

BIRDS OF KURE ATOLL, HAWAII

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At 9:00 a.m. on June 5, 1957, we landed on Green Island, Kure Atoll, west of Midway, and spent nine hours ashore. Previously we had made four low-altitude aerial surveys of the atoll on December 9 and 21, 1956, and on February 12 and May 14, 1957. The only other recorded visit by biologists to this remote atoll was that of the Tanager Expedition in 1923, when a party of five, under the direction of Alexander Wetmore, worked for several days on Green Island. No report on the birds obtained has been published.

Our visit to Kure Atoll was part of a study of breeding populations of oceanic birds conducted from 1956 to 1957 by the United States Fish and Wildlife Service and sponsored by the United States Navy. We wish to acknowledge the cooperation extended by Capt. E. T. Hughes, Commanding Officer of the Midway Islands Naval Station, who authorized the Kure Atoll trips. We also wish to extend our appreciation to Lt. Cdr. J. F. Reilly, who was in charge of the expedition; his interest in our work made it possible for us to spend sufficient time ashore. Dr. John W. Aldrich and Mr. Chandler S. Robbins of the Bureau of Sport Fisheries and Wildlife participated in the first aerial survey.

Kure Atoll is the most westerly land in the Leeward Islands, a chain which extends for 1200 miles northwest of the main Hawaiian Islands. Its position is latitude $28^{\circ} 25'N$, longitude $178^{\circ} 25'W$; it is 56 nautical miles northwest of Midway Atoll. Kure is a typical atoll with a nearly circular barrier reef enclosing a lagoon which is six miles in diameter. Other than a few shifting sandspits, the only land area is Green Island, which lies just inside the southeast reef. The island is roughly crescent-shaped, sandy, and it is over one mile long and less than one-half mile wide. Behind the sand beaches, spreading inland from the crests of 10- to 20-foot dunes, is an almost impenetrable growth of *Scaevola frutescens*, broken only by an opening of several acres, carpeted by low herbaceous vegetation, in the interior. A radar reflector tower has been erected by the Navy on the northwest side of the island. A more detailed description of Kure Atoll may be found in Bryan (American Polynesia and the Hawaiian Chain, 1942:204).

No land birds inhabit Green Island. The only terrestrial mammals are rats. *Rattus exulans* was the species collected by members of the Tanager Expedition. Dr. David H. Johnson of the United States National Museum suggests that possibly *Rattus rattus* may have been subsequently introduced and that it has replaced *exulans*. In 1923 the island was "overrun with rats." They are not common now; we saw only one during our visit. Monk seals (*Monachus schauinslandi*) regularly use the beaches as hauling grounds.

ANNOTATED LIST OF SPECIES

We attempted to record quantitative information on the local breeding populations of the oceanic birds observed. The following list includes all of the species seen. Unless otherwise stated, the observations were made on the ground survey of June 5. Several other species could doubtless be found at other seasons or by more intensive search. The estimated populations of sea birds resident in 1957 are summarized in table 1.

Diomedea nigripes. Black-footed Albatross. This species nests only on beaches or on bare sand. On June 5 virtually all the young were on the open beaches; therefore, our count is probably very near the actual total. We counted 14 chicks along the south beach and 28 along the north beach of the island, or a total of 42 young. We doubtless missed a few, so perhaps 50 young were present. Judging from the mortality caused by wind-driven sand in the course of winter storms at Midway Atoll early in the nesting season, there must have been about 40 per cent more albatross nests on Kure Atoll,

Table 1

Estimated Resident Sea Bird Populations on Green Island, Kure Atoll, in Spring, 1957

Species	Nesting pairs	Total adults
Black-footed Albatross (<i>Diomedea nigripes</i>)	70	163
Laysan Albatross (<i>Diomedea immutabilis</i>)	345	805
Wedge-tailed Shearwater (<i>Puffinus pacificus</i>)	common?	common?
Red-tailed Tropic-bird (<i>Phaethon rubricauda</i>)	500	1000
Blue-faced Booby (<i>Sula dactylatra</i>)	80	170
Brown Booby (<i>Sula leucogaster</i>)	30	70
Red-footed Booby (<i>Sula sula</i>)	240	500
Great Frigate-bird (<i>Fregata minor</i>)	100	325
Gray-backed Tern (<i>Sterna lunata</i>)	?	8
Sooty Tern (<i>Sterna fuscata</i>)	?	3
Noddy Tern (<i>Anous stolidus</i>)	66	252
White-capped Noddy Tern (<i>Anous tenuirostris</i>)	?	44
Fairy Tern (<i>Gygis alba</i>)	?	1

or a total of about 70 breeding pairs. A group of 64 adult Black-footed Albatrosses was photographed from the air on the bare sand point at the western end of the island on December 21. We could not determine whether they were nesting. In June we found no Black-footed Albatrosses on this point. At that time, we saw only about 10 adults, mostly unemployed birds (Richdale, Sexual Behavior in Penguins, 1951:7), on the island. Judging from conditions on Midway Atoll, the number of unemployed birds should equal at least one-sixth of the number of breeding birds. Including 23 unemployed birds, our estimated total for adults present this season was 163.

Diomedea immutabilis. Laysan Albatross. We counted all chicks that could be seen on June 5. In the interior open area of the island, there were 172 chicks; along the south beach, 35; along the north beach, 63; thus we recorded a total of 270 chicks. We doubtless missed a number, so probably about 300 chicks were present. Allowing for a 15 per cent mortality, based on data from Midway, there must have been approximately 345 nests at the beginning of the season. Most of the chicks along the beaches were on the open sand; a few were found under the *Scaevola* shrubs fronting the beach. At a number of points, we made a thorough search into the dense *Scaevola* thickets. It was obvious that no Laysan Albatrosses could nest there since albatrosses nesting in the open interior had to fly in and out over the impenetrable barrier of *Scaevola* which prevented them from walking to the beach. It is possible that this fact accounts for the low population of albatrosses in an otherwise suitable habitat. We found several albatross skeletons in the *Scaevola* thickets. Probably they were from newly-fledged birds not yet proficient in flight which had inadvertently landed, become entangled, and starved to death in the thickets. A partial count, plus estimates for others seen, indicated that 75 to 100 adult birds, mostly unemployed, were on the island. There should have been at least 115 unemployed Laysan Albatrosses using Green Island this season, if we assume that the ratio from sample counts made on Midway can be applied here. Our estimate for the total number of adults using the island was 805.

Puffinus pacificus. Wedge-tailed Shearwater. We saw numerous burrows of this species in the interior open area. At daybreak, and also in the evening, Wedge-tailed Shearwaters were fairly numerous two to 20 miles offshore.

Phaethon rubricauda. Red-tailed Tropic-bird. Nesting tropic-birds were fairly common in the *Scaevola* scrub, but they were not as abundant as they are on Midway Atoll. A concentration of 70 to 80 were participating in aerial display over the western section of the island. We would guess their abundance at about 500 pairs. At sea we saw several single birds and a few small groups.

Sula dactylatra. Blue-faced Booby. We counted 80 nesting pairs in a loose colony on the interior open area. We found no nests elsewhere. Since Blue-faced Boobies characteristically nest in the open, we believe that we saw all the nests. A few nests contained two eggs; the majority contained single young birds ranging in development from newly-hatched to nearly-fledged. We saw a few birds in immature plumage, so we estimated that 170 birds, exclusive of nestlings, were present.

Sula leucogaster. Brown Booby. In the interior open area, we counted 27 nests. Of 13 examined

closely, two held one egg, five held two eggs, one held two newly-hatched chicks, and five held single chicks, the largest of which were half grown and still covered with white down. Since these birds often nest under *Scaevola* at Midway Atoll, it is possible that we missed nests, so we have estimated a total of 30 nests. A few birds in immature plumage were observed. The total, excluding nestlings, must have been at least 70.

Sula sula. Red-footed Booby. These boobies were nesting over much of the scrub-covered area, mainly in the higher *Scaevola* clumps. We counted them from the top of the radar reflector tower, from which the entire island is visible; there were 218 presumably nesting pairs. We believe that this count included about 90 per cent of the nesting population, indicating a total of about 240 nests. All nesting birds were in white plumage. We saw several birds in brownish or mottled immature plumage. The total population, excluding nestlings, must have been close to 500.

Fregata minor. Great Frigate-bird. Although frigate-birds perched in the *Scaevola* over most of the northeastern two-thirds of the island, there appeared to be three concentrations, probably nesting colonies, between the interior open area and the southeast beach. We made observations through binoculars from the top of the radar reflector tower and counted 210 frigate-birds resting on bushes and 115 in the air, a total of 325. While time did not allow us to penetrate the tangled *Scaevola* around the colonies, we estimated that there were about 100 nests. No males with distended gular sacs were seen. This indicated that the courtship phase of the breeding cycle had passed.

Pluvialis dominica. American Golden Plover. Two birds in winter plumage were seen along the north shore.

Arenaria interpres. Ruddy Turnstone. Three were seen along the north beach.

Heteroscelus incanum. Wandering Tattler. We captured one extremely emaciated individual in winter plumage, unable to fly, on the north beach.

Sterna lunata. Gray-backed Tern. Five flew over the north beach and three crossed the interior open area. No nests were found.

Sterna fuscata. Sooty Tern. Three birds flew over the island. We found no nests. The absence of flat open nesting habitat may explain the scarcity of this species. At this season, incubation was already well under way in the large colonies at Midway Atoll. Many Sooty Terns flew near the ship in the waters off Kure Atoll.

Anous stolidus. Noddy Tern. We counted 15 birds on the west point, 40 along the south shore, 107 on the northeast point, and 90 along the north shore, a total of 252. Six nests were found on the west point, about 20 along the south beach, and about 40 at the northeast point, a total of about 66 nests. All nests were among chunks of broken coral on the open beaches. Several eggs examined were fresh; we saw no young.

Anous tenuirostris. White-capped Noddy Tern. A flock of 40 rested on the north beach; in addition, we saw one on the south beach, another on the west point, and two on the northeast end of the island. There was no indication of nesting.

Gygis alba. Fairy Tern. The only one seen was flying one-half mile outside the reef. We saw a few in flight over the ocean within 20 miles of the atoll. Since Fairy Terns are at the height of nesting at this season on Midway, it seems likely that the birds at Kure Atoll may nest on the large protruding rocks of the barrier reef, as they are known to do elsewhere.

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