rock, though steep, are intricately terraced, especially on the northeast point, where there is a series of shelves and all sorts of knobs and crannies, making the place ideally fitted for the occupation of birds. The succession of terraces is curious and appears almost artificial in places. Each shelf, from 1 to 10 feet wide, is succeeded by a slightly overhanging rise. These perpendicular steps are full of bowl-like hollows, deep, irregular crevices, and jutting knobs, and form excellent nesting-places for *Gygis alba kittlitzii*, *Procelsterna saratilis*, *Sterna lunata*, *Puffinus cuneatus*, *Bulweria bulweri*, and *Phaëthon rubricauda*.

Out on the open shelves one finds other birds, such as *Sterna fuliginosa*, *Anous stolidus*, *Sula cyanops*, *Sula sula*, and *Diomedea immutabilis*. The wider shelves of the island are sparsely covered with a fleshy-stemmed, yellow-flowered portulaca (*Portulaca lutea*), and the summit is rather plentifully grown over with *Chenopodium sandwichicum* bushes, on which large colonies of *Sula piscator* and *Fregata aquila* were nesting at the time of our visit. The bright red, puffed-out gular sacs of the male frigate birds could be discerned with a glass from some distance at sea, shining out like great red fruits among the green foliage of the summit.

We landed in a little cove on the north side of the island, through the skillful management of Mr. A. B. Alexander. The rocks rise abruptly out of the water, and the whole north side is very precipitous. A shelf of rock, just above the surf, makes it possible to go about without difficulty. We found birds in great abundance and were fortunate to meet almost at once the diminutive pearly gray tern which we had seen at French Frigate Shoals. This species turned out to be new, and I have called it *Procelsterna saratilis*^a because it always lays its egg in hollows among the rocks. Its nearest relative, *Procelsterna cinerea*, is an inhabitant of Australian and New Zealand seas. We were also so fortunate as to discover the eggs and downy chick, and an immature bird in full juvenal plumage.

It proved very interesting to compare the nesting sites of the same species on two such different islands as Necker and Laysan—the one high, steep, and rocky, the other low, flat, and sandy. *Gygis alba kittlitzii*, here much more common than on Laysan, still clung to the rocks. *Sterna fuliginosa* chose the softest spots, where an accumulation of soil had collected on the shelves. Both *Sula piscator* and *Fregata aquila*, as a rule, nested in the bushes on the summit of the island, just as on Laysan. But *Puffinus cuneatus* and *Phaëthon rubricauda* have been obliged to seek crevices in rocks. They seem as prosperous, however, as on Laysan amid the sand. Birds are abundant and most of the available space is occupied. As on Laysan, so here the sooty tern is the most plentiful species, while the black-footed albatross is probably the least abundant of the breeding forms. One interesting find on this island was the eggs of *Bulweria bulweri*, a gentle, retiring little petrel of rather nocturnal proclivities.

Several of the party who climbed to the summit of the rock, not without some

difficulty, found a number of stone shrines. It is believed that the native Hawaiians visited the islands periodically long ago for the purpose of performing religious rites, involving sacrifices.

The following were either collected or positively identified at Necker Island:

<i>Sterna fuliginosa.</i>	<i>Diomedea immutabilis.</i>	<i>Sula piscator.</i>
<i>Sterna lunata.</i>	<i>Diomedea nigripes.</i>	<i>Sula sula.</i>
<i>Anous stolidus.</i>	<i>Puffinus cuneatus.</i>	<i>Fregata aquila.</i>
<i>Micranous hawaiiensis.</i>	<i>Bulweria bulweri.</i>	<i>Heteractitis incanus.</i>
<i>Procelsterna saxatilis.</i>	<i>Phaëthon rubricauda.</i>	<i>Arenaria interpres.</i>
<i>Gygis alba kittlitzii.</i>	<i>Sula cyanops.</i>	

We remained on Necker only a few hours, but long enough to gain some idea of the profusion of bird life which characterizes it. Without doubt we were the first naturalists to land, else *Procelsterna saxatilis*, one of the distinctly noteworthy birds, would not have remained so long undiscovered.

Early in the afternoon of the following day, June 1, we sighted Bird Island, rising like a citadel into the hazy sky line, and the *Albatross* came to anchor at dark off the south side. Although we could see nothing of the island, birds were much in evidence by their cries. An *Oceanodroma fuliginosa* flew aboard, attracted by the glare of deck lights, and on the following evening *Bulweria* and *Puffinus cuneatus* were similarly lured in some numbers.

From our anchorage Bird Island appeared like a very steep, half-funnel-shaped hillside, with several bold rocks and cliffs rising from the general slope. Two sulcuses, on the east and west halves, divide the slope into three ridges, and in each little valley there is a group of palm trees. The peak to the west rises 903 feet. The whole of the south side is covered with a growth of bushes and rank grass. This portion of the island suggests half of an old crater. The west, north, and east sides rise as a wall of naked rock, straight and sheer to an imposing height. The west face is black and menacing and perfectly perpendicular.

We were in the vicinity of Bird Island two days, but the sea was too heavy for landing. In fact, a safe landing can be made only in very quiet weather. The shore on the south side is so rocky that even a small swell causes considerable commotion. Birds nest all over the island. Those species which love the cliffs find a congenial home on the precipices and in the escarpments of the south side, while the boobies and man-o'-war birds live among the bushes on the grassy slopes. In fact, the whole mountain seemed alive with *Sula cyanops*, *Sula piscator*, and *Sula sula*. The last species lives along the top of the low escarpment which rises out of the sea along the south side. These three species and man-o'-war birds were continually flying around the vessel, as were likewise the various terns. We noted with pleasure *Procelsterna saxatilis*, which was common. We saw only one or two *Diomedea immutabilis* west of the island some miles, but a number of *nigripes*. Birds collected or otherwise identified are:

<i>Sterna fuliginosa.</i>	<i>Diomedea nigripes.</i>	<i>Sula cyanops.</i>
<i>Sterna lunata.</i>	<i>Puffinus cuneatus.</i>	<i>Sula piscator.</i>
<i>Anous stolidus.</i>	<i>Puffinus nativitatis.</i>	<i>Sula sula.</i>
<i>Micranous hawaiiensis.</i>	<i>Bulweria bulweri.</i>	<i>Fregata aquila.</i>
<i>Procelsterna saxatilis.</i>	<i>Oceanodroma fuliginosa.</i>	<i>Charadrius dominicus fulvus.</i>
<i>Gygis alba kittlitzii.</i>	<i>Phaëthon rubricauda.</i>	<i>Arenaria interpres.</i>
<i>Diomedea immutabilis.</i>		

We left Bird Island waters on June 3, and late at night, some 35 miles south-west of the rock, heard many *Sterna fuliginosa*, which were thus scouring the sea at

a considerable distance from their nests, for it is reasonable to suppose that these were nesting birds.

The *Albatross* visited Bird Island again August 5 and remained four days in the vicinity. Although a landing might possibly have been made with considerable risk when we first arrived, the problem of leaving the island proved scarcely reassuring, so that we had to be content with again observing the birds from a distance. All the species seen during the first trip were again noted, with the exception of the albatrosses, both kinds of which were absent. The terns of the year were now full-fledged and flying about, the spotted plumage of the young of *lunata* and *fuliginosa* rendering them especially conspicuous. Young boobies were common also, and all stages of plumage between the immature and adult could be noted. Especially conspicuous were the juvenile *Sula sula*, which are wholly brown. *Procelsterna saxatilis* was still abundant. About 30 miles east of Bird Island we saw a white-tailed tropic bird (*Phaëthon lepturus*). This was the farthest west in the group that we noted the species, although about Kauai, Niihau, Oahu, Molokai, and Maui it was frequently observed.

LIST OF SPECIES.*

LARIDÆ.

Sterna fuliginosa. Sooty Tern.

Sterna fuliginosa Gmel., Syst. Nat., i, ii, 1788, p. 605.

While the *Albatross* was still some distance from Laysan we could easily distinguish great swarms of birds hovering over the island so as to form a veritable cloud. The greater number of this excited, screaming multitude were sooty terns. Their cries reach one at sea as a low murmur, but in the midst of a populous district the noise is simply deafening, and whenever we wandered among their "nests" we were obliged to suspend conversation.

The sooty terns live in a great colony which extends along the upper half of the interior slope completely around the island, with only a few interruptions, and are thus found almost entirely among the bushy grass; on the west side the community extends nearly to the low bluff overlooking the sea. Their distribution on such a small island is only of interest when compared with that of a near-by related species, the two forms mutually agreeing to keep apart, though necessarily living in close proximity. Thus the white albatross or gony has preempted the greater part of the island and has relegated the black-footed albatross to the sand beaches. So the sooty tern, by virtue of greater numbers, has crowded the gray-backed tern (*Sterna lunata*) toward the sea, where the latter occupies a narrow strip of island between the colonies of *Sterna fuliginosa* and the beaches and also a few scattered localities near the lagoon. It is much less numerous than *S. fuliginosa*, which has evidently gotten the best of the struggle, if struggle there has been. *Sterna lunata* begins to nest sooner than *S. fuliginosa* and presumably arrives earlier.

The sooty terns nest in among the tall grass and the single egg is laid directly on the sand, with sometimes scarcely a hollow to suggest a nest. The eggs are placed very close together in many localities—so close that it is sometimes difficult to progress and not walk on them. The birds are very loath at times to leave their nest, and scold soundly before finally slipping off. When at last driven, they limp away, dragging their wings in a painful manner, just as our own birds do. Thus, here, on a little island, is this firmly implanted instinct strongly in evidence, and practised where it can be of no possible advantage to the bird. Sometimes a dozen or more will struggle on ahead of the pedestrian, trampling over each other and crying incessantly, kicking eggs to the right and left in a mad endeavor to escape, while overhead their fellows keep up an incessant screaming. There is always a great cloud of these birds flying back and forth over the colony, even when no disturbing element is present. They seem to need the nervous excitement. Just at sunrise they are spontaneously most noisy, for then they apparently are returning from the sea, where I have heard them at various times during the night. The illustration of these terns flying gives a good idea of their actions on the wing. (Fig. 2.)

All the eggs of this tern were fresh. We ate many of them while on the island and found them superior to those of the domestic fowl. Mr. Schlemmer informed us that the egg of the albatross is the finest of all.

The eggs of the sooty tern vary much in markings, but can usually be told from those of *Sterna lunata* by greater size and usually coarser spotting. The ground color is white or occasionally a cream buff. One type of marking consists of deep burnt sienna and grayish vinaceous spots, with occasional nearly black scrawls scattered rather evenly over the whole surface. These spots are 1, 2, and 3 mm. in diameter, with occasional larger and smaller ones. Another less prevalent variation consists of heavy, very deep burnt sienna blotches (5 mm. to 15 mm. in extent) congregated in a zone near the blunt end, and lesser pale grayish vinaceous and deep burnt sienna spots sparsely scattered over the rest of the egg. A very handsome type has the brown laid over the vinaceous, and occasionally the deep burnt sienna or chestnut shading off to one side into light, caused by the spiral twisting of the egg in the oviduct.^a One specimen shows this to a marked degree, having long chestnut daubs extending spirally from the big end.^b Still another type has fine brown and grayish vinaceous maculations scattered all over the egg, but more numerous at the blunt end. An abnormal specimen is entirely without markings, being pure white. The shape is ovate, either elongate or thick. An average specimen measures 53 mm. by 35 mm.

This species has been found on Midway and Lisiansky islands, and we encountered numbers off the French Frigate Shoals, where in 1891 Henry Palmer found large breeding colonies. On Necker it is the most abundant tern, and as noisy as ever. The birds lay their eggs on the shelves of rocks where there is some soil and matted succulent portulacas. Unlike those on Laysan, all the eggs were advanced in incubation, and many young birds were hatched and peeping. Some were perhaps a week or 10 days old. A few eggs of this species were laid in cavities in the face of the rocks, where the young were eminently able to cling with their sharp little claws. They pecked most savagely if we attempted to dislodge them. Likewise many eggs were laid out on the bare rock in the full glare of the sun, and I saw a few perilously near high-water mark, in fact wet with spray. A number of eggs of *Gygis* were in this position also. Dr. Gilbert found a nest with two eggs, and saw the bird rise from them. The usual number is, of course, only one.

The rocks where we did most of the collecting faced a deep bay, and whenever the gun was discharged thousands of terns would simultaneously shoot out from the face of the crags, as though individually hit, filling the whole cove with an incredibly dense mass of angry birds.

The species was abundant at Bird Island both in June and August. On our second trip we saw many in the spotted juvenal plumage.

Saunders defines their wide distribution as follows: "Tropical and juxta-tropical seas, wherever suitable islands and reefs exist; occasionally wandering to Maine * * * and to Europe, even as far as England. Almost unknown on the South American side of the Pacific, otherwise very generally distributed."^c

Sterna lunata. Gray-backed Tern.

Sterna lunata Peale, U. S. Expl. Exp., Birds, 1848, p. 277.

The gray-backed tern is one of the most characteristic birds of Laysan, and after *Sterna fuliginosa* is the most abundant of the five terns breeding on the island. Its habits are very similar to those of the sooty tern. The colonies of this species, as mentioned under *Sterna fuliginosa*, are somewhat peculiar in distribution. One large, rather scattered community encircles the island like a narrow band, close to the seabeach on the wind-swept sedgy slope facing the ocean and entirely outside the big colony of sooty terns. There are also some separated and small colonies in a similar position with reference to the lagoon. In short, there are two more or less interrupted circles of gray-backed terns, sandwiching between them a much greater community of *Sterna fuliginosa*.

The single egg is laid on the sand, and in some cases on bare phosphate rock. A few young hatched while we were on the island, and all the eggs were advanced in incubation, whereas the eggs of *Sterna fuliginosa* were quite fresh, and many birds had not yet laid. The egg of this species is smaller than that of *Sterna fuliginosa*. No two specimens are alike, as is usually the case, I believe, with sea birds. The ground color is white or very pale yellowish, and the spottings a rich, often

^a Grinnell, Pacific Coast Avif. No. 1, Birds of the Kotzebue Sound Region, Alaska, p. 24.

^b Noted also by Snodgrass & Heller, Birds of Clipperton and Cocos Is., <Proc. Wash. Acad. Sci., iv, 1902, p. 507.

^c Cat. Birds Brit. Mus., xxv, p. 105.

deep, chestnut, over shell markings of lilac gray edged with vinaceous. The maculations are sometimes evenly distributed, fine spots of deep brown over broader splashes of gray, but in the commoner type of marking the spots are larger and more numerous at the blunt end. The contours vary from blunt ovate to elongate ovate. An average specimen measures 46 by 33; an elongate one 48 by 29 mm.

One parent always stands guard over the nestling, and the bird shown in fig. 7, pl. 3, was very solicitous for her young. I found one small company nesting right on the bare sand at the edge of the beach. Often the nest is placed under a bush, which, so far as I am aware, is never the case with the sooty tern.

These terns, when excited, spread their wings slightly, tilt the tail, and walk around in circles, often rising a little on their toes. In flying they do not carry the bill pointed downward like our common tern, for example, but straight ahead like a gull.

Sterna lunata has been recorded from Lisiansky and the French Frigate Shoals. Off the latter islands we found it common, and likewise observed many on Necker. Here the gray-backed terns nested in shallow cavities and hollows of the rocks on the more exposed portions of the island, and only very sparingly on the broad shelves with *Sterna fuliginosa*. At Bird Island we found the species common in June, and again in August, when there were numbers of birds in juvenal^a plumage.

Saunders gives the distribution of this tern as follows: "Paumotu Islands (Low Archipelago), Society Islands, Fiji group, Phoenix Islands, Hawaiian group, Laysan and Krusenstern islands, Caroline and Pelew islands, Moluccas, Solomon Islands, and probably the intermediate islands of the Pacific." (L. c., p. 101.)

***Procelsterna saxatilis.* Necker Island Tern.**

Procelsterna saxatilis, W. K. Fisher, Proc. U. S. Nat. Mus., xxvi, 1903, p. 559.

This handsome little tern we first saw off the French Frigate Shoals, particularly near the large rock mentioned in the narrative, and its identity was much of a mystery. When we landed on Necker Island the same species was soon in evidence, and its egg was found even before we realized to what tern it belonged. The birds are seen usually sitting quietly on the rocks, and their small size immediately singles them from the hosts of other sea fowl all around. They fly with a quick, dove-like wing beat, and were more suspicious of our movements than any of the other species. We never heard them utter a cry. Although they may perch near the "nest," they are extremely non-committal as to its exact position, leaving the neighborhood whenever the egg is disturbed. In fact, only one bird was actually flushed off the egg, and that by Mr. Snyder as he was climbing the steep north face of the island. The single egg is laid in a shallow bowl-like cavity or recess in the rock with no nest, but occasionally a few stray quills and rubbish scattered about. (Frontispiece.)

Although the birds were fairly common, my impression is that the nests were not nearly so numerous in proportion, but I have no doubt that the majority of the birds nested in inaccessible places along the steep face of the rock.

All the eggs were very much incubated and we were able to save but two specimens. These are bluntly ovate and broadly elliptical ovate. The ground color is dull creamy white, in one specimen not very thickly marked with roundish, rod-shaped, Y- and U-shaped and irregular small spots of clay color, light sepia and wood brown, the shell marks showing various tints of bluish gray. In this example the spots are rather evenly distributed over the whole egg. The other egg has more numerous, smaller, and more regular spots, about the size of a dust spot, which are scattered over the whole egg, but are thicker at the blunt end. The gray spots are larger and more numerous than the brown ones. The two specimens measure 36.5 by 26, and 39 by 27 millimeters.

At Bird Island this tern is abundant. We were not able to land on the rock, but from the *Albatross* saw many of them as they flew back and forth. The stomachs of those collected at Necker contained small silvery fishes.

The present species is nearest *Procelsterna cinerea* (Gould), but instead of being ashy gray is more bluish in general tone, with darker upper parts, darker breast, sides, flanks, and lower tail coverts (instead of white of *cinerea*), shorter and slenderer bill, and shorter wings. In some respects it is intermediate between *Procelsterna cerulea* (Bennett) and *P. cinerea* (Gould). This is true of the size

^aFollowing Dr. J. Dwight, jr., I have used *juvenal* here and elsewhere to signify the second plumage of a young bird, or that succeeding the natal down. As explained by Dr. Dwight, *juvenile* is inexact. (See *The Auk*, XIX, p. 251.)

in a general way and also of the color of the under parts. The under parts of *cerulea* are fully as dark as the back, which (in an old skin collected by T. R. Peale, Dog Island, Low Archipelago) is more ashy than that of *saxatilis*.

Procelsterna saxatilis shows its closer kinship with *cinerea* in the light lower parts and light gray wedges on the four outer primaries; but, as mentioned above, it is smaller than *cinerea*, with conspicuously shorter wing and shorter and slenderer bill. The under wing coverts are pearl-gray instead of white, and the breast, sides, and lower tail coverts are decidedly gray, whereas in *cinerea* the lower parts are almost white, and entirely so on the belly. The general tone of the plumage of *cinerea* is ashy, but in *saxatilis* it is somewhat bluish.

While the geographical distribution of the present form is very restricted, so far as known, being found on French Frigate Shoals, Necker, and Bird islands only, that of its nearest relative *cinerea* is rather wide, ranging over "Australian and New Zealand seas, Lord Howe, Norfolk, and neighboring islands, the Kermadec group, also the islet of San Ambrosio, which is nearest to the coast of Chile, but lies outside the cold Antarctic current," and Eua, Friendly Islands. (L. c., p. 136.)

A very interesting point is the fact that *Procelsterna cerulea* (Bennett) ranges in between the two forms, so that in addition to being far removed from its nearest ally, *saxatilis* is further segregated by the intervention of this less closely related species. *Cerulea* is distributed over "central Polynesia, Paumotu or Low Archipelago, the Marquesas, the Society to the Ellice islands, the Phoenix group, and the Fannings (Christmas I.), a little north of the Equator." (L. c., p. 134.)

A redescription of *Procelsterna saxatilis* is here added for the sake of completeness:

Type No. 188651, U. S. N. M., adult male. Bill black; pileum and fore part of cervix, lores, chin, and throat clear light gray (about No. 8 or 9 of Ridgway's nomenclature), shading to darker (between French gray and cinereous) on nape, cheeks and sides of neck, and passing into a trifle lighter gray (No. 7) on sides, hind part of jugulum, breast, flanks, and lower tail coverts. Fore part of jugulum and the abdomen pure white, blending into surrounding gray of sides and breast. Breast almost as pale as the pileum, but becomes gradually darker on sides, sides of neck, shoulders, and malar region, inclosing the conspicuously lighter throat and white jugular patch. An orbital ring is black in anterior two-thirds of upper, in forward and first third of lower parts, and pure white for the remainder. The black and white are conspicuous, being from 1 to 2 millimeters wide. There is a small white area just above black on "eyebrow." The gray of the nape and hind neck and shoulders shades gradually into a darker and less bluish gray over the mantle (about gray No. 5 or slightly darker), which darkens into a decidedly ashy gray (between slate gray and mouse gray) on wing coverts. Secondaries conspicuously edged with white. The feathers of the mantle are vermiculated with almost obsolete bars of lighter gray (present also in *cinerea* and *cerulea*) which show plainly in favorable lights. Primaries dark slate color, an indistinct light gray "wedge" on inner web of first three primaries (reaching to within 25 millimeters of tip on first), less conspicuous on fourth, and represented on remainder by an indistinct lighter edging. Shafts of primaries very dark sepia. Under wing coverts pearl gray, whitish at bend of wing. Rump, upper tail coverts, and rectrices like mantle. Inner web of each rectrix edged with pale gray distally, becoming almost white proximally (less extended than in *cinerea*). Legs in life a dull sepia black, paler toward and on tibiae and toes; webs creamy flesh color, rather lifeless, with an indefinite edging of sepia next to toes. Iris deep sepia, pupil black. Measurements of type in millimeters: Length, in flesh 285; wing 186; tail 113; culmen 26; depth of bill at nostril (post. end) 5.5; bill from nostril 17.5; tarsus 25; middle toe 32.

Adult female, No. 188652, U. S. N. M. In color like the male, but a trifle smaller (for size see table of measurements).

Juvenal plumage, No. 188653, U. S. N. M., female immature. The upper parts are as a whole darker; the pileum of dark feathers is edged with light gray, giving a mottled appearance. The mantle is darker and more ashy than adult, lacking faint bars, except on longest tertials. Inner tertials, and upper tail coverts edged with light gray. Lower parts, as a whole, lighter than adult, being white except an illy defined band across breast and on throat, which are gray. Sides of head and neck darker than adult. Black portion of orbital ring much wider and more conspicuous than white. White area over eye as in adult. Malar stripe white. Measurements in millimeters: Wing 157; tail 80; culmen 17; tarsus 23.

Nestling, recently hatched (male), No. 188654, U. S. N. M. Completely covered with soft down. Pure white below. Crown white; sides and back of neck very pale buff. Ends of wings white; inner portion of alar and the humeral and spinal tracts brownish gray (down white at tips and brownish gray below). Feet greenish gray; bill blackish.

The following diagnosis will serve to distinguish the three species of this genus:

- a. Lower parts nearly as dark as mantle, a decided and rather uniform gray. No discernible white wedges in first three primaries. *cerulea*
- aa. Lower parts very much lighter than mantle. A more or less conspicuous light-gray wedge in three outermost primaries. *cinerea*
- b. General tone ashy. Under wing coverts and lower tail coverts white; breast very pale gray. Size larger: Wing 211; culmen 28. *cinerea*
- bb. General tone bluish gray. Under wing coverts and lower tail coverts gray. Breast decidedly gray, whole under parts more suffused with gray than b. Size smaller: wing 186; culmen 26. *saxatilis*

I append the table of measurements published with the original description:

Number.	Sex.	Wing.	Tail.	Culmen.	Bill from nostril.	Depth of bill at nostril.	Tarsus.	Middle toe with claw.	Locality.
<i>Procelsterna saxatilis.</i>									
U. S. N. M., 188651. Type.....	♂ ad.	186	113	26	17.5	5.5	25	32	Necker Id.
Orig. 148	♂ ad.	186	109	25.2	17	5.5	25	32	Do.
Orig. 144	♂ ad.	185	112	26	17	5.5	25	bent.	Do.
Orig. 147	♂ ad.	186	115	26.5	17	5+	25	32	Do.
Orig. 146	♂ ad.	183	109	25	16	5.5	25	32	Do.
Orig. 145	♂ ad.	185	112	25	16.5	5.5	25	32	Do.
U. S. N. M., 188652.....	♀ ad.	180	110	25	16+	5	24+	31	Do.
<i>Procelsterna cinerea.</i>									
Acad. Nat. Sci. Phila., 5032. Type.....		211		28					East coast Australia.
Acad. Nat. Sci. Phila., 5033		α206+		28					Do.
U. S. N. M., 15466.....		α195+		27	19.5	6.5	25.5	33	(?)
<i>Procelsterna cerulea.</i>									
Acad. Nat. Sci. Phila., 5029		180		27					Polynesia.
Acad. Nat. Sci. Phila., 5031		178		26					Do.
U. S. N. M., 131532.....		180		25.5	17+		24	30	Dog Id., Low. Archip

α Wing tip gone.

Anous stolidus. Noddy.

Sterna stolidus Linn., Syst. Nat., ed. 10, 1, 1758, p. 37.

The noddy ranks fourth in relative abundance among the terns dwelling on Laysan. It does not build its nest close among others of its fellows to any marked degree, though I found a few small colonies. The noddies had apparently only recently begun to lay, when we arrived, and I believe their numbers increased during our stay. They were living mostly on the west and northwest sides of the island, where they made their nests on the slopes and summits of the low sand bluffs next to the beach. The nest is usually on the ground, though sometimes it is placed on the prostrate branches of a procumbent shrub. It is a much simpler structure than that of *Micranous hawaiiensis*, and when on the sand usually consists of a shallow bowl, lined roughly with dried sedge. Rarely there is no nest at all, the egg being deposited on the bare ground. When placed on the beaten-down stems of bushes, as is sometimes the case, the nest becomes a makeshift platform of sticks and sedge. The rather acute ovate egg is a creamy white, sparsely spotted with light gray, burnt umber, and walnut brown. Most of the brown spots are on the larger half, and are sometimes small and at other times quite large (4 to 8 millimeters across). One egg has no dark marks, but is scantily spotted and streaked with light Mars brown. Specimens vary from 58 by 48 to 51 by 35 millimeters. (Figs. 12 and 14.)

Noddies like to gather in little companies on the beach, or on rocks near the shore, where they sit for hours dozing away or preening their feathers. They are not so tame as their smaller relative, *Micranous hawaiiensis*.

We found this species off the French Frigate Shoals, from which it has already been recorded by Rothschild. Likewise on Necker it was fairly common, and we found nests and eggs. Here the nest was smaller than on Laysan, the material being restricted from necessity to the fleshy stems of *Portulaca lutea*, which grows abundantly on the shelves of the rocks. As on Laysan, the birds gathered on the rocks near the water's edge just out of reach of the surf. We found the species at Bird Island, both at sea and on shore, where they were seen standing on the beach.

This tern has a wide range, which is given by Saunders as follows:

"Tropical and juxta-tropical America; chiefly on the Atlantic side, but also on the Pacific in

Mexico and the central region; Atlantic down to Tristan da Cunha (breeding); intertropical African and Asian seas up to Yeddo; islands of the Pacific up to Laysan, etc., and as far as Sala y Gomez, 105° W.; also Chatham I., Galapagos (fide Ridgway), but not on coasts of Peru or Chile. Breeding, as a rule, where found. Once obtained off the south coast of Ireland." (L. c., p. 140.)

Micranous hawaiiensis. *Hawaiian tern; Noio.*

Micranous hawaiiensis Rothschild, Bull. Brit. Orn. Club, No. x, July, 1893, p. xvii.

This handsome little tern is one of the most characteristic birds of Laysan, where it nests in considerable numbers, ranking perhaps third in relative abundance among the terns. Saving the noddy, it is the only one which builds any nest worthy of the name, and hence is remarkable for this reason alone. The birds live in small communities, scattered over the island, either near the sea or in the interior. I found nests in two different kinds of bushes, and they were placed anywhere from 18 inches to 3 feet up, according to the desirability of location. They are constructed of twigs, usually morning-glory stems and leaves, and are from 10 to 12 inches in diameter. Usually the nests are built flat on top of the bushes, or sometimes below in a crotch. There is scarcely any hollow, and occasionally a few feathers enter into the lining of dried leaves. The nests are in a large number of cases completely plastered over with droppings, and are used year after year. (Figs. 9, 10, 11.)

The single egg is laid early in May, although from perfectly fledged birds, which were common, I should judge these eggs to belong to the second setting of the year. All were more or less advanced in incubation. They present some variation in size and hue. The ground color is either nearly pure white, creamy white, cream buff, pale buff, or even light vinaceous buff. Sometimes the egg is heavily blotched and streaked with chestnut at the large end, with only pale, partially obscured, markings elsewhere. Again, these blotches and smaller spots are scattered over the egg. In another type the deep burnt umber maculations are in small spots and irregular lines from 3 to 8 millimeters long, with many nearly obscured larger spots all over the egg. No two eggs are alike in color, and it is impossible to define any special type, unless it be the pale-buff ground tint, with scattered deep-brown blotches and streaks. The pale-brownish ground color is quite characteristic, though some eggs are almost pure white. The prevalent shape is ovate, sometimes very blunt. A large egg measures 47 by 33, a smaller specimen 43 by 30 millimeters.

This little tern is quite unsuspecting and allowed us to approach closely. When disturbed from its egg the noio flies about in circles as if in doubt, and finally settles on the edge of its nest, as shown in fig. 10. Numbers of them habitually sit in company on the tops of bushes facing the wind, some flying off occasionally and others joining the group. Their only occupation during these assemblies seems to be preening their feathers. Very few were seen at sea during the day, so that they must fish considerably after nightfall.

Speaking of this tern about Hawaii, Mr. H. W. Henshaw writes: ^a

"The noio lives wholly upon fish, to obtain which it habitually makes excursions offshore 10 or 15 miles. Indeed, comparatively little of its food is obtained inshore, though occasionally they may be seen slowly winnowing their way along the surf-streaked coast and scanning the heaving billows with anxious eye for their quarry.

"While following its prey on the broad ocean the noio is of much service to the Hawaiian fishermen, and acts as his pilot; for its presence in numbers in a given spot marks the whereabouts of shoals of noi, a long silvery minnow, and there also is sure to be found the aku, or skipjack, much sought after by the fishermen. This tern never dives for fish, but with a quick stoop and a dip of the head it seizes the unsuspecting minnow when close to the surface.

"In the olden time I learn that the natives used to raid the nesting sites of the noio pretty regularly for both eggs and young, the latter especially being esteemed delicacies, as indeed were the young of most sea birds. For this purpose dark nights were usually chosen, and by means of torches and the help of clubs the old birds, bewildered by the light, were easily secured."

Henry Palmer found this tern on Lisiansky and Midway. ^b We did not see any at French Frigate Shoals, but observed a number on Necker, without discovering any nests. We also saw them at Bird Island in August. The species is not uncommon in the Hawaiian group proper, and is recorded from Hawaii, Molokai, Oahu, Niihau, and Kauai. As a wanderer it is found likewise on the other islands. So far as our knowledge goes at present it does not breed outside this region.

^a Birds of the Hawaiian Islands, etc., 1902, p. 125.

^b Rothschild, Avifauna of Laysan, etc., p. 43.

Gygis alba kittlitzii. *White Tern*.

Gygis alba kittlitzii Hartert, Katal. Vogelsamm. Senckenb. 1891, p. 237.

On Laysan the white tern, or love bird, as it is sometimes called, is one of the least abundant of the breeding sea birds. Small colonies are scattered over the interior of the island, but the largest is found in the vicinity of the fresh-water pond. Here the little white terns lay their eggs on lumps of phosphate rock, among bush grass, or under the overhanging shelter of some shrub or clump of vines. Only one egg is deposited. We found all gradations, from fresh eggs to fully fledged young, which resemble the parent. The nestlings cling to the rocks with great persistence and fortitude. The air of independence which they are capable of assuming is very amusing. A peculiar trait of this white tern is its habit of occasionally depositing its egg on the bare limb of a bush, as depicted in plate 4, fig. 16. Here the bird stands over it, with confidence born of success probably, and the young is undoubtedly hatched, though we saw none. We watched the bird sitting on the egg shown in the photograph, and when she flew off it was not disturbed in any way. It is safe to assume that a heavy wind would play havoc if this habit was very general. We frequently saw these terns resting near their "homes," the two standing side by side, but they do not seem to brood so much as other species. They do not sit on their egg in the ordinary manner, but stand over it, as their legs are short.

The eggs are very handsome, the ground color varying from a faint greenish through very pale buff, cream, and white, with traces of yellowish. The marking is different on each egg. One is heavily blotched with French gray, over which are thick irregular lines and streaks of raw umber forming a band near the larger end, but scattered over the whole egg. Over this are fewer lines, almost black, confined to larger half. Another egg is streaked and mottled with drab-gray and olive. Other eggs are heavily blotched with slate gray, over which are irregular patches of very deep Prout's brown, almost black in spots. In some examples the markings tend to become streaks; in others irregular spots. The shape is bluntly ovate, broadly elliptical ovate, or oval, which last is perhaps the most prevalent contour. An ovate specimen measures 42 by 30, an oval 40 by 32 millimeters.

The old bird brings two silvery fishes to the young and she invariably carries them crosswise in her bill. Dr. Gilbert captured two such fishes from a young tern. These turned out to be a silvery half-beak, and some species not yet identified. Mr. Schlemmer told me he had always observed two fishes, but Henry Palmer,^a on Midway Island, saw an old bird with "not less than four in its beak at once." The interesting part is how the old birds capture the additional fish and still retain the first one. Certainly the difficulty would seem great in the case of four fishes!

Whenever we happened to wander near their eggs or young the white terns came and hovered in front of our faces and peered intently at us as if trying to divine our intentions. Just out of reach they would flutter, turning their heads from side to side, occasionally uttering a droll and wheezy little cry. They did not offer to peck us, but were content to stare and wheeze. When fully satisfied they flew silently away, looking back from time to time, but would sometimes return for several additional inspections. Not infrequently, when we were nowhere near a colony, one of these terns, attracted by the unusual sight of white helmets, changed its course and came close to gaze at us with the same disconcerting intentness.

Some idea of the beauty of this species will be gained when it is remembered that their plumage is pure white, except a black orbital ring.

Henry Palmer (op. cit., p. xvi) found *Gygis* abundant on Midway Island and observed it at Gardner Rock, and we saw many individuals off French Frigate Shoals. On Necker it is one of the commonest terns, far more abundant than on Laysan, and I am inclined to think that the species finds the rocks a more congenial home. The seeming disregard for the welfare of the egg is well demonstrated here, for it is deposited on any little insufficient shelf of the rock, usually at the edge of some shallow cavity, where it clings, so to speak. I confess myself somewhat astonished at the recklessness of this little tern. How the egg is ever balanced on some of the extraordinary places upon which it is deposited, when the birds are continually flying on and off, passes comprehension. I observed many nestlings, all small, and saw one little bird emerging from the egg, its mother standing over it and resolutely refusing to desert her offspring, even though I stroked her back. She did not appear frightened, but rather indignant at intrusion. The species nests all along the steep face of the island, where they can be easily seen against the dark rock. Also at Bird Island we found the species

^a Rothschild, Avifauna of Laysan, etc., p. XIV.

common, both in June and August. Here against the blackish crags the little white specks shone out plainly, as on Necker.

Saunders in the British Museum Catalog does not separate *kittlitzii* from *alba*. The combined distribution of the two forms is given by this author as follows:

"Fernando Noronha, Trinidad and Martin Vas Islets, Ascension, St. Helena, Madagascar, Mascarene Islands and vicinity, Chagos group, Bay of Bengal, Malaysia to Australia, Polynesia to Ducie Island, and the Central Pacific generally, up to the Sandwich Islands and Krusenstern Islets."

Gygis alba kittlitzii was described by Hartert from the Caroline Islands, and has been determined by Rothschild and others to be the form from the Hawaiian group. It is probable that all the birds from localities north of the equator belong to this form. Although described as a subspecies, the form will probably be found to be a full species, as the presence of intergrading forms seems a little improbable.

DIOMEDEIDÆ.

Diomedea immutabilis. Laysan Albatross; Gony.

Diomedea immutabilis Rothschild, Bull. Brit. Orn. Club, No. IX, 1893, p. XLVIII.

With many ornithologists the word Laysan is so intimately connected with pictures of albatrosses that the two have become inseparably associated. Surely no birds can stand out more vividly in our memory than these splendid creatures, not alone on account of their great numbers and remarkable appearance, but more perhaps from the unusual charm and interest which attaches to their personalities. Their large size and striking plumage at once raise them to an exalted place among all sea birds, a position similar to that which tradition and fancy have accorded the eagle among birds of the land.

The Laysan albatross or gony is distributed all over the island, with the single exception of the beaches, which on all sides except the west are colonized by the black-footed albatross. The flat plain surrounding the lagoon is their favorite habitat, and we found the young here in far the greatest numbers. This great colony extended all the way around the lagoon, but certain portions were more congested than others. The largest single colony of young is on the south side of the lagoon, where the ground has been leveled off in past years by phosphate-rock diggers. Here from a little eminence one can look off and see many thousands of birds at a glance, but it would be hazardous to guess how many there are on the whole island. At the time of our visit the young were about two-thirds grown, the white feathers of the breast and abdomen having in most cases the appearance of the adult, but the rest of the body was covered with long brown down, except on the head, where it was short. The beaks of the young are dark dirty gray or brownish gray, while those of the adult are light greenish. There seems scarcely a tussock of the grass which covers the greater portion of the slopes of the island but has an ungainly young bird in its shadow ready to snap at the intruder with a show of ferocity. These amusing creatures sit on their heels with the whole length of the tarsus on the ground or tilted slightly in the air, as shown in the illustration. Their spare time is spent in gazing stupidly around, but if their reverie is at all disturbed by one passing too near they fly into an apparent rage, lean forward and snap their beaks viciously, or sway their uncouth bodies from side to side in a frantic attempt to maintain a balance. Sometimes they make a rush, waddling along and darting their heads back and forth to the music of clicking mandibles. But they only occasionally come to the point of biting, and are always amenable to tact and persuasion. (Figs. 18-21.)

Usually, after the first paroxysm of snapping is over, one can stroke them with little danger of scratched hands. They maintain a small fire of objection, with impotent nips, or try to sidle off. But sometimes a youngster is more determined than the rest. It often happens that in an eager rush to scare an intruder the young bird stumbles in a petrel's hole and falls forward with considerable force on its chin. In some way nature never meant an albatross's head to be lower than its stomach, or the concussion affects it unpleasantly, for usually it disgorges its breakfast very promptly and energetically, but curiously I never saw them do this without first falling over. After such a performance the young one looks dejected, for it is usually left hungry, and hunger is its chief trouble.

The old birds, however, are quite different, and do not seem to mind the presence of man. One can walk among them without disturbing their various occupations and amusements in the least. Only when suddenly startled do they exhibit any tendency to snap their bills, and then they are easily calmed. They back away from any proffered familiarity with great rapidity, unless suddenly hindered by a tuft of grass, which event surprises them immoderately. They will not allow themselves to be

handled, and make off at a great rate if one offers them this indignity. They have a half-doubting inquisitiveness which leads them sometimes to walk up to the visitor and examine anything conspicuous about his person. One bird became greatly interested in the bright aluminum cap to my tripod, and strolled up and examined it carefully with both eye and beak, appearing somewhat astonished when the cap tinkled.

Matters always seem to go harmoniously among the members of a colony and no ill-will was shown between adults. The young birds, however, occasionally had slight misunderstandings, and between the old birds and strange young ones there existed at times of feeding a peculiar animosity.

When standing beside their young they present a very attractive sight, as their plumage is always immaculately clean. The region about the eye is dark-grayish, overhung by a pure white eyebrow, which gives them a decidedly pensive appearance. They have an innate objection to idleness, and consequently seldom stand around doing nothing, but spend much time in a curious performance, the meaning of which I am at a loss to explain. It has been called courting (*Avifauna of Laysan, etc.*, p. 57), but as the antics are carried on during the birds' residence of about ten months on the island, they are probably an amusement, in which the albatrosses indulge immoderately in lieu of other diversion. This game, or whatever one may wish to call it, may have originated in past time during the courting period, but it certainly has long since lost any such significance.

The proceeding in brief is as follows: Two albatrosses approach each other bowing profoundly and stepping rather heavily. They circle around each other nodding solemnly all the time. Next they fence a little, crossing bills and whetting them together, pecking meanwhile, and dropping stiff little bows. Suddenly one lifts its closed wing and nibbles at the feathers underneath, or, rarely, if in a hurry, merely turns its head and tucks its bill under its wing. The other bird during this short performance assumes a statuesque pose and either looks mechanically from side to side or snaps its bill loudly a few times. Then the first bird bows once and, pointing its head and beak straight upward, rises on its toes, puffs out its breast, and utters a prolonged nasal groan, the other bird snapping its bill loudly and rapidly at the same time.

Sometimes both birds raise their heads in air and either one or both utter the indescribable and ridiculous bovine groan. When they have finished, they begin bowing at each other again, almost always rapidly and alternately, and presently repeat the performance, the birds reversing their rôle in the game, or not. There is no hard and fast order to these antics, which the seamen of the *Albatross* rather aptly called a "cake walk," but many variations occur. The majority of cases, however, follow the sequence I have indicated. Sometimes three engage in the play, one dividing its attention between two. They are always most polite, never losing their temper or offering any violence. The whole affair partakes of the nature of a snappy drill, and is more or less mechanical. (Figs. 25-28.)

Occasionally one will lightly pick up a twig or grass straw and present it to the other. This one does not accept the gift, however, but thereupon returns the compliment, when straws are promptly dropped and all hands begin bowing and walking about as if their very lives depended upon it. If one stands where albatrosses are reasonably abundant, he can see as many as twenty couples hard at work bowing and groaning on all sides, and paying not the slightest attention to his presence. When walking through the grassy portions of the island, I have seen white heads bobbing up and down above the green, as solitary pairs were amusing themselves away from the larger congregations of their kind. If I walked up to them, they would stop and gaze in a deprecating way, and walk off, bowing still, with one eye in my direction. Having reached what they considered a respectful distance, they would fall to and resume their play.

Should one enter a group of albatrosses which have been recently engaged in this diversion and begin to bow very low, the birds will sometimes walk around in a puzzled sort of way, bowing in return, a curious fact, which F. H. von Kittlitz recorded as early as 1834:

"When Herr Isenbeck met one, he used to bow to it, and the albatrosses were polite enough to answer, bowing and cackling. This could easily be regarded as a fairy tale; but considering that these birds, which did not even fly away when approached, had no reason to change their customs, it seems quite natural."^a

One moonlight night we strolled over the island after nocturnal petrels and visited a portion of a populous albatross colony. The old birds were still hard at work executing that queer "song dance," and in the uncertain light the effect was one long to be remembered. Their white plumage made them conspicuous for a long distance over the stretches near the lagoon. From all sides the sound of

^a Extract from *Avifauna of Laysan*, p. 111 (F. H. von Kittlitz in *Museum Senckenbergianum*, I, pp. 117 *et seq.*).

their groans and bill-snappings was audible above the continual thin, high squeak of young albatrosses and the moans and caterwauling of shearwaters and petrels. During some quieter spell in the activities of the vocalists far-away groans were borne to us across the placid lagoon, as a reminder that in other parts the good work was still going on. By this time many of the albatrosses had started off fishing, as they seem to do a large part of it after dark, probably toward morning.

It is interesting to note that the antics which have just been described are not limited to this species, but, in a modified form, are practiced by *Diomedea nigripes*, and are mentioned also by Rothschild and Hartert^a in connection with *Diomedea irrorata* Salvin. Probably all species of the genus exhibit the trait in some form.

After sunrise the albatrosses begin to feed the young. The old bird, coming in from the sea, alights near her offspring, which immediately takes the initiative by waddling up and pecking or biting gently at her beak. This petitioning always takes place and perhaps acts as some sort of stimulus, for in a few moments the mother stands up, and with head lowered and wings held loosely at the side disgorges a mass of squids and oil. Just as she opens her beak the young inserts its own crosswise and skillfully catches every morsel, which it bolts with evident relish. This operation I saw repeated, with short intermissions, ten times. The last two or three ejections of this oily pabulum cost the albatross considerable muscular effort, and the last time nothing came up but a little oil, and stomach juices presumably. The young bird is not at all modest in its demands, but keeps asking for more. The old bird now pecks back in an annoyed manner, and if the other still urges, she arises and walks off, usually to some neighboring young one, which she viciously mauls about the neck. This exhibition usually takes place just before she feeds her young and likewise between courses, as it were. Why she does this I am at a loss to suggest, unless it be mere ill-will. The old bird does not always confine this ill treatment to one strange young bird, but takes in a circle of those whose parents are absent. The young thus rudely treated sometimes bite back, but usually do not offer resistance, uttering instead a plaintive little squeak. A small mortality is the result of this practice. Dr. Gilbert observed that *Diomedea nigripes* is more savage than the white species. He saw a black-footed albatross thus take in a circle of about twenty young *immutabilis* and "wool" them soundly. Finally, however, the ruffian arrived at a youngster whose parent, being unexpectedly near by, set upon the persecutor, and in the scimmage *nigripes* was put to rout. (Figs. 22-24.)

Near the forms or nests one not infrequently finds solid pellets—disgorged by the young in all probability, and by old birds too—consisting entirely of squid beaks and opaque lenses of the eyes. These lenses become very brittle and amber like under the action of stomach juices and show a concentric structure. Candle nuts, the large seed of *Aleurites molluccana*, were found by Mr. Snyder in the interior of the island and were almost undoubtedly ejected by albatrosses. As is well known, albatrosses pick up all sorts of floating material, and candle nuts are frequently seen on the ocean, having been swept seaward by mountain streams. The nearest trees are on Kauai, about 700 miles east. This suggests a means by which many hard, floating seeds might be carried into the interior of islands by albatrosses, shearwaters, petrels, and frigate birds, and thus obtain a foothold, whereas if swept ashore on barren rocks or beaches they would stand little chance of ever germinating.

The white albatross or gony lays one egg, on the ground or frequently in a slightly raised mound with a shallow basin in the top. We saw numbers of these "forms," almost worn out by the young birds. According to Mr. Schlemmer, the egg is laid about the middle of November. We were of course out of season to secure any, although we saw numerous spoiled ones half buried in the sand. Rothschild^b describes them as follows:

"I have received a series of eight eggs of *D. immutabilis*, which vary very much both in shape and coloration. The two extremes are as follows:

"1. Very elongate; length 111.5 mm.; width 62.5 mm.; ground color dirty white, marked with numerous large and small blotches of a brownish-maroon color, which are principally massed at the two ends, though there are a few in the central zone.

"2. Very thick and short; length 100 mm.; width 70; color, uniform brownish buff without any markings whatever.

"The majority of specimens before me are dirty white with irregular patches and spots of brownish-maroon at the larger end."

^aNovitates Zoologicae, VI, 1899, p. 125.

^bAvifauna of Laysan, etc., p. 291.

In the "Avifauna of Laysan" there is a plate showing "carloads" of albatross eggs, supposed by many persons to be ready for shipment to Honolulu. Mr. Schlemmer assured me that eggs have never been sent to Honolulu from Laysan, and that these eggs were gathered together by a photographer, who could find nothing better to do, for the purpose of a spectacular picture. The photograph has had a rather wide circulation and led to some criticism of Mr. Schlemmer's predecessor.

The albatrosses begin to arrive on Laysan about October 25 and 26, and they remain till the following August. Dr. Schauinsland says:

"During the last days of October the first vanguard of the mighty albatrosses appeared, and a few days afterwards the island looked, from an elevated point, as if it was densely covered with large snowflakes. There was hardly a spot of ground on which the dazzling white plumage of an albatross was not apparent and the number of these birds is often so large that many are obliged to be content with rather unsuitable spots, and many must leave the overcrowded area." ^a

The young are hatched in February, according to Mr. Schlemmer. They then are covered with a grayish-white down ^b which is soon superseded by a plumage of dark-brown down, assumed by a continued growth of the original covering and a wearing off of the gray tips. As the young birds grow older the white feathers come in on the breast and abdomen first, and the brown down is in direct communication with the terminal barbs of these juvenal feathers, as is, of course, well known. The feathers of the back also come in about the same time, and those of the wings, save the quills.

In large colonies of animals, it has always been something of a problem how a parent is able to find its young among so many of its kind. The voice is probably responsible in some cases, but as birds are extremely keen of sight and evince a positive genius for discriminating landmarks, I believe the albatrosses must in some way depend upon peculiarities in the surroundings of their young. It is worthy of record, however, that the young often "sing" in a thin, high squeak, which is kept up continuously for periods, and may be of service in guiding the parent, though I could not distinguish the slightest individuality in tone. I do not know whether they do this when the old birds are present, but remember that very many were engaged in the cricket-like song when we visited a populous colony late one moonlight night.

I saw numbers of the young sleeping, their eyes being tightly closed and bills tucked under their wings. Some of them did not awake till touched, and then naturally were much startled. The old birds seem to be wide-awake at night, but about 9 or 10 o'clock in the morning they frequently sleep near their young, with the bill and one eye covered by the wing.

The shallow, basin-shaped hollow in which the egg is deposited, is the young albatross's home and it usually does not stray far. But as the nestlings grow stronger so that they can walk a little, albeit very awkwardly, they wander sometimes a rod from the home spot and engage in mild squabbles with youthful neighbors. The same feeling of growing strength leads them about this time to slowly fan their wings back and forth from time to time. During a light shower I saw a considerable colony of young birds do this together, after the manner of cormorants drying their wings. When the breeze is rather brisk they usually all face it. Their spare time is taken up with idly dozing in the hot sun, preening their feathers or examining their surroundings. Several times I observed young birds collect dried grass and similar material, which happened to be within reach, and carefully cover the hollow in which they were sitting. Sometimes their spirit of inquiry leads them into trouble. We found a young bird, still lively, buried to its neck in a collapsed petrel burrow. It objected strenuously to being disinterred, but appeared little the worse for its adventure.

We saw a few *Diomedea immutabilis* on one of the smaller islands of the French Frigate Shoals, but the species is evidently not plentiful there. On Necker it is rather abundant, over the top of the island, where there is more or less vegetation. Dr. Gilbert estimated roughly that there might be from one to two thousand birds. They are also scattered over the shelves on the sides of the north point, where I saw an old one feeding her young. She was much more timid than any birds we encountered on Laysan. During our first visit to Bird Island, June 2, I saw one or two of this species, but on the second trip, in August, none were noted.

The gony is not seen about the Hawaiian group proper, where it occurs only as a migrant. The species is known to breed on Midway, ^c Lisiansky ^c, Laysan, French Frigate Shoals, Necker, and

^a Drei Monate auf einer Koralleninsel, p. 52.

^b Rothschild, Avifauna of Laysan, p. 29.

^c Avifauna of Laysan, etc., pp. 57, and XIII.

Bird islands. When not caring for its young it is a wanderer, and the following paragraph from Rothschild's Avifauna of Laysan gives some idea of its extralimital distribution:

"*D. immutabilis* is, as a migrant, widely spread. Mr. Alan Ownston sent me a specimen killed on Myiakejima, Japan, in October, 1893 (Bull. B. O. Club, III, p. XLVII, June, 1894). In the Muséum d'Histoire Naturelle, in Paris, I have seen a specimen killed near Hawaii by M. Bailleu. Mr. A. W. Anthony found this species near San Gerónimo and Guadalupe islands on the coast of Lower California, and it is to be suspected that several reports of albatrosses observed on the western coast of North America refer to this species, and perhaps also some of the specimens mentioned by Cassin (U. S. Expl. Exp., p. 399) might have been *D. immutabilis*. Certainly the birds mentioned by Pickering (l. c., p. 401) as being observed between Oahu and the northwest coast of America, and as being 'all of a blackish or dark dove-color with a white frontlet or a circle around the base of the bill,' were all *D. nigripes* and not the young of the white species; but the white birds described on page 399 could only have been *D. immutabilis* or *D. albatrus*" (p. 292).

About 1,000 miles northeast of Oahu, on the Great Circle route to San Francisco, we saw a white albatross, which I feel reasonably sure was this species (August 25).

Diomedea nigripes. Black-footed Albatross.

Diomedea nigripes Audubon, Orn. Biog., v, 1869, p. 327.

The black-footed albatross is very much less abundant on Laysan than the white species. It colonizes the sandy beaches on the north, east, and south sides, but is not found, except rarely, on the west side. It is likewise common on the sedge-covered slope near the beach, in the same habitat with *Sula cyanops*. On one or two occasions I noted them in the interior with *D. immutabilis*.

The habits of this bird are very similar to those of *Diomedea immutabilis*. They feed their young in the same manner, abuse the nestlings of neighbors, and engage in the peculiar performance described above. Although very docile in expression, their treatment of the young of neighbor birds is not carried on in a mild or playful mood. Their beaks are very powerful, and when they unmercifully "wool" the young ones, the process sometimes finishes the victim, for young which appear to have been misused are frequently seen lying around dead.

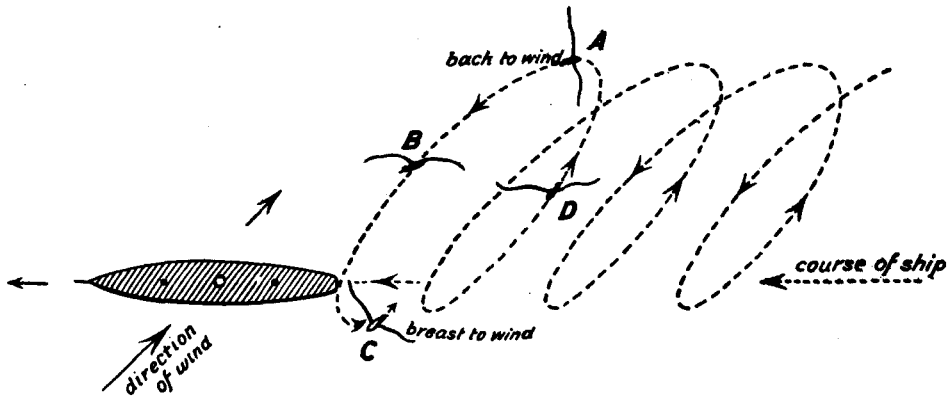
We saw this species rather seldom engaged in the curious dance, and indeed they impress one as more matter-of-fact creatures. The only difference which was noted in the ceremony as carried out by the two species is that *nigripes* spreads its wings slightly (the metacarpus or "hand" being folded closed) when it lifts its head to utter its nasal song.

This species was found on Midway and Lisiansky by Henry Palmer. We saw it also at the French Frigate Shoals, and sparingly on Necker and at Bird Island. None were observed at Bird Island on our second trip in August. It is seen at sea much more than *D. immutabilis*, and it followed our ship almost continually on the return trip from Laysan. As wanderers these birds were seen in very limited numbers in Hawaiian waters, that is, about the Windward Islands. All the birds which follow steamers from California leave when within about 500 miles of Oahu, and on our return trip to California they joined us about 1,200 miles from San Francisco, and 1,000 from Oahu. All through the night one can see them following at a distance, or close at hand, sometimes settling on the water for rest or food.

As is well known, albatrosses are past masters at soaring or sailing. If the wind is favorable they are able to skim over the water for a long time without once flapping their wings. *Diomedea nigripes* is certainly no exception to the general rule, and we had ample opportunity to witness their powers. The long, slender wings, with long humeral bones, are eminently fitted for this sort of existence, and their construction renders flapping laborious, for in proportion to its size the albatross is not a very muscular creature and could not fly a great distance if obliged to do so by wing beats. When a stiff breeze is blowing albatrosses can sail only against the wind or with it, and are able to quarter a breeze, or go directly across it only for a short distance and when under great momentum. When we were steaming directly against the wind the albatrosses had no trouble in following us, and they would fly all around the ship without flapping their wings except when the breeze was strong, and then they were obliged to give a few vigorous beats when turning up into the wind. When, however, our course lay at an angle to the wind, as shown in the accompanying diagram, they followed us by sailing in a series of ellipses. They would, in this case, sail directly against the wind, approaching us on the starboard quarter, go over the stern a short distance to port, then wheel and scud before the breeze perhaps 100 yards off the starboard quarter, when they turned and approached us as before. Their speed was so superior to ours that they were able to keep up without any trouble, and their

frequent trips astern and rapid overhauling again made our cumbersome gait all the more apparent. Of course as they neared the turning point each time they had to quarter the breeze a little and for a moment sail directly across it. Sometimes at A in the diagram they were obliged to flap rather frantically to keep their equilibrium.

The position in which the wings are held when sailing against or with the wind is quite characteristic in either case. When coming against the breeze the carpal segment and primaries are bent downward, as if to catch the wind, so that the bird appears as in B; but when the bird turns and goes with the breeze the ends of the wings are bent up, as in D. When sailing against the wind they often gradually rise, but they are likewise perfectly capable of descending, and when going swiftly with the wind they not infrequently, in fact usually, make a long swoop downwards and skim over the water, rising a little as they turn to come to windward. The position of the wings in the two cases seems to be constant. In the first case they catch more wind, and the fact that the birds generally rise a little shows that the wings act on the same principle as a kite. On the other hand, when sailing with the breeze, the position is such as gives less resistance to the wind. The first position (B) is, as suggested by Dr. Gilbert, one of great muscular rigidity.



One is impressed, when watching these birds, with the fact that there is a tremendous amount of muscular tension brought into play to preserve an equilibrium. We are told that wind is not a constant movement, but is made up of a series of lulls and gusts following each other. With consummate skill, the soaring bird seems forever balancing itself and taking advantage of these little blasts. When there is very little breeze albatrosses are not able to sail far, and during a dead calm they progress by a series of flaps and short sails.

The albatrosses frequently settle on the water, and their actions when so doing are very ludicrous. As they are about to alight both feet are sprawled out on either side, and they strike the water with a splash. The wings are held high over their heads till the birds are safely settled, when they are folded with extreme care, so as not to become the least wet.

PROCELLARIIDÆ.

Puffinus cuneatus. Uau Kane; Wedge-tailed Shearwater.

Puffinus cuneatus Salvin, Ibis 1888, p. 353.

The uau kane is an abundant bird on Laysan, and far and away the form most familiar to persons cruising in Hawaiian waters. Although so common on Laysan, Mr. Schlemmer estimates that in point of numbers it is second to *Astelata hypoleuca*. The greater number are congregated in a zone perhaps 50 yards wide around the lagoon, some distance seaward from the bare flood plain mentioned in the narrative. It is surprising how consistently they keep to this locality, as they are rare elsewhere on the island. This area is shared with albatrosses, rails, and in places with *Sterna lunata*, and overlaps the wide *Astelata* colonies. The burrows are among tall bushy grass as well as in the open among matted juncus and succulent portulaca.

While we were on the island the birds sat in pairs all day near the entrance to their homes, or if the sun grew too warm retired a short way into the tunnel, where they kept up an almost constant cooing.

Not infrequently one will observe the shearwaters cleaning out old burrows or in the act of lengthening them. I saw but one tunnel newly started, so that the number of yearly visitants seems to keep fairly constant. In digging the birds scratch with bill and feet, and with the same implements shove the loose sand and soil under their bodies, when they kick it in little jets far out behind. As they remove the sand they lie first on one side and work a foot and then shift to the other. One is sometimes startled, while standing quietly among the bushes, by being suddenly beset with little showers of sand, which on closer inspection are found to originate with some shearwater toiling into the earth. In their search for nesting sites they do not hesitate to wedge themselves into all sorts of places, apparently without thought of escape, but we never found any birds actually trapped. The burrows enter the ground at a slant and then become horizontal. They are at least 3 feet long and often very much deeper. Rarely they are only about 2 feet, and these are new, while the longer ones are the older, having been dug out by successive tenants from year to year. The birds had not yet begun to lay, and do not till early in June, according to the testimony of Mr. Schlemmer.

Their note varies. When undisturbed they utter a dove-like *khoo-whó*, which changes to a loud *khoo-ow'* as they grow excited, and finally at the height of their enthusiasm one hears only a *yow-ow'* or *oo-ow'*, quite like the nocturnal serenade of cats. It seems to be a courting song, but is decidedly unmusical.

A comparatively few at this season fly abroad during the day, but after dark they begin to move about more, and one moonlight night we found them very active and owl-like in their flight. At sea they are expert fliers, sailing with immovable wings rapidly and readily close over the waves, as well against as with the wind, and they can go across the breeze much more easily than can the albatross.

We met this species off the French Frigate Shoals, and on Necker found it nesting, but, as on Laysan, there were no eggs. The birds nest in hollow cavities of the rock, where they sit facing the wall, and when disturbed coo and yowl in familiar fashion. I suppose the *uau* (*oo-ow'*) of the native name is in imitation of the cry. No nest proper was found in any of these little caves; only a few twigs, feathers, and old bones scattered about.

The species was noted at Bird Island, where a number flew aboard, attracted by the glare of deck lights. Stomachs of these birds contained the hard parts of small cephalopods (squid, octopus, and the like). It was seen constantly at sea throughout the main Hawaiian group. It is known to breed on Kauai,^a This shearwater ranges west across the north Pacific Ocean to Volcano Island, south of Japan,^b Krusenstern Island, Sulphur Island, Bonin Island.

We kept four males and four females of this species. One male from Bird Island and one from Laysan have the lower parts immaculate, except for a faint smoke gray or brownish gray shading and barring of feathers on sides and flanks. In all the other specimens (3 males and 3 females) the deep brownish gray of the sides of the neck encroach in varying degrees onto the throat and jugulum and that of the sides and flanks onto the breast and abdomen. In two specimens this shade extends entirely across the throat, the feathers of the sides of neck being terminally mouse gray, edged with white, while those of the throat are white with one or two irregular bars of gray. The effect produced is a delicate vermiculation of the jugulum and a coarser herring-bone spotting of the throat. The flanks are dark in these six specimens, and in all there is a greater or less vermiculate barring of abdomen. A breeding female from Laysan has a very fine, dust-like spotting scattered over nearly all the abdomen. There is a slight variation in the bills. (Fig. 29.)

Puffinus nativitatis. *Christmas Island Shearwater.*

Puffinus nativitatis Streets, Bull. U. S. Nat. Mus., No. 7, 1877, p. 29.

The Christmas Island shearwaters were nesting on Laysan at the time of our visit. They are distributed here and there over the island, usually in the domain of *Æstrelata hypoleuca*, but not infrequently we found them among the wedge-tailed shearwaters, and again on low sand bluffs overlooking the sea. It is entirely probable that the species is much more abundant than they seem to be, for they are decidedly retiring in their habits, and prefer to lay their single egg under the densest bushes away from the hot sun. For this reason alone a large proportion would naturally escape detection.

^aStejneger, Proc. U. S. N. M. 1888, p. 93.

^bSalvin, Cat. B. B. Mus., xxv, 1896, p. 371.

The egg is deposited either directly on the sand under some bush or occasionally in a mere semblance of a burrow. This burrow was never sufficient, so far as I could see, to entirely cover the bird, but seemed an expedient to gain shade in lieu of denser brush. I saw only a comparatively few of these shallow holes, none of which were more than a foot or 18 inches deep. Frequently this shearwater is found nesting under colonies of *Sula piscator*.

The white egg is usually ovate; an average specimen rather more elongate than the diagram in Ridgway's Nomenclature of Colors. One specimen in our series of twelve is bluntly elliptical ovate, and another is nearly oval. An average specimen measures 58 by 40 millimeters. The bird, on going back to her egg, pushes it under her breast with her beak, and then works the egg backward till it is entirely covered. (Fig. 41.)

The note or cry is much like that of *Puffinus cuneatus*, and is dove-like, rising in volume and pitch as the bird gathers interest or becomes more excited. When one is close the note resembles *khoo-hoo' - - - !* or *khoo-oo-ow'!* The first note or two notes are made on the inspiration, the final *ow!* on expiration. Both are prolonged, and the final note is cat-like from a distance.

The species is more gentle than *Puffinus cuneatus*. We did not see the birds flying about much. They seem to be nocturnal or crepuscular in habits. One bird which I frightened disgorged a squid and some small silvery fishes.

The bills of two males are larger than those of two females. Our specimens are in fresh plumage, and the brown feathers of the breast and abdomen are tipped ever so lightly with a paler brown, so that the contour of the feather ends is seen. This very soon wears off, and in one bird is nearly absent.

We met with this shearwater off the French Frigate Shoals, but saw none on or near Necker. On our first visit to Bird Island in June it escaped detection, but at the same place in August I saw a few, so that they undoubtedly breed on the island.

Salvin^a gives the distribution of this bird as "Central North Pacific Ocean, from Christmas Island to Krusenstern Island and the Phoenix Group."

Æstrelata hypoleuca. *Salvin White-breasted Petrel.*

Æstrelata hypoleuca Salvin, Ibis, 1888, p. 359.

This petrel is strictly nocturnal on Laysan, which was the only place where we found it. Here it occurs in great numbers, and is the most abundant species of its family inhabiting the island. The long burrows in which the birds nest honeycomb the sandy soil over all the region covered by coarse bushy grass, or from the edge of the plain surrounding the central lagoon to the divide overlooking the sea. In walking over the island one constantly breaks through the roofs of these tunnels, which makes progression tedious at times, especially if one is in haste. The burrows are quite long, 6 feet at least, and usually turn either to the right or to the left after the first few feet. They are placed very close together, so that nearly all available space in the area indicated seems occupied.

When we visited the island many young in incomplete juvenal dress had crawled out to seek shelter under a tuft of grass, as shown in fig. 30. These young had assumed the juvenal plumage on the breast, abdomen, back, top of head, wings, and tail, but the remiges, rectrices, sides of head, nape, forehead, throat, and jugulum were still downy, and the lower abdomen in most birds still retained a big tuft of pure white down. The down of the upper parts is light gray, including all the head and sides of neck.

According to Mr. Schlemmer the eggs are laid about the 1st of January, but the birds arrive in vast numbers months before. Dr. Schauinsland thus graphically describes the invasion:

"I remember most vividly the evening of the 17th of August, 1896. It was less noisy on the island than before, for the clamorous terns had reared their young, and thousands of albatrosses had left their ancestral home for the boundless ocean, which would in future be their dwelling-place. We were just leaving the little bill from where we had been looking for the sail which should take us back again to civilized countries. The golden glow of the sunset was fading away, and the slender sickle of the new moon began to shine, when our eyes, which had become well acquainted with every one of the characteristic motions of our feathered companions of the island from week-long observations, were struck by a new phenomenon. Against the dissolving evening glow was sharply traced the silhouette of a magnificent flier, which cut through the air with the keenest and at the same time most graceful movements, inaudible and almost without movement of its wings. The manner in which it dashed along was unknown to us, and we saw that a new arrival had reached our island.

^aCat. B. B. Mus., xxv, 1896, p. 390.

"The next morning there were more, and on the third thousands filled the air. The new guests were pretty birds, barely of the size of a domestic pigeon, but they began to domineer all over the island in such a way that the few pairs of tropic birds, terns, and others which were still breeding made way before them, as if they could not stand these noisy neighbors. They are, on land, entirely nocturnal, and at once took possession of their innumerable subterranean burrows. In the bright moonshine one could see how they were busily engaged in removing the loose sand from holes, most of which had more or less collapsed since they had left them. Loving couples selected their nests and fought hard for them against later intruders. Quarrels, fights, and clamor became unceasing; in a few days there was no spot with sandy soil where the horrid 'song' of these petrels could not be heard. Under every bush, between our luggage and cases, and, alas, also under our bedroom, their tune was raised, which stood about in the middle between that which 'drives men to madness' and the cries of newborn babies, which are only harmonious to their devoted parents. The face of the island was entirely changed!"^a

Little could be learned of the habits of this petrel during our brief stay. We saw them come out of their burrows singly and in pairs after nightfall, and there were great numbers flying about. As we walked through the tall grass they frequently rose silently and flew a short distance to settle down soon. Many were evidently bound for the sea to feed. Their note resembles somewhat that of *Puffinus cuneatus*, and rises from a low moaning to an infant-like cry, as Dr. Schausinsland aptly describes it.

This petrel ranges over the North Pacific Ocean.^b

***Bulweria bulweri*.^c *Bulwer Petrel*.**

Procellaria bulweri Jardine & Selby, Illustr. Orn., 1828, pl. 65.

We found the Bulwer petrel breeding on Necker Island in considerable numbers. Here the birds nest in rather deep, bubble-like holes in the rocks, as far from the light as possible. We found the first bird by discovering a white egg under a loose, flat rock back in a cavity. When the stone was lifted the petrel was under the far side. The favorite site, however, is a hole about 2 feet deep, with a narrow entrance, and wider cavity at the rear. These are probably bubbles in the lava. The nest, scarcely worthy of the name, consists of a few old tern feathers gathered rudely around the egg, as if merely to hold it in place. Sometimes there is no trace of a nest, and again I found a few wing bones of a tern, as though these had been used in place of sticks. We found many nests, each with one egg, or occasionally the birds had not yet begun to lay. Once we found a set of two eggs. They are a glossless pure white and differ much in shape, no two in the collection of nine being alike. Ovate is the most prevalent type, more or less acute, varying to elliptical ovate and short ovate. One egg is nearly elliptical. An ovate specimen measures 44 by 30 millimeters, another 41 by 31. An almost elliptical egg is 45 by 30.

The Bulwer petrel is quite gentle, and when first disturbed utters a penetrating but low moan something like *who! who!* dove-like in quality, but decidedly different from the *oo-ow'* of the uau kane (*Puffinus cuneatus*). On several nests we found two birds sitting side by side.

Henry Palmer found this species on French Frigate Shoals, where it was nesting under a pile of old turtle shells. He also met with it on Laysan, where we did not detect any during our stay.

^a Drel Monate auf einer Koralleninsel, p. 49. Extract transl. in Avifauna of Laysan, p. 304.

^b Cat. B. B. Mus., xxv, 1896, p. 409.

^c As Rothschild in "Avifauna of Laysan," part 3, 1900, uses the name *Bulweria anjinho*, and Wilson and Evans do the same in "Aves Hawaienses," 1899, I wrote to Dr. Leonhard Stejneger and Dr. C. W. Richmond for information on this point. Dr. Stejneger writes: "In reply to your inquiry respecting *Bulweria bulweri* or *B. anjinho*, I am able to state that the former is the only correct name. Dr. Richmond, who kindly looked the case up for me, as he has easier access to the books, informs me that not only was *B. anjinho* published a year later than *B. bulweri*, but that the diagnosis of the former is so defective that it is doubtful if it really refers to the bird in question, inasmuch as the tail is said to be 'slightly forked,' while in *B. bulweri* it is graduated or wedge-shaped. The latter name (*bulweri*) dates from 1828, the former from October, 1829."

Dr. Richmond writes as follows regarding the date of Jardine & Selby's "Illustrations of Ornithology": "Jardine & Selby's 'Illustrations of Ornithology' was issued in several parts, and until a few years ago the dates of the different parts were guessed at. In the *Ibis* for 1894 you will find a note by Sherborn giving the dates of the different installments of the work, and plate 65 (*Procellaria bulweri*) comes in part 4, which was issued in November, 1828."

I might add that Mr. Sherborn's references to the second series were all wide of the mark, which probably accounts for the persistent publication of 1830 as the date of *Procellaria bulweri*. Dr. Richmond, who had previously worked out the dates for this work, sent a note of correction to Mr. Sherborn, who revised the dates of the second series in answer to Dr. Richmond's "inquiries" (sic)—a delicate way of acknowledging the mistake.

At Bird Island the petrels were abundant. They flew aboard, attracted by deck lights. These birds had been feeding on fish eggs? and ctenophores or comb-jelly. During the day many were seen skimming rapidly over the water.

This species ranges over the temperate North Atlantic and temperate North Pacific oceans (Salvin).

Oceanodroma fuliginosa. *Sooty Petrel.*

Procellaria fuliginosa Gmelin, Syst. Nat., 1, 1788, p. 562.

Under this name I include two petrels, one of which was obtained on Laysan and the other at Bird Island. The Laysan bird was found hurt or sickly near the lagoon, where I saw upward of a dozen dead and dried-up individuals. The Bird Island specimen flew aboard, attracted by deck lights. Both birds are immature, retaining a trace of the down. They agree essentially in respect to size and color with the description by Mr. Ridgway, published in the Catalogue of Birds of the British Museum, with the exception that the wings are shorter, which is accounted for by the immaturity of the specimens. The bird from Laysan has remarkably short wings.

The following are the measurements of the two specimens in millimeters:

No.	Sex.	Locality.	Date.	Wing.	Tail.	Fork of tail.	Culmen.	Depth of bill just in front of nostrils.	Tarsus.
43	♂ im.	Laysan.....	May 18	150	94	30	16	4.5	29
168	♀ im.	Bird Island.....	June 1	196	110	37	18	5	29

On Laysan, according to Mr. Schlemmer, this species breeds in February, and nests in burrows under scattered bowlders of old coral rock on the southwest side of the island. There was a small colony of *Puffinus cuneatus* in this place when we visited the island, so that the same burrows are occupied during the year by two species.

The sooty petrel may be said to be hardly common.

PHAËTHONTIDÆ.

Phaëthon rubricauda. *Red-tailed Tropic Bird.*

Phaëthon rubricauda Boddaert, Tabl. Pl. Enl., 1783, p. 57.

The red-tailed tropic bird is fairly common on Laysan, where it nests under the shelter of bushes and not infrequently several will congregate beneath colonies of *Fregata aquila*, occupying the ground floor as it were. The bird has a vicious temper, and if one attempts to disturb or to take it from the egg, it sets up a horrible and discordant screaming, which soon grows unbearable. The sharp beak with serrated edges is not to be despised and the enraged bird will sometimes use it to good advantage. The bow's'n birds keep up their strident cries so long as one meddles with them, but if left undisturbed will soon quiet down. Whenever we inadvertently passed near one hidden under a chenopodium bush, we soon became aware of its presence by its cry of defiance. (Figs. 31, 32.)

To see these birds at their best one must watch them flying about in the bright sunshine, when their pale, salmon-pink plumage shines as though burnished, and the satiny feathers stand out like scales. The two long, red tail-feathers are possessed by both sexes, and the female is only a trifle less pink than the male. Usually when flying about they were quiet, and progressed by short, nervous wing-beats, never attempting to sail. Occasionally, however, they swooped about our heads and made the neighborhood lively.

The nest is merely a hollow in the sand, with a few grass straws and leaves gathered in the bottom. The single egg is brooded by both parents, each of which sits upon it with the wings slightly opened. The egg is particularly handsome, being thickly sprinkled with specks, spots, and even blotches of reddish brown (liver brown), in most of the specimens rather evenly distributed over the egg, but with an irregular dark area at the larger pole in some specimens. The ground color is a dirty white, almost obscured by the fine marks. Some examples have few spots, only fine sprinkling, so that the general tone of the egg at a distance is vinaceous. One specimen is almost white, while two others are very heavily washed at the blunt end with deep reddish chocolate. The eggs are ovate,

and a typical specimen measures 67 by 45 millimeters. We found one white, downy nestling, and most of the eggs were considerably incubated.

We saw only one red-tailed bow's'n bird near the French Frigate Shoals, but on Necker they were rather common. Contrary to the very pronounced nesting habits on Laysan, the species here has accommodated itself to the rocks and lays its egg in any rounded cavity. One nest I examined consisted of old torn feathers, a few stray sticks, and similar rubbish. The birds sat facing the wall, and were as noisy as usual when disturbed.

The species is scarce at Bird Island, where it was observed in August.

Among the windward islands of the group, that is from Niihau and Kauai to Hawaii, we did not observe this species, although *Phaëthon lepturus* was frequently seen. Mr. Wilson in "Aves Hawaiienses" states that "it breeds in several places in the group, especially on Kauai and Niihau, and chooses holes in almost inaccessible cliffs wherein to deposit its eggs."

SULIDÆ.

Sula cyanops. Blue-faced Booby.

Dysporus cyanops Sundev., *Physiogr. Sällsk. Tidskr.*, 1837, p. 218, tab. 5.

On Laysan the masked, or blue-faced booby lives only on the sedgy slope facing the ocean, exposed to spray-laden winds and close to the booming surf. On the inner slopes of the island the species is entirely absent, being replaced by its somewhat smaller congener *Sula piscator*. We found *cyanops* most plentiful on the northeast, east, and southern exposures, where the narrow littoral slope is broadest, but on the west side, where a little bluff replaces the seaward slope, the birds are absent. The homes of these boobies are, not crowded, but are scattered here and there over the greensward and from a distance are easily recognized by a little round patch of sand and the sentinel bird. Two limy, white eggs are laid on the bare sand, with usually no semblance of a nest, or occasionally there may be a little dried sedge scratched about the eggs or young. As is well known the eggs are a light blue underneath, and the coarse limy coating covers this to a greater or less extent. Sometimes the blue shows through, or is revealed by scratches made when the outer layer is soft. All the eggs we saw were very untidy. There is, of course, variation in size and shape, some eggs being ovate, and others elongate oval or short fusiform.

We found young and eggs in about equal numbers, and most of the eggs were far advanced in incubation. The young varied from about a week old down to newly hatched individuals. It is a curious fact that although there are two eggs, only one young is reared. Often all signs of the second egg were removed, as if the young had hatched and had been devoured by a parent or some marauding *Fregata*. But more frequently there would be one nestling and one egg. Sometimes this egg was spoiled, sometimes contained an embryo. In one case I found two newly hatched young, one of which had already been trampled to death. Professor Nutting saw one large nestling and one small, still alive, but I doubt if it lived long. The presence of only one young bird has been noted in the eastern Pacific at Clipperton Island by R. H. Beck,^a and Rothschild^b mentions the same fact for Laysan. The voracity of the bird first hatched is probably responsible for the death of the second.

The young bird nearly always keeps its head under the parent, although the greater part of its body may be exposed to the sun. Both old birds take turns in sitting on the eggs or watching the nestling. Occasionally both will be seen standing guard together, in an absurd statuesque pose, or gazing seaward or at the sky on the lookout for winged marauders. From time to time they utter a very hoarse strident cry. (Figs. 33, 34, 36.)

We derived no little pleasure on the first afternoon of our visit from watching an old bird feed the young. The young one inserts its head fairly into the throat of the parent, in a decidedly gruesome manner, and catches the disgorged food. In fact, the young one's head went so far into the parent's throat that I became solicitous for its safety. Flying-fish, swallowed whole, seem to be their favorite food, judging by remains scattered about nests and a stomach examined. (Fig. 35.)

When the old birds exchange places, one slips off the nestling and the other immediately takes its place, as if fearing an attack from a frigate bird. The boobies appear to exhibit affection for their young. I have seen them gazing at the fuzzy-white ball with evident pride in their otherwise stolid

^a Condor, iv, 1902, p. 51.

^b Avifauna of Laysan, p. 26.

countenances, and on one occasion saw an old bird carefully lay dry sedge over the exposed, and not too heavily feathered, hind parts of the young.

This species was commonly seen about the French Frigate Shoals, where Henry Palmer found a large colony in 1891. It is also rather abundant on Necker, nesting among the bushes on the top of the island, and also out on the bare rocks. They chose often a jutting crag, where they could obtain a good prospect of the surrounding island and sea. The few "nests" examined had young somewhat larger than the Laysan birds. The species is likewise common on Bird Island, where we saw numbers of individuals the first of June, and again in early August. On our last trip numerous birds in juvenal plumage flew near the ship.

***Sula piscator.* Red-footed Booby.**

Pelecanus piscator Linn., Syst. Nat., ed. 10, 1, 1758, p. 134.

Unlike its relative, the masked gannet, this species always builds in bushes, never on the ground. At Laysan it is found in colonies of scattered individuals on the inner slopes of the island, usually well down toward the lagoon. The nest is simple, scarcely more than a slightly hollowed platform composed of twigs and sticks of chenopodium, on the tops of which the structure is usually placed. In the newer nests a few leaves are scattered under the egg. These leaves were a rude index to the age of the egg, for when dry and crisp the bird had been sitting some time, but when fresh, as was frequently the case, the egg was only newly laid.

Both male and female sit on the egg, and occasionally one is seen perched on the side of the nest while the other is brooding. The birds are rather loath to leave their egg, and when disturbed ruffle their feathers and utter a very harsh cry, making use of their beaks if occasion offers. They are singularly beautiful birds despite their vicious yellow eyes, as the white plumage is set off by bright blue skin about the bill, and by coral-red feet. (Figs. 37, 38.)

The species eats squid and also fish.

Most of the nests contained a single white egg, and we saw only one or two downy white young recently hatched. The eggs, like those of *Sula cyanops*, are covered with a thick limy coating, which, scratched off in numerous places, shows the pale blue under shell. The eggs vary in size and shape, being cylindrical ovate, elliptical ovate, short ovate, and ovate, with all gradations between these contours. The dimensions vary from 71 by 40 millimeters to 59 by 43, and 69 by 35 to 60 by 39. Elliptical ovate is the most prevalent type, measuring 65 by 42 millimeters. A very small egg (53 by 34) contained no yolk.

The species is not uncommon about the French Frigate Shoals, where an immature bird foolishly lit on the bow of our steamer and subsequently found its way to the laboratory. It was in the immature plumage still. We saw numerous birds on Laysan corresponding to this specimen. Whereas the adult is pure white, except the dark grayish-brown quills and greater wing coverts, this immature bird, in much-worn plumage, has the head and neck hair brown, the feathers edged with whitish; throat the same; jugulum white; a sepia band across breast; abdomen white; back deep bister, the feathers edged with wood brown; wing coverts and tertials sepia edged with light brown; rectrices same, tipped with white; remiges brownish black. The immature individuals must belong to a late brood of the previous year.

On Necker we found the red-footed booby abundant. It nests on the top of the island in chenopodium bushes and has the same habits as on Laysan. Young and eggs were common.

The species is likewise plentiful at Bird Island. From the ship we were able to see the birds sitting on their nests in the tops of bushes. In the "Avifauna of Laysan" a plate is given of a red-footed booby nesting in a palm, labeled "Laysan," and subsequently corrected to "Lehua." Lehua is a little island off the north end of Niuhau, which is as bare as a steep volcanic cone can possibly be, so that the palm does not belong there. The picture may possibly have been taken on Bird Island, where there are two little bunches of palms (*Pritchardia gaudichaudi*). When we returned to Bird Island in August (5th and 6th) I did not see any adults of this species, to be certain; but noted several immature birds.

***Sula sula.* Booby.**

Pelecanus sula Linn., Syst. Nat., ed. 12, 1, 1766, p. 218.

This booby was not seen on Laysan, although I looked for it assiduously. It has been reported from there by Dr. Schauinsland, who procured a specimen August 29, 1896. The bird certainly does not breed on this island, or at least not regularly, for we could not have missed it.

At French Frigate Shoals we saw a number of them, and on Necker Island the species breeds but is not at all abundant. The two eggs are laid on a level place, where there happens to be a little soil, upon a shelf of the rock. We also found rather large young in white down, and all intergradations between these and the egg. Frequently both birds sit by the nest, and they did not appear particularly suspicious. As in the case of *Sula cyanops*, only one young appears to be reared, although two eggs are laid. Of those eggs collected one of a set was fresh and the other much incubated. The eggs are either ovate or elliptical ovate and an average specimen measures 58 by 40 millimeters.

Sula sula breeds on Bird Island, and prefers the brink of the escarpment of rock on the south side. In August we saw numbers of young birds, wholly brown.

FREGATIDÆ.

Fregata aquila. Man-o'-war Bird.

Pelecanus aquilus Linn., Syst. Nat., ed. 10, 1, 1758, p. 133.

The man-o'-war bird proved scarcely less entertaining than the albatrosses. The curious and excessively bizarre appearance of the male at this season of the year compels attention. His antics are as extraordinary as his looks, and when engrossed in the task of making himself attractive his self-absorption and apparent vanity are highly diverting. During the courting period the gular pouch of the male is enlarged, and before the brooding cares have begun he inflates it to a large size, and at the same time it becomes a bright red color. The bird looks as if there were a balloon, such as children dangle on a string, fastened to its throat.

The pouch is apparently a large air-sac, connected only indirectly with the lungs, which can not be emptied readily nor inflated instantly. It varies in the intensity of its carmine or crimson, and catching on its surface the sheen of the sky, shows at times bluish hues, or, becoming somewhat collapsed, turns a translucent orange about the sides. It is no uncommon occurrence to see a male bird sitting on the nest with the sac blown out, obscuring the whole front of the creature, only the bill and eyes appearing over the top. For hours he sits on a newly-made nest without once leaving or scarcely altering this position. But if the female appears somewhere overhead, sailing to and fro, he suddenly arouses himself from the lethargy, and as she passes he rises partially from a sitting posture, throws back his head, spreads his wings, and protruding the brilliant pouch, shakes his head from side to side, uttering a hoarse cackle. Occasionally, when the female alights near, he waves his pouch from side to side, the head being thrown well back and the wings partially spread. At the same time the long, greenish, iridescent, scapular feathers are fluffed up and the creature presents a most unusual and absurd appearance. In this posture he chuckles again and again, and rubs his pouch against his mate, who usually ignores him completely and flies away. These performances take place before the egg is laid; afterwards, the male ceases to inflate his sac. (Figs. 39, 40.)

At Laysan the birds live in colonies varying from a few pairs to many, and the nests are always built on the tops of low bushes, sometimes very close together. The species has congregated almost entirely on the eastern half of the island, and their villages are spread over the inner slope of the old atoll basin. The nests, which are sometimes so old that they have become mere masses of filth, are scarcely more than platforms of sticks, not entirely devoid of leaves, woven together loosely with morning-glory (*Ipomœa insularis*) vines. There is one pure white glossless egg, and we observed a very few newly hatched, almost naked, young. The eggs do not vary nearly so much as those of *Sula*, either in size or shape. A rather blunt ovate is the usual contour, though some are elliptical ovate and others approach short ovate. A fairly average specimen measures 72 by 50 millimeters. In some of the eggs the limy outer coating is made apparent by the egg having been scratched when newly laid; but the inner layer is white, not pale blue as in *Sula*.

Both parents take turns in covering the egg, which is a necessity, for if the nest were left without an occupant other frigate birds would quickly appropriate its material, especially if the nest were new. Consequently, even before the egg is laid, either bird holds down the property, as it were, against marauding neighbors. After the nestling is out this vigilance is all the more necessary, for if left unprotected a young bird would very likely serve as food for some watchful reprobate of the vicinity. Mr. Snyder saw an old frigate bird snatch up and fly away with a young of the same species, whose parent had been frightened off the nest. According to Henry Palmer^a who visited the island a few

^a Avifauna of Laysan, p. x.

weeks later in 1891, this is a very common occurrence, but the young were so scarce we considered the accidental demonstration mentioned above as sufficient evidence of the heartless trait. It is probable that the man-o'-war birds eat the young of other species also, but we did not observe anything to substantiate this. The fact that they chase other sea birds, gannets for instance, and make them disgorge their hard-earned prey is well known, but I was not fortunate enough to see them do this. One bird which I frightened excessively disgorged over the side of its nest a mass of squids, which are the staple of diet among all larger sea birds, *Sula cyanops* perhaps excepted.

When roused from the nest the birds have some difficulty in rising, especially the males with swollen throats, and will sprawl over the bushes in a very awkward manner. But once a-wing they are perfectly at home and sail off with ease, the cardinal "balloon" of the males swaying from side to side. Their appearance, as they soar aloft with this impedimentum, can be more readily imagined than described. I suppose there is a temptation with everyone who has observed man-o'-war birds on the wing to wax eloquent. But certainly in this art of soaring they are deserving of any meed of praise which we may bestow. To maintain any continuous sailing the albatrosses need a fresh breeze, and they always move with considerable rapidity. Not so with the frigate birds, however: on comparatively calm days they are able to rest on motionless wing or slowly to describe circles high in air. Some wind or motion of air is of course always necessary, but they seem to be able to do with a minimum amount. They frequently rise so high that one can scarcely detect them against the shimmering blue of the tropical sky. Suddenly some individual aloft takes a notion to descend, and promptly does so by a series of long leaps or swoops that make one fairly dizzy. It is a pleasant occupation to watch them soaring about the mastheads, when the peculiarly short "arm" and "forearm" and disproportionately long quills are seen to advantage; and their deeply forked tails, likewise, which help to keep them balanced, and which open and shut occasionally like a pair of shears. Their feet are small and their legs weak, so that although still totipalmate they never alight on the water, but pick up floating bits of food as they swoop down in a broad parabolic curve. They can judge distance so accurately that no disturbance is created when the object is seized.

On Laysan this good judgment was made use of when the birds drank from a small pond. They flew back and forth, about 20 feet above the water, then suddenly darted downward in a long curve, and when directly over the surface, like a flash bent the head down, dropped the lower mandible, and scooped up a little water. I observed some with distended pouches performing in this way, and each time they came down the sac would plow a little wake.

We found man-o'-war birds at French Frigate Shoals in considerable abundance, and on a tall rock south of the shoals proper they were particularly plentiful. Also on Necker we encountered them, nesting mainly on bushes scattered over the summit, where there were large colonies. A few had nests on the rocks, generally on jutting crags. Mr. Snyder photographed a female sitting bolt upright with her wings spread out and tail bent back for a rest, apparently sunning herself. While we lay at anchor off the south side of the rock a flock of immature white-headed, brown-breasted birds sailed leisurely back and forth about the mastheads, inspecting the flapping pennant, which they occasionally tried to seize. I here saw a bird carrying a splinter of wood in an aimless way, as if uncertain of its utility, yet unwilling to release it. The stomach of one of these birds contained a flying-fish.

At Bird Island the species is abundant, nesting on bushes over the steep south slope of the mountain. On our second visit, early in August, they were still to be seen in considerable numbers.

ANATIDÆ.

Anas laysanensis. *Laysan Teal.*

Anas laysanensis Rothschild, Bull. Brit. Orn. Club, No. IV, 1893, p. XVII.

It is surprising that an islet scarcely 3 miles in its longest dimension should harbor a peculiar species of the genus *Anas*. The birds themselves are scarcely less peculiar than their distribution. Most of us picture ducks as among the wariest of wild fowl, but the Laysan teal, though not exactly tame, are at any rate quite unsophisticated. These birds congregate in greatest numbers about a little rush-bordered fresh-water pond, mentioned in the narrative. Here we could find them at any time, standing usually on a little pile of rocks near the center. When disturbed near shore they quietly swam out to their rock and sunned themselves by the hour. We saw the ducks also on other parts of

the island. Near the habitations there was a pair which probably had a nest in the vicinity. One of these used to come up to the house after nightfall and walk about like a barnyard fowl. Mr. Schlemmer said it was searching for millers.

The stomach of a male collected near the pond was gorged with small flies resembling the common housefly. Although these ducks can fly perfectly well they ordinarily did not take wing until approached within a few rods, and then never went far. They much prefer to walk, and we used to see them strolling about in pairs, or even threes. In this way they pick up their food as they go along. We never saw any teal near the ocean, and it is probable they never swim in salt water.

We were fortunate enough to discover one nest within a couple of rods of the pond, placed under a thick chenopodium bush. Six eggs of the palest green rested in a shallow bowl, formed of long dry juncus stems. The hollow was a little over 5 inches in diameter. As I wished, if possible, to secure a picture of the female, I photographed the eggs and left them till the following morning. When I returned to the nest, however, three of the eggs had hatched, one young was half out, another egg picked, and only the sixth remained whole. In shape the egg is a blunt ovate and measures 55 by 38 millimeters. Two days later (May 21) Mr. Snyder saw three old birds with broods, one of which took to the pond. I also saw a young one swimming about, the mother being hidden somewhere in the tangle of grasses. (Figs. 47, 48.)

The Laysan teal is, of all the birds on the island, the one most likely to be exterminated when the present favorable régime comes to an end. There are probably less than a hundred of this species now living. I shall not presume to say what keeps their numbers so in check, but it may be *Fregata aquila*. Cats running wild over the island would soon finish them, and the mongoose would do the same.

RALLIDÆ.

Porzanula palmeri. *Laysan Rail*.

Porzanula palmeri Frowhawk, Annals and Mag. Nat. Hist., ix, 1892, p. 247.

The Laysan rail is a wide-awake, inquisitive little creature, with an insatiable thirst for first-hand knowledge. It is one of the most naive, unsophisticated, and wholly unsuspecting birds in the whole avian catalogue. At times it is confiding and familiar in deportment, yet at others holds aloof with some show of reserve. It will occasionally hide behind a bunch of grass, as if afraid, and then suddenly come forth with entire change of demeanor and examine the intruder with critical eye. One can never tell just how he will be received by the next rail. Often they scurry away, as if pursued by a *bête noir*, but an insect will stop them in their mad career, and, having partaken of the interruption, they seem to forget their former fright and walk about stretching their necks in a highly inquisitive manner. It is evident that they are incapable of pursuing a train of thought for more than an instant. Their ideas seem to flash by in kaleidoscopic succession and within a minute they make as many false starts as a healthy monkey. One can scarcely imagine more amusing and foolish little birds than these.

The rails are everywhere on Laysan in great numbers. Nearly every bunch of grass seemed to harbor a pair. They probably have no enemies of any importance, and the only check to their increase is space and food supply. A man-o'-war bird may pick one up now and then, but I did not observe this. Yet the rails like to slink about in the shade of grass tussocks, or bushes, much in the same way that a chipmuck seeks the shadow of a log in preference to crossing a bright, sunny space. This trait suggested the idea that they might have winged enemies. However, if business calls, the crakes exhibit no reluctance to come out into the sunlight, especially after food, and perhaps it is the hot sun that causes them to retire to cooler byways.

The best time to observe the rail is during the morning or evening hours. Even at noon there are a great many abroad and they are only comparatively less abundant. They spend the greater part of their time creeping mouse-like in and out of nooks and crannies, as if trying to satisfy their genius for exploration. Old petrel burrows fallen in, low-bending bushes, and grass tufts are searched with care and precision in this unending quest. As they walk their heads are thrust forward from side to side, the very acme of inquisitive interest. If I stretched out on the ground with my head under a bush, and viewed the landscape from the rail's point of view, in a very short time one would appear and fix its bright red eyes on me, as if doubtful of the propriety of pursuing acquaintance. They used sometimes to come up and peer at my shoes, with one foot poised in air like a barnyard fowl.

Scarcely a thing escapes their notice. The smallest spider or beetle is snapped up with as much avidity as a more conspicuous seed. We caught all our specimens with an ordinary dip net. Usually it was merely necessary to place the net on the ground edgewise, when presently a rail would make its appearance and proceed to examine the new phenomenon at close range. Sometimes they would fairly walk into the net.

In strolling through the brush we could hear them calling on all sides. Their "song" is a plaintive, high-keyed little rattle, which resembles remotely an alarm clock with a muffled bell or pebbles ricocheting on a glass roof.^a I have seen them standing under bushes in the shade rattling away in this manner with swollen throats and bills slightly opened. I once saw two approach each other with feathers erect, and when close together begin rattling in each other's face. Then they suddenly ceased and slunk away in opposite directions. At the house the little rails walked about the piazza in search of food, with far less fear than the chickens, and while Mr. Snyder and I were preparing specimens it was no uncommon event to have a rail under our chairs in unobtrusive search for fallen bits of meat. They took no notice of the shearwaters and albatrosses. I observed two in a lively serpentine chase about a young albatross's legs, the big creature appearing like an uncouth mammoth above the trim little rails.

They do not seem to exhibit any desire to fly, probably having learned from experience that their wings are no longer to be relied upon. I have only seen them spread their wings when hopping up to a perch or when running fast, and then they made no attempt to rise off the ground. Their food consists of small insects, seeds, green material, and eggs. Their beaks are weak, and I doubt if they can break any seabirds' eggs, except the thinner shelled ones of the terns. I did not myself see the rail actually puncture an egg, but in the "Avifauna of Laysan," the following note from Henry Palmer's diary is of interest. "While out this morning both my assistant and I saw a little rail break and eat an egg. We had disturbed from its nest a noddy (*Anous*). Immediately the rail ran up and began to strike at the egg shell with its bill, but the egg being large and hard he was quite a long time before making a hole. The rail would jump high into the air, and come down with all its force on the egg, until it accomplished the task, which once done the egg was soon emptied. By this time the tern came back and gave chase, but in vain." (Pt. 1, p. x.)

Mr. Snyder soon found that he had only to break a tern's egg and place it in the open, when a rail would appear and begin to eat it. In this way it was not difficult to secure good photographs. Porzanulas lurk about the outskirts of tern settlements all the time, and I had once to frighten one from a tropic bird's nest while attempting to photograph the egg. I also saw a rail ruffle its feathers and rush at three teelepizas, driving them from a *Sterna* egg on which they were feeding. The rail then set to and finished the repast, dragging the embryo about in a vain attempt to swallow it. With such habits, it is difficult to see how these creatures can ever seriously be at a loss to find food. (Fig. 45.)

We found the rails' nests in two different situations, which, however, were fundamentally alike. Among the tangled and matted juncus, not far from the lagoon, the nests were very abundant. One had only to walk along and watch where the rails ran out from between the stems, when the nest could be easily found. It is placed on the ground at the end of a tunnel or runway, about 5 or 6 inches long, hollowed out of dried juncus leaves, and is a roundish cavity lined above and on all sides, except the little entrance way, with soft dried stems. The eggs are deposited in a little bowl-shaped hollow, about four inches in diameter. We found several sets of threes and a few of twos. The eggs are large in proportion to the bird, a typical specimen measuring 31 by 21 mm. They do not vary more than a millimeter from this size. Occasionally one is slightly longer and wider. In contour they are bluntly ovate or elliptical ovate. (Figs. 46, 52.)

The ground color is a pale olive buff, closely spotted with pale clay color or raw sienna, and faint lilac gray. The maculations are distributed fairly evenly over the egg, but in some specimens seem more crowded at the broader end. The clay color is brightest and seems to predominate. The specimens vary in the relative closeness and size of the spottings, the flecks being larger and more scattered in a few examples. None of our specimens present the creamy buff ground-color mentioned by Rothschild, or figured in his "Avifauna of Laysan." Ours are distinctly greenish. One egg in the collection instead of being smooth is decidedly rough all over, and the spots are crowded to the larger end, being made indistinct by a final layer of lime.

^aThe latter comparison is made by Mr. Frowhawk, *Annals and Mag. Nat. Hist.*, ix, p. 248.

The rails also build their nests near the ground in big grass tussocks. In this position the nest is usually more pretentious, being hollowed out of a mass of dried grass, stems, and leaves, and is lined with finer shredded stems, mixed with a small amount of down from young albatrosses. Such nests are commonest along the border of the bushy grass area near the lagoon. Whenever visited, the few nests always contained old birds. As the greater part of the rails collected were males, it is probable that the females were keeping rather close to home. We found no young, and all the eggs collected were fresh. The young apparently begin to hatch about the middle of June.

The following episode illustrates very forcibly the fearlessness of these rails. While photographing a nest I propped back the mass of juncus stems which obscured it. The camera was only 2 feet away, and during the adjusting of apparatus the rail crept onto the nest and energetically began to cover herself with the soft lining. After photographing her several times, I lifted her off, but almost at once she slipped back again and settled down contentedly. Then with the dark cloth I persuaded her to retire to the tall grass near at hand. I hastened back to the camera, but on turning perceived my rail skipping across the flattened juncus in hot pursuit, and I was able to make only a hasty inspection of the ground glass before she had settled on the nest again. (Fig. 44.)

Porzana palmeri is peculiar to Laysan. Its appearance strongly suggests a pale brownish *Porzana jamaicensis*. It is highly probable that the Laysan bird originated from some form closely allied to *jamaicensis*, if not from the identical species. *Penula*, of the island of Hawaii, presumably had a similar origin from accidental migrants.

Though provided with wings, the Laysan bird has lost the power of flight, because its change of habits and the proximity of food in the colonized island have made the use of wings no longer necessary. Why the original migrants never left the island, as the golden plovers do now, is difficult to conjecture, unless, driven on by the strong northeast trades, they were so completely worn out and lost that they never cared to abandon the welcome land. This suggests that the original colonists may have been immature birds which joined flocks of more or less regular migrants to the Hawaiian group.

We brought away 16 specimens—10 males and 6 females. These present no marked variation, with the exception of one female, which is remarkably paler than the other specimens, besides possessing a stouter bill and larger legs and feet. In the ordinary birds the top of head, back, scapulars, sides, and flanks are sandy brown, marked on head and back with very dark-brown lanceolate shaft streaks. The outer edges of the feathers of the back and flanks are also sparsely streaked with white. The wings are the same color as back, except that the shaft streaks are lighter or almost wanting. The lower surface, sides of head, and a line over each eye are slaty gray, rather deep in the less worn specimens, and occasionally brownish about the breast from an infusion from the sides of neck. The abnormal specimen has the ground color of the top of head, back, etc., a cream buff, very pale on the wings. The streaks are represented by illy defined and uneven spots of light wood or broccoli brown, which are darker and more definite on the head. The under parts are conspicuously paler than those of the normal bird and the bill and feet are paler. This specimen was taken by Prof. C. C. Nutting, and was the only unusual individual noted, although we must have seen many hundred birds at close range. The size of an average rail is: length about 150 mm.; wing, 54; tail, 24; culmen, 19; middle toe, 34.

It is of the utmost importance that neither the mongoose, cat, or pig ever be taken to Laysan. The first two particularly would make short work of this most interesting bird. So long as the island is in as good hands as at present, this will not happen. It is likely to be brought about by ignorance rather than by malice. One can easily see how the pig might be taken ashore for food and eventually run wild to the almost certain destruction of the sea-bird population.

SCOLOPACIDÆ.

Heteractitis incanus. Wandering Tattler; Ulili.

Scolopax incanus Gmelin, Syst. Nat., i, li, 1788, p. 658.

On Laysan this bird was the least common of the migrants. We generally saw a few every day wading in the shallow water of the lagoon, gleaning small flies and possibly brine shrimps (*Artemia?*) also. Usually the species was seen alone. I saw also one or two on Necker Island, feeding among the rocks just above the surf.

In "Birds of the Hawaiian Islands," p. 92, Mr. Henshaw says: "The ulili is a permanent inhabitant of the Hawaiian Islands, frequenting the rocky shores of all members of the group, as, indeed, it does of the Pacific islands generally. * * * Apparently the ulili never nests on the islands, and about

April or May the greater number accompany the plover in their northern flight. Before they depart, many of the outgoing ulili assume the barred plumage, which is characteristic of the nuptial season. While most go, many remain, the latter being the immature birds and the weaklings. At all events, those that remain retain the immature or winter dress and show not the slightest inclination to breed.

"About the middle or the latter part of August the return migrants begin to appear, and it is noticeable that the first comers are adults, chiefly males and still in nuptial dress, which, however, is now somewhat worn and faded. Very soon after their arrival they begin the fall molt, and by the middle of September individual birds are to be found that show but a few barred feathers and have nearly donned the full winter suit."

Our specimen, Laysan, May 18, is in breeding plumage.

Numenius tahitiensis. *Bristle-thighed Curlew; Kioea.*

Scelopax tahitiensis Gmelin, Syst. Nat., t. II, 788, p. 656.

We found the bristle-thighed curlews on Laysan in small flocks, which usually either stayed around the fresh-water pond or scattered over the sedgy slopes near the sea to feed. They were fairly tame and allowed us to approach them, and when frightened did not fly any great distance. None of these birds were breeding. Speaking for Hawaii, Mr. Henshaw says:

"I feel sure that the large majority of these curlew make their appearance in September and October, and I have little doubt that they come from Alaskan breeding-grounds with the kolea (*Charadrius dominicus fulvus*) and the akekeke (*Arenaria interpres*). Yet I am not prepared to assert that the kioea does not at least occasionally nest upon the islands." (Fig. 42.)

CHARADRIIDÆ.

Charadrius dominicus fulvus. *Pacific Golden Plover; Kolea.*

Charadrius fulvus Gmelin, Syst. Nat., t. II, 1788, p. 687.

These plovers were common on Laysan, where they were found in flocks near the lagoon. I noted a few also at Bird Island. All were in the winter plumage.

According to Mr. Henshaw, the kolea leave Hawaii for Alaska in April and May and the first-comers return about the middle of August. A certain proportion of immature birds and cripples remain the entire summer in the islands.

APHRIZIDÆ.

Arenaria interpres. *Turnstone; Akekeke.*

Tringa interpres Linn., Syst. Nat., ed. 10, t. 1, 1758, p. 148.

This species was abundant on Laysan, especially near the lagoon, where it was to be seen in flocks at all times during our stay. I saw also a few on Necker Island.

Mr. Henshaw writes:

"The first stragglers put in an appearance about the middle of August. In 1900 I shot some twenty of these first-comers, and to my great surprise found all of them plump and in fine order for the table, while some were very fat indeed. All these birds, with one exception, were fully adult, and the majority were males. Moreover, they were in much the same plumage as when they left for Alaska in May; that is, they were in the red and black plumage, characteristic of the nuptial season. The young birds did not begin to appear till at least a fortnight later, and when they came were thin and poor."^a

DREPANIDIDÆ.

Himatione freethi. *Laysan Honey-eater.*

Himatione fraithii Rothschild, Annals and Magazine Nat. Hist., x, 1892, p. 109.

The honey-eater is the least abundant of the Laysan land birds. It is by no means rare, however, for in a short walk we were always able to see plenty of them. Their bright scarlet plumage renders them especially conspicuous as they flit about amid the soft green of the chenopodium bushes, and very

^a Birds of the Hawaiian Islands, 1902, p. 87.

attractive creatures they are on such a curious island as Laysan. The species is peculiar to the islet, but is closely related to the apapane (*Himatione sanguinea*), found throughout the main Hawaiian group. From this form the Laysan bird differs in its shorter bill and lighter colors, being a scarlet vermilion, brightest on crown, with abdomen sepia, under tail-coverts very pale brown, primaries and tail dark sepia, almost black, edged with buffy, and secondaries brown edged with buffy and vermilion. On the other hand the apapane is a dark crimson, and the primaries and tail are black, the belly white.

This brilliant little bird is found all over the island, but is most abundant in the interior among the tall grass and low bushes, bordering the open stretches near the lagoon, where all the land birds seem fond of congregating. Its favorite nesting-place is this same area, and the proximity of broad patches, acres in fact, of a prostrate succulent portulaca with yellow and a sesuvium with pink flowers has many attractions for the honey-eaters. Here they may be found throughout the day walking around after small insects or drinking honey from the blossoms. The brush-like tongue of the himatione renders the gathering of honey an easy task. It is not uncommon to see one go from flower to flower and insert its bill between the petals of a nearly blown bud with a certain rapidity and precision which suggests a hummingbird, except of course the fact that the himatione is on its feet.

I have observed them catching tiny, green, and hence protectively colored, caterpillars from *Chenopodium sandwicheum*, a plant very abundant in the interior of the island. They are also fond of a small brownish-gray moth or "miller," which abounds on the island to the point of distraction. While we were at lunch, on several different occasions, a himatione flew in and extracted moths from a crack between boards. It then grasped the miller with one foot, after the manner of a bird of prey, clinging with the other to the rough board wall, and ate the soft parts. After a few moments the still fluttering victim was released, and the destructive search for moths resumed. It became evident that the millers, relieved of important parts of their anatomy, did not thrive after such treatment.

The nests proved more difficult to find than those of *Acrocephalus*. In fact we discovered only one, placed in the middle of a grass tuft about 2 feet from the ground. This contained but a single egg, though a nest which Mr. Schlemmer gave to us contained four. The structure is loosely made of fine grass and rootlets, and the bowl, 2½ inches across by 1½ deep, is lined with fine rootlets and brown down from young albatrosses (*Diomedea immutabilis*). There are no white feathers in the lining, thus making the structure at once distinguishable from the nest of the miller-bird. The ovate egg is pure lusterless white, blotched and spotted at the large end with grayish vinaceous, and with fewer light and dark spots of Prout's brown. A typical egg measures 18 by 13.75 millimeters. (Fig. 51.)

The sexes are alike. Seven specimens without regard to sex are somewhat lighter than six others, or at least have more yellow in the brilliant scarlet vermilion. It is not improbable that the first set are birds of the previous year, while the deeper colored ones are in the fully adult plumage. The bill, wings, and tail of the females are a trifle shorter than those of the male specimens. The plate in Rothschild's "Avifauna of Laysan" represents this species far too pale and gives an erroneous idea of the color of the bird.

Telespiza cantans. *Laysan Finch.*

Telespiza cantans Wilson, Ibis, 1890, p. 341, pl. ix.

The Laysan "finch" is quite fearless and unsuspecting. It is also saucy to a marked degree, and ignores the presence of man when he is peaceably disposed. One can not walk anywhere without encountering them singly or in little flocks, diligently searching for food among the bushes, or out in the open. When disturbed they eye the intruder with interest or half in doubt and utter their low, mellow, linnnet-like call. They do not fly far, but prefer to alight soon, and run along the ground, or elude pursuit by suddenly crouching under a grass tussock.

They are not particular as to food, but are fond of the soft parts of grass stems, tender shoots of bushes, seeds, and especially of eggs. I saw a pair fly to the egg of a *Sterna lunata* immediately after the bird had been disturbed by my approach. One of them opened the egg with a few strokes of its beak and began to feed at once, although I was hastily adjusting a camera only a few feet away. Nor did the removing of some rocks which obscured the view bother them greatly, for they only hopped out of reach and watched the process with equanimity, resuming their repast as soon as I had finished. But presently a rail appeared and angrily drove them off, appropriating the egg for himself. The "finches" were common in the vicinity of the house, and hopped about the piazza in a very familiar way. While I was preparing specimens one came several times and lit on a table within a few feet and explored my belongings.

The *Telespiza* is the best songster on the island, and a number were captured by officers and seamen of the *Albatross* for cage birds. One which was kept in the laboratory on board made such good use of his vocal powers that it was sometimes necessary to give him more space on deck for the performance.

The favorite nesting site is in the middle of a big tussock of grass, somewhat nearer the ground than the situations of the *Himatione* and *Acrocephalus* nests. The species also builds in chenopodium bushes. We found several nests in grass clumps bordering the open near the lagoon—a location very popular with both himationes and miller-birds—and in each case the nest was wedged in the center of the tussock, well hidden by the tall grass stems. It is made of rootlets, twigs, and coarse grass, and the whole structure is rather loosely put together. The shallow cup is $2\frac{3}{4}$ inches in diameter and is lined with shredded grass.

Three eggs are laid, though we found some nests with incomplete sets of two. All were fresh. A rather large specimen measures 24 by 18 millimeters. It is somewhat bluntly ovate, of a lusterless white, with small blotches and spots of light sepia and lilac gray, crowded toward the blunt end and very sparingly present on the acute half. Another egg of the same set of three is smaller, measuring 22.5 by 17.5 millimeters. The third egg is a trifle smaller still, and has the spotting distributed evenly over the whole surface. An example from a set of two is plentifully blotched with lilac gray at the blunt end and sparsely spotted with dark Prout's brown, giving it a rather unusual appearance. Some eggs have the spots relatively large (2 millimeters in diameter); in others they are very small. Occasionally an egg presents at the blunt end one or two dark lines. There is great variation in size and color, and some eggs are as small as 21 by 15 millimeters.

We collected 24 individuals of this species. The adult and subadult plumages are quite different, and led Mr. Walter Rothschild to describe the fully matured bird as *Telespiza flavissima*. For descriptions of this species see any of the works cited in the introduction, especially the "Avifauna of Laysan," which gives excellent colored plates of both adult (*sub nomine* "*flavissima*") and "immature" plumages (*s. n.* "*cantans*"). Of the 24 specimens 11 are adult males in the bright yellow plumage, with back not streaked. One adult male is about midway between the two plumages, having assumed the "yellow stage," except on back, wings, and tail. Five other males are in the immature streaked plumage, but one is much yellower than the others. All these five are much more worn than birds in the yellow plumage. All the sitting birds I noted were in streaked dress, similar to the one shown in the photograph. (Figs. 49, 50.)

Of seven females three are in the immature streaked stage and are all a trifle paler over the yellow area than males in a similar stage. The other four are halfway between the "adult" and the "immature" stages. Had not Mr. Rothschild expressly stated that the sexes are alike in fully adult plumage, I would have considered three of these birds in the final plumage. The back is streaked like the immature males and top of head to less extent. The yellow of rest of head, and breast, which is not streaked, is more greenish than that of the adult male and less extended over abdomen and flanks. The flanks are light brownish and sparsely streaked. If the adult female is exactly like the male, these four specimens form a beautiful connecting link between the two plumages. We collected no females similar to the adult males. I believe the juvenal plumage is worn a year, till after the first nesting season, when the intermediate phase is assumed. Just how long that is worn is hard to tell, but I doubt if the fully adult plumage is gained till the bird is in its third year.

SYLVIIDÆ.

Acrocephalus familiaris. Miller Bird.

Tartare familiaris Rothschild, Annals and Magazine Nat. Hist., x, 1892, p. 109.

The warbler is locally known as the miller bird on account of its fondness for "millers," or grayish brown moths, which abound on Laysan. It is peculiar to Laysan Island, and singularly enough the genus is not found in the Hawaiian group proper, to the eastward.

Acrocephalus "comprises a well-marked group of birds familiarly known as Reed-Warblers, and is distinguished by the possession of a very minute bastard primary and a moderately rounded tail. The bastard primary is so minute that in adult birds it does not usually extend as far as the primary coverts. In birds of the year, and in one or two species slightly aberrant in this respect, it is usually somewhat longer, occasionally extending beyond them. * * * The bill is typically large.

depressed, and broad at the base, with moderately developed rictal bristles. * * * The general color of the plumage is more or less uniform brown, sometimes olive brown, sometimes russet brown, gradually fading, as the plumage becomes abraded, into a neutral brown or dust brown, not inaptly described as *museum* color.

"Most of these birds are migratory and molt twice in the year, shortly before each journey. Their breeding range extends over the whole of the central and southern Palearctic Region, but only one species extends as far north as the Arctic circle. They winter in the tropical regions of Africa and Asia, and are especially common in the islands of the Malay Archipelago. Two species apparently migrate south instead of north to breed, and resort to the swamps of Australia for that purpose. Two other species appear to be nonmigratory—one having found a permanent home in South Africa and the other^a in the Caroline Islands of the Pacific."^b

It is not difficult to conjecture how Laysan became colonized by the original *Acrocephalus*, as the Caroline Islands form a convenient mid-station from the Malay Archipelago. It is singular, however, that the genus did not secure a foothold in the large islands of the group—Kauai, for instance. *Acrocephalus syrinx* is said to occur only on Ponapé, one of the most easterly of the Caroline Islands, where it is resident. Thus, in a genus of marked propensities for migrating, it is of interest to find a few species so restricted and conservative, as it were.

The miller bird is one of the most abundant of the four strictly land birds peculiar to Laysan. In the cool of the morning or in late afternoon it is seen to best advantage, for then it is very active and at times musical. During the heated portion of the day, following the custom of our wood warblers of North America, it retires, to remain hidden among bushes or in the tall tufts of grass where its nest is made. The species, like others on the island, is quite fearless. One has no difficulty in approaching close to the active little creatures, especially near the nest, though, as is natural, they evince some doubt at first. With a little patience I was able to secure a photograph, although neither myself nor the camera, within a few feet of the nest, were at all concealed. (Fig. 43.)

Acrocephalus always appears busy. It is fond of moths and other insects, and drags the former from their hiding-places with much skill. It is not averse to the habitations on the island and may be seen with the himationes assiduously hunting for millers about piazzas and outhouses, prosecuting the search even into the rooms. One of its favorite feeding-places is over stretches of prostrate portulacas, near the lagoon, where it gleans small caterpillars from the herbage in considerable numbers.

They nest usually in big tufts of bushy grass, and like the other land birds congregate in greatest numbers along the inner edge of the bush-grass area near the lagoon. We discovered only two nests with eggs, but many empty ones apparently just ready for eggs. Each nest was placed in the middle of a large bunch of grass about 2 feet from the ground. The structure itself is composed of dried grass stems and blades, fine rootlets, white albatross feathers. The bowl is 1½ inches wide by the same depth, and the diameter of the mouth is somewhat less than that of the interior, so that the edges of the cup overhang a little. It is lined with fine rootlets, shredded grass, and white albatross feathers, the last being a very characteristic feature of all nests, so that the miller birds probably began very long ago to make use of this convenient material. Occasionally a trace of down was found on the inside. The outer portion of the nest is rather loosely held together, and forms a globose mass 3½ inches in diameter.

The eggs differ considerably both in size and coloration, one being as small as 19 by 14 mm. and another as large as 22 by 15 mm. The ground color varies from very pale olive buff through greenish white to almost pure white. In one specimen the markings are olive blotches and spots of various intensities crowded at the blunt end, and likewise very tiny lines and specks scattered all over the egg. Another example is paler, blotched with olive and drab, and with minute specks. Two out of the five eggs lack the tiny specks.

^a *Acrocephalus syrinx* (Kittlitz) Ponapé.

^b Cat. Birds Brit. Mus. (Seebohm) v, 1881, p. 87. (Written before *Acrocephalus familiaris* was discovered.)

APPENDIX.

The following are additional irregular visitants recorded from Laysan by Dr. H. Schauinsland (*Drei Monate auf einer Koralleninsel*, Bremen, 1899) and quoted in Rothschild's *Avifauna of Laysan*, Bryan's *Key to the Birds of the Hawaiian Group*, and Henshaw's *Birds of the Hawaiian Islands*. Schauinsland's names are in brackets (l. c., p. 101). Schauinsland did not list *Anas boschas*, but a specimen secured by him is recorded by Rothschild. Starred species were represented by specimens.

- | | |
|---|--|
| * <i>Larus glaucescens</i> Naum. [<i>Larus glaucus</i> Brun.] | * <i>Clangula albeola</i> (Linn.). |
| * <i>Phalacrocorax pelagicus</i> Pall. | * <i>Crymophilus fulvicastris</i> (Linn.). |
| * <i>Anas boschas</i> Linn. | * <i>Tringa acuminata</i> (Horsfield). |
| * <i>Anas americana</i> Gmel. | * <i>Tringa pacifica</i> (Coues). [<i>Tringa (Pelidna) americana</i> Cass.] |
| * <i>Anas carolinensis</i> Gmel. [<i>Nettion crecca</i> .] | * <i>Calidris arenaria</i> (Linn.). |
| <i>Anas querquedula</i> ?? Linn. (probably <i>discors</i>).
[<i>Querquedula ciria</i> .] | * <i>Limosa lapponica baueri</i> (Naum.). [<i>L. nova zealandiae</i> Gray.] |
| * <i>Spatula clypeata</i> (Linn.). | |
| * <i>Dasyla acuta</i> (Linn.). | |

Since the foregoing report was written Mr. William E. Safford, of the U. S. Department of Agriculture, has kindly examined and identified the plants collected on Laysan. The following is the list:

LAYSAN:

Cenchrus calyculatus Cav.
Sporobolus virginicus Kunth.
Eragrostis cynosuroides (Retz.).
Cyperus hypochlorus Hillebrand.
Santalum freycinetianum Gaud.
Chenopodium sandwicheum Moq.
Amarantus viridis L. (*Eurotus viridis* Moq.)
Boerhaavia tetrandra Forst.
Sesuvium portulacastrum L.
Portulaca lutea Sol.

LAYSAN—Continued.

Capparis sandwicheana D'C.
Tribulus cistoides L.
Ipomœa insularis Stend.
Heliotropium curassavicum L.
Scaevola kœnigii Vahl.

NECKER ISLAND:

Sesbania tomentosa Poiret.
Portulaca lutea Sol.
Chenopodium sandwicheum Moq.

LELAND STANFORD JUNIOR UNIVERSITY,

June 1, 1903.



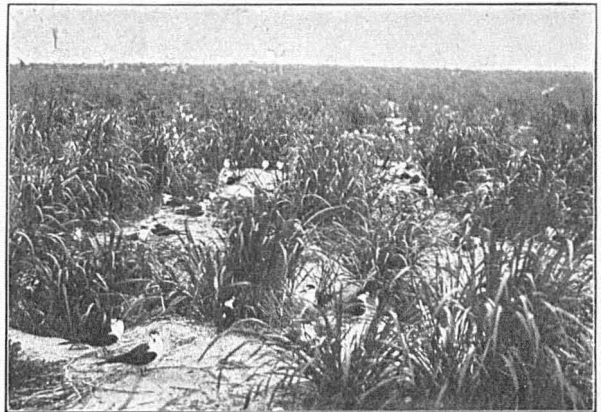
1. SOOTY TERN (*STERNA FULIGINOSA*) AND NEST.



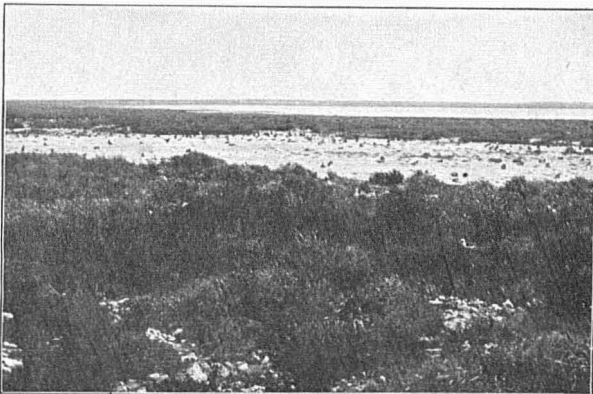
2. CUSTOMARY ACTIVITY OVER A LARGE COLONY OF SOOTY TERNS.



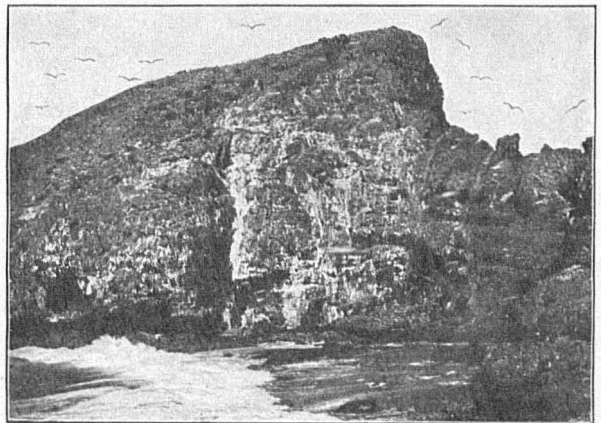
3. PORTION OF A SOOTY TERN COLONY.



4. CHARACTERISTIC VIEW IN LARGE COLONY OF SOOTY TERNS.



5. LOOKING NORTH OVER LAYSAN ISLAND, SHOWING WEST SHORE OF LAGOON.



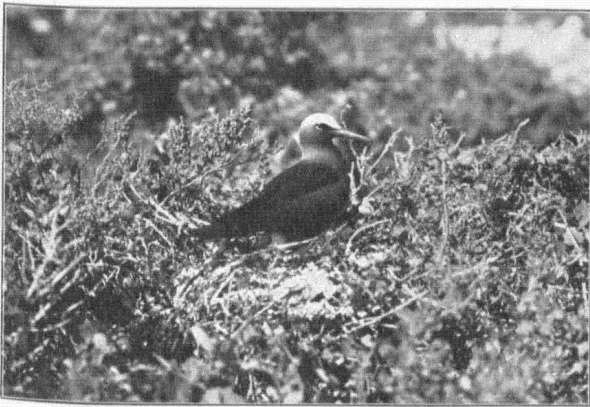
6. COVE, NECKER ISLAND, SHOWING HIGHEST PEAK, 300 FEET.



7. GRAY-BACKED TERN (*STERNA LUNATA*) AND YOUNG, SHOWING NESTING SITE AMONG LOOSE PHOSPHATE ROCK.



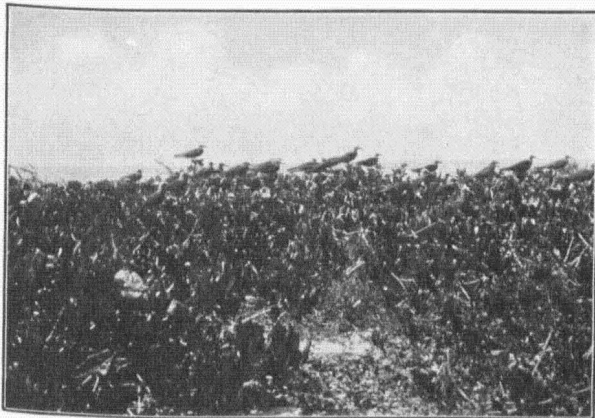
8. CHICK OF *STERNA LUNATA*.



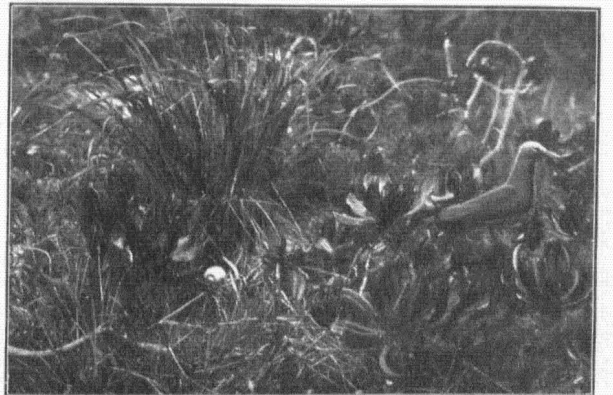
9. HAWAIIAN TERN (*MICRANOUS HAWAIIENSIS*) ON NEST.



10. HAWAIIAN TERN ALIGHTING ON ITS NEST.



11. COMPANY OF *MICRANOUS HAWAIIENSIS* RESTING ON BUSHES NEAR THE SHORE.



12. THE NODDY TERN (*ANOUS STOLIDUS*) AND NEST.



13. WHITE TERNS (*GYGIS ALBA KITTLITZI*) NEAR THE "NEST."



14. NEST OF NODDY (*ANOUS STOLIDUS*).



15. CHARACTERISTIC "NEST" OF *GYGIS*, A BARE LUMP OF PHOSPHATE ROCK.



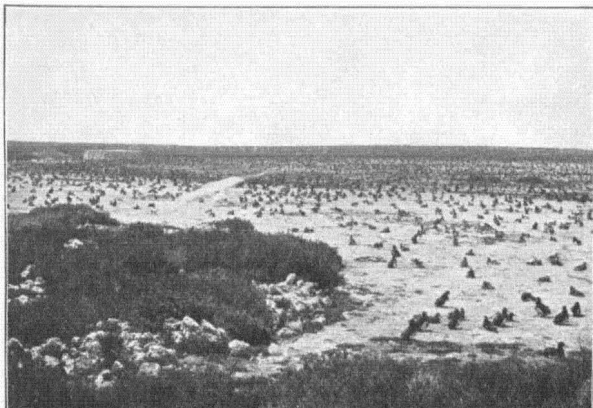
16. ANOTHER "NEST" OF *GYGIS*, THE BARE LIMB OF A *CHENOPODIUM* BUSH.



17. CHICK OF *GYGIS ALBA KITTLITZI*, ABOUT 3 DAYS OLD.



18. THE WRITER INTERVIEWING CHIEF CITIZENS OF LAYSAN.



19. VIEW OF A LARGE COLONY OF LAYSAN ALBATROSSES (*DIOMEDEA IMMUTABILIS*); MOSTLY YOUNG BIRDS.



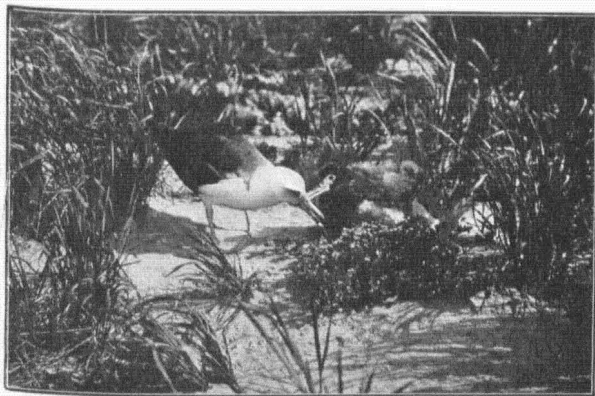
20. A CORNER IN ONE OF THE COLONIES OF *DIOMEDEA IMMUTABILIS*.



21. PORTRAIT OF A YOUNG LAYSAN ALBATROSS.



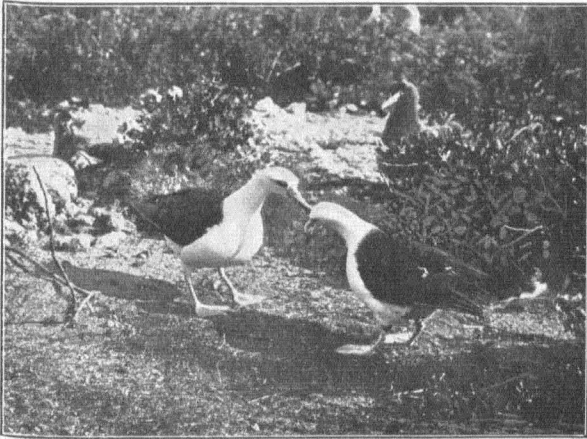
22. *DIOMEDEA IMMUTABILIS* FEEDING ITS YOUNG—FIRST STAGE, THE YOUNG ASKING FOR FOOD.



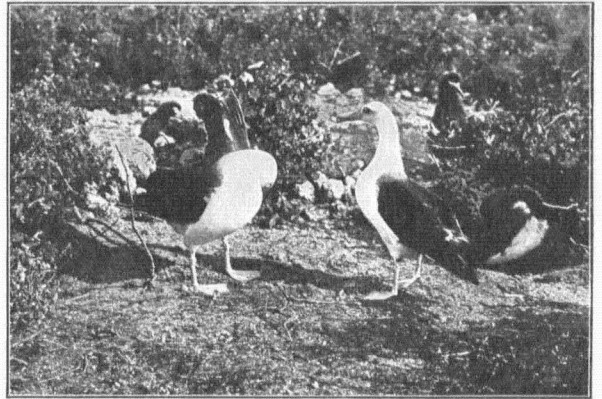
23. SECOND STAGE IN FEEDING YOUNG—OLD BIRD STARTING TO DISGORGE.



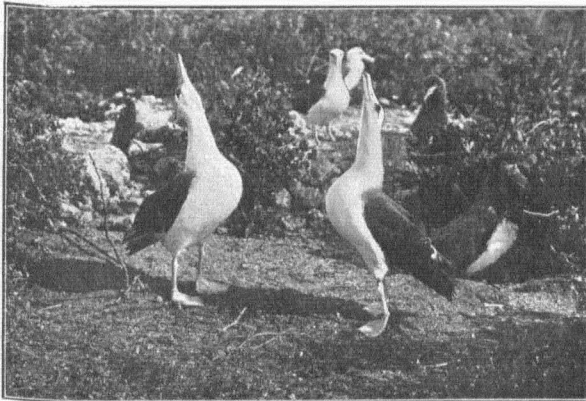
24. FINAL STAGE IN FEEDING YOUNG—ARRIVAL OF BREAKFAST.



25. *DIOMEDEA IMMUTABILIS*; FIRST STEPS IN FAVORITE DANCE AND "SONG."



26. SECOND STEP IN THE ALBATROSS DANCE.



27. FINALE OF DANCE—THE DUET.



28. A MORE COMMON ENDING OF DANCE—ONE "SINGING" THE OTHER SNAPPING BEAK.



29. A PAIR OF WEDGE-TAILED SHEARWATERS (*PUFFINUS CUNEATUS*).



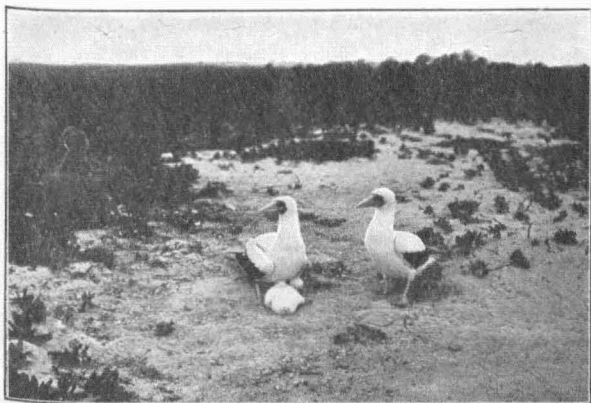
30. YOUNG OF *AESTRELATA HYPOLEUCA*.



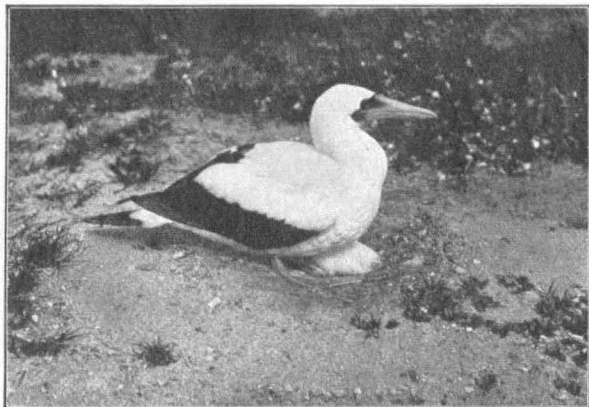
31. RED-TAILED TROPIC BIRD COVERING CHICK.



32. RED-TAILED TROPIC BIRD (*PHAETHON RUBRICAUDA*) ON NEST.



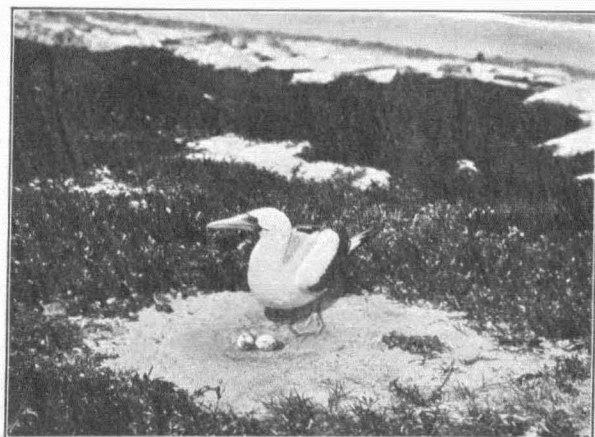
33. PAIR OF *SULA CYANOPS* GUARDING YOUNG.



34. BLUE-FACED BOOBY (*SULA CYANOPS*) AND YOUNG.



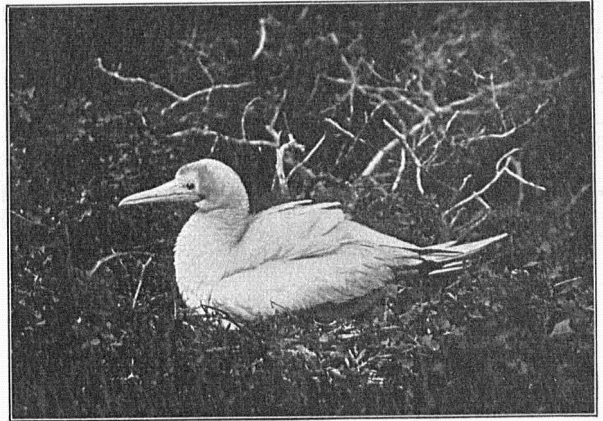
35. BLUE-FACED BOOBY FEEDING YOUNG.



36. *SULA CYANOPS* GUARDING EGGS.



37. RED-FOOTED BOOBY (*SULA PISCATOR*) ON NEST.



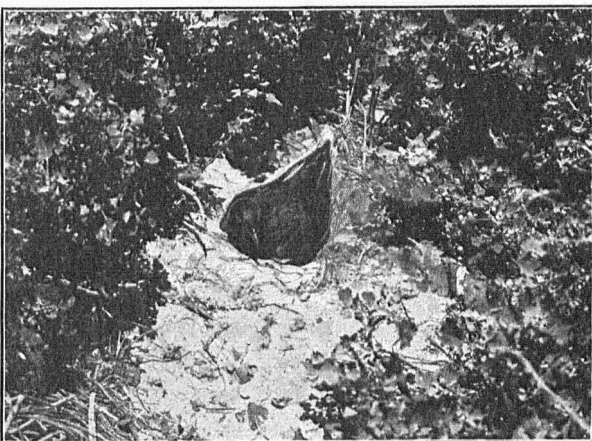
38. RED-FOOTED BOOBY.



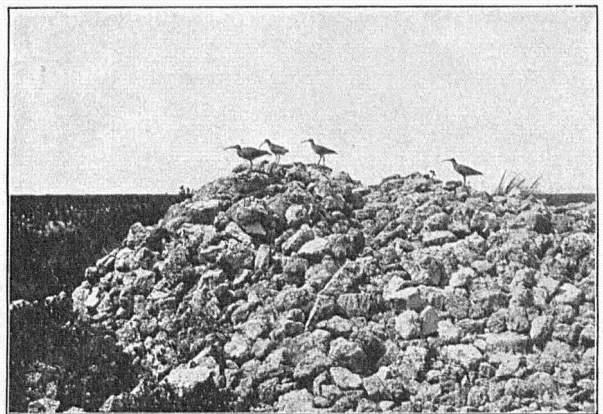
39. MALE MAN-O'-WAR BIRD (*FREGATA AQUILA*) WITH INFLATED GULAR POUCH.



40. MAN-O'-WAR BIRDS; FEMALE IN FOREGROUND, TWO MALES BEYOND, ON NESTS.



41. CHRISTMAS ISLAND SHEARWATER (*PUFFINUS NATIVITATIS*) ON NEST.



42. BRISTLE-THIGHED CURLEWS (*NUMENIUS TAHITIENSIS*).



43. MILLER BIRD (*ACROCEPHALUS FAMILIARIS*) AND NEST.



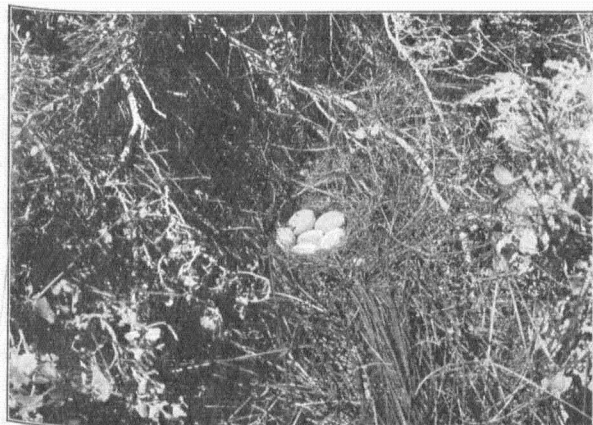
44. LAYSAN RAIL (*PORZANULA PALMERI*) ON NEST.



45. LAYSAN RAIL EATING A TERN'S EGG.



46. EGGS OF LAYSAN RAIL.



47. NEST AND EGGS OF THE LAYSAN TEAL.



48. NEWLY HATCHED YOUNG OF THE LAYSAN TEAL.



49. LAYSAN FINCH (*TELESPIZA CANTANS*) AND NEST.



50. LAYSAN FINCH.



51. NEST OF LAYSAN HONEY EATER (*HIMATIONE FREETHI*).



52. NEST OF LAYSAN RAIL IN GRASS TUSSOCK, VIEWED FROM ABOVE.