

## THE BIRDS OF CLIPPERTON ISLAND, EASTERN PACIFIC

By KENNETH E. STAGER

Although Clipperton Island has been visited by only a few ornithologists, it nevertheless has been long recognized as a haven for large numbers of oceanic birds. Clipperton is the most easterly coral atoll in the Pacific Ocean and is situated at latitude  $10^{\circ} 18' N$ , longitude  $109^{\circ} 131' W$ . With reference to the American mainland, the island is approximately 600 nautical miles southwest of the Mexican state of Guerrero. The nearest coral atoll to Clipperton is Pukapuka, in the eastern Tuamotus, 2300 nautical miles to the southwest.

In 1958, during the International Geophysical Year, the Scripps Institution of Oceanography engaged in a number of research cruises to the tropical eastern Pacific Ocean. One of these cruises was the "Doldrums" expedition, made for the purpose of studying the Equatorial Counter Current. As an adjunct to the "Doldrums" expedition, the Scripps Institution landed a party of 13 scientists and technicians on Clipperton for the purpose of making an intensive survey of the life on the atoll. It was my privilege to serve as the ornithologist of this field party. The landing on Clipperton was effected from the research vessel "Spencer F. Baird" on the morning of August 7, 1958, and work was terminated on August 26, 1958. On this latter date, nine members of the field party were picked up by the "Spencer F. Baird" and taken to Panamá for the return home. The other four members of the field party remained on Clipperton for an additional month to complete a program of shark studies.

## ACKNOWLEDGMENTS

I am deeply grateful to the Scripps Institution of Oceanography for the privilege of participating in the Clipperton survey and wish to take this opportunity to express my thanks to its director, Dr. Roger Revelle. Particular credit is due Dr. Carl L. Hubbs, of Scripps, who originally suggested the Clipperton survey and from whom the invitation to serve as ornithologist was received. Grateful appreciation is expressed to my field companions for their help in work on the island. Comparative material from the American Museum of Natural History was made available through the cooperation of Dr. Dean Amadon. Permission to land on the island was granted by the French government.

## PHYSICAL FEATURES OF THE ISLAND

The island consists of a low, oval-shaped atoll, approximately 4 kilometers long at its northwest-southeast axis (fig. 1). The lagoon in the center became land locked sometime between 1839 and 1858 (Sachet, 1962*a*). The water of the lagoon is somewhat brackish, but during the rainy season the surface layer of water is fresh enough for human consumption. The ribbon of land varies in width from 45 to 400 meters with much of it being 200 meters in width. The coral limestone ribbon varies in elevation from 0.65 to 4.0 meters above estimated mean high tide level. On the south periphery of the atoll, a large volcanic rock (fig. 1) rises to a height of 29 meters and is visible from every part of the island. For more detailed information regarding the meteorology, hydrography, lithology, and general physiography of the island see the excellent papers by Sachet (1962*a*, 1962*b*).

## ECOLOGICAL CONSIDERATIONS

The general low elevation of the atoll and its extensive coral reefs, coupled with the fact that it is exposed to the open sea, has made Clipperton a hazard to navigation since early in the 16th century. Periodic shipwrecks as well as planned landings have

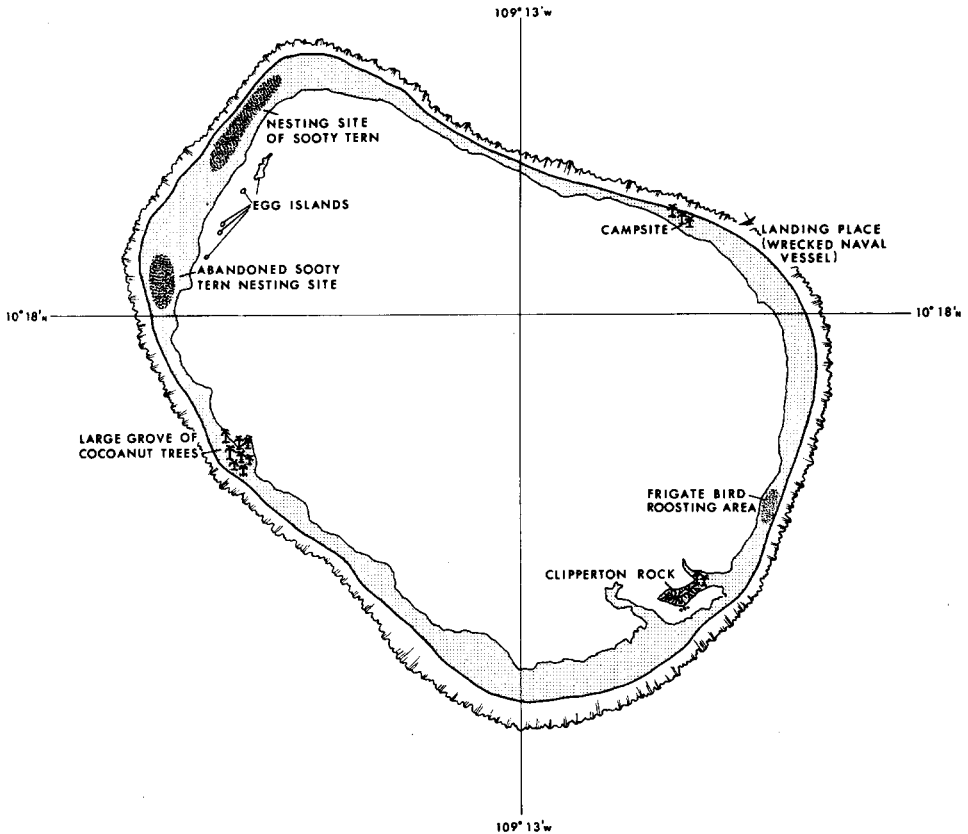


Fig. 1. Map of Clipperton Island.

provided the island with a temporary human population of varying numbers in the past 200 years. The presence of man on the island has left its mark in many ways, especially with regard to the vegetative cover. Around the turn of the present century, a British phosphate company maintained a bird-guano mining operation on Clipperton. During this period it was reported that except for a lone coco palm tree (*Cocos nucifera*) the island was almost completely devoid of vegetation, supposedly due to the presence of large concentrations of oceanic birds and countless numbers of red land crabs (*Gecarcinus planatus*). At the time of our visit to the island in 1958, there were several hundred coco palms present, with the greatest concentration forming a dense grove on the west side of the atoll. There was also a small group of palms adjacent to the east face of Clipperton Rock. A third group of six palms provided a camp site for our field party on the northeast side of the atoll.

At the time of our stay on Clipperton a portion of the island was covered with luxuriant mats of goatsfoot morning-glory (*Ipomoea pes-caprae*), common to many atolls of the Pacific area. The greater part of the land area was covered with what Sachet (1962*b*) refers to as mixed herbaceous vegetation. Sachet (1962*b*:294) describes this vegetative cover as, "an ill-defined, variable assemblage of weedy species forming a low grassy or brushy cover." At various points along the lagoon shore there

were small sedge marshes. According to Sachet (1962*b*) the sedge marshes were single species beds, consisting of *Eleocharis*, *Hemicarpha micrantha*, or *Scirpus rubiginosus*.

In the past two hundred years the sparse vegetative cover of this atoll has been subjected to alternating periods of destruction and re-establishment. Sachet (1962*b*: 288) states that, "in 1711, 1825, and probably 1839 the island had a low cover of suffrutescent and/or grassy vegetation. By 1858 this had disappeared and between 1893 and 1917 was still nonexistent. In 1935 the low cover had re-established itself and it has persisted to the present." Sachet (1962*b*) postulates that the destruction of the vegetation on Clipperton was probably due to catastrophic hurricane action with regeneration hampered by the presence of countless numbers of land crabs and sea birds. The crabs supposedly ate the new vegetation back as fast as it developed and the sea birds damaged the new growth by their nesting activities.

Pigs were introduced on Clipperton around 1897 and were probably survivors of the wreck of the British ship "Kinkora." In 1917 the number of pigs on the atoll was estimated at about twelve (Morris, 1934). Subsequent visitors to the atoll estimated the number of pigs at fifty, except for the crew of the schooner "Ethel Sterling" that reported the number at nearly one hundred (Sachet, 1961*a*). Earlier visitors to the atoll had reported the presence of sea birds in countless thousands. In 1958, however, even the most abundant species (boobies, terns, and frigates) were only present in a few hundreds and it was evident that there had been a serious depletion in their numbers. A rapid reconnaissance of the atoll disclosed the presence of pigs in all areas and their numbers were estimated at more than fifty. The pigs wandered about the atoll singly and in small bands. It was a common sight to see a colony of birds take to the air and upon close examination with the aid of binoculars, to see a pig or two wandering about the nesting area. The sad consequences to bird populations resulting from the introduction of nonindigenous animals to the small islands of the Pacific are too well known to warrant discussion here (see Mayr, 1945; Nelson, 1921).

The small size of the atoll, however, indicated that a pig extirpation plan would be feasible if pursued steadily during my stay on the island. I had come prepared for such a program and began killing pigs on the second day after arrival. A study was made of the favorite hiding and foraging areas of the pigs, a bit of sound military tactics was employed, and the pig population began to decline. The daily kill ranged from one to five animals and continued until the final week of our stay on Clipperton. The score on this date stood at 57 pigs and it appeared that the last pig on Clipperton had been destroyed. The disturbing fear that I had overlooked a pregnant sow somewhere on the atoll, however, caused me to secure the promise of help from the four men who were to remain on the island for an additional month. During this subsequent period, the men kept a close watch for pigs and found only a solitary male, which was promptly killed.

With the removal of these 58 animals it is felt that the problem of feral pigs no longer poses a threat to the ground-nesting bird colonies of Clipperton. Sachet (1962*a*), however, takes a different view of the pig extirpation and postulates that the introduction and multiplication of pigs on Clipperton were responsible for bringing back a better equilibrium between the flora and fauna of the atoll. Her argument to support this postulate is that the pigs consumed large quantities of land crabs (*Gecarcinus planatus*), and that with the reduction of the numbers of plant-eating crabs, the young plant growth flourished and the vegetation again gained a foothold on the island. Regardless of the possible validity of this hypothesis, I feel strongly that feral pigs have no place in the ecology of this tiny atoll and that their removal will be of immeasurable aid in restoring Clipperton Island as an important nesting center for oceanic birds of the eastern Pacific.

## ORNITHOLOGICAL INVESTIGATIONS

The earliest ornithological observation recorded for Clipperton Island appears to have been made in 1825 by Morrell (1832) when he observed, "the whole island . . . literally covered with seabirds." Belcher (1843) made a similar comment as to the abundance of bird life during his visit to the island in 1839. Fifty-nine years later Snodgrass and Heller (1902), as members of the Hopkins Stanford Expedition, enroute to the Galápagos Islands, landed on Clipperton on November 23, 1898. Snodgrass and Heller spent two days on the island and came away with a collection of 21 specimens of sea birds, representing six species. The next ornithologist to visit Clipperton was Beck (1907) who spent a few hours ashore on November 19, 1901, while enroute to the Galápagos as a member of the Webster-Harris Expedition. Beck added nine new sight records of birds for the island, as well as collecting a single specimen of what he thought to be *Sula variegata*. On August 10, 1905, Beck again stopped off at Clipperton for one day (Gifford, 1913) while enroute to the Galápagos, this time as chief of the California Academy of Sciences Expedition. A number of specimens of terns and boobies were collected, but no additional species were recorded for the island. Following Beck's visit in the year 1905, the island received no further ornithological attention for a period of 33 years. During the Presidential Cruise of 1938, a shore party from the "U.S.S. Houston" landed on Clipperton for one day's collecting on July 21, 1938. A collection of 34 specimens of boobies and terns was made on this date and subsequently deposited in the United States National Museum (Wetmore, 1939). No further ornithological attention was paid to the atoll for a period of 28 years. Between October 21 and 26, 1956, a field party from the Scripps Institution of Oceanography landed on Clipperton for the purpose of making a collection of shore fishes of the atoll. Mr. Wayne Baldwin, a member of the field party, collected three small passerine birds and preserved them in formalin. These were subsequently reported on by Howell (1959).

The next and latest observations on the birds of Clipperton resulted from the field work accomplished during our visit to the island in 1958.

## SPECIES ACCOUNTS

*Phaethon rubricauda melanorhynchos*. Red-tailed Tropic Bird. A careful watch was kept for the presence of tropic birds on Clipperton, but it was not until August 19, 1958, that the species was noted. On this date, Mr. David Peterson, an entomologist in the field party, observed a large white bird alighting on the atoll and disappearing into a mat of *Ipomoea* covering a ledge of coral limestone. Peterson marked the spot and immediately notified me of his find. Upon parting the overhanging plants, an adult Red-tailed Tropic Bird was found sitting quietly in the center of a cleared spot under the limestone shelf. The bird was easily captured by hand and proved to be an adult male with testes 18 mm. in length. The specimen is in the Los Angeles County Museum (LACM 36098). A thorough search was made of all similar roosting spots on the atoll subsequent to the discovery of this single bird, but no further individuals were found. A careful search was made of the wrecked naval vessel (fig. 1), but it was found to harbor only large numbers of nesting White-bellied Boobies (*Sula leucogaster*).

There are several records of *Phaethon rubricauda* for the eastern Pacific. Most of these, however, are sight records of birds observed at sea (Gifford, 1913). A specimen secured by Anthony (1898) north of Guadalupe Island and now no. 21822 in the Carnegie Museum, was identified by Oberholser (1919) as *Phaethon rubricauda rothschildi*. *Phaethon rubricauda* has never been recorded from the Galápagos and the individuals recorded from the eastern Pacific are apparently wanderers from islands to the southwest, such as the Society, Marquesas, Tuamotus and other island groups of Polynesia. Vagrants of this species farther north in the eastern Pacific quite possibly come from the Hawaiian area.

An examination of a series of skins of *Phaethon rubricauda* from the Marquesas, Tuamotus, Tonga, and Henderson Island, on loan from the American Museum of Natural History, indicates

that the birds of this region average larger in size than a comparable series of skins of *Phaethon rubricauda rothschildi* from Laysan Island in the collection of the Los Angeles County Museum. A summary of these measurements is as follows: 7 *Phaethon r. rothschildi* from Laysan Island, wing, 313 mm. (307-322); culmen, 60.8 mm. (58.4-63.4). 7 *Phaethon rubricauda* from Marquesas, Tuamotus, Tonga, and other islands, wing, 330 mm. (320-344); culmen, 65.9 mm. (62.0-69.6). In addition to averaging longer, the bills of birds from the south Pacific area are more robust than those of birds from Laysan and the depth of the bill measured in a vertical line through the external nares is noticeably greater than in *rothschildi*. The old 1789 Gmelin name of *melanorhynchos* is available for the birds of the south Pacific area and the specimens from the above localities should be referred to that subspecies rather than to *P. r. rothschildi*.

The specimen from Clipperton Island agrees in size (wing, 321 mm.; culmen, 67 mm.) with the birds of the south Pacific area and can therefore be assigned to the race *melanorhynchos*.

*Sula dactylatra granti*. Blue-faced Booby. Small numbers of Blue-faced Boobies were present on Clipperton in 1958. Scattered pairs of birds were observed standing at nesting sites on the broad land strip at the northwestern corner of the atoll (fig. 1). None of the sites contained eggs or young except one nest observed by Sachet (1962a) that held a single egg. The area of greatest abundance was the "egg islands" (fig. 1), a group of almost submerged coralline rocks in the northwest corner of the lagoon. Numerous Blue-faced Boobies were observed daily perched atop these scattered rocks but showed no indication of breeding. Beck (1907) reported thousands of Blue-faced Boobies on the atoll, but the August, 1958, population numbered no more than 150 individuals of this species.

Subspecific determination in *Sula dactylatra* in the eastern Pacific is based solely upon the color of soft parts. Rothschild (1902) described *Sula granti* from the Galápagos as possessing a red bill and bluish green feet. Later, Rothschild (1915) described *Sula dactylatra californica* from the Revilla Gigedo Islands, stating that it differed from *granti* by having the bill yellow and the feet and legs orange. Rothschild (1915) also recognized both insular populations as races of the polytypic species *Sula dactylatra*.

Subspecific determination based solely upon the color of soft parts presents a perplexing problem in the identification of the Blue-faced Boobies of Clipperton. Observations of Blue-faced Boobies on Clipperton showed that the birds had yellow bills, with a slight red tinge to the lower mandible, and bluish green feet. There is no appreciable difference in size between birds from the Galápagos, Clipperton, or the Revilla Gigedo. It is entirely possible that the colors of the soft parts of the birds of these three areas vary seasonally. Until we have a better understanding of the stability, or lack thereof, of the color of the soft parts in this species, I feel that the birds of Clipperton should be assigned to the race *granti*, which is the older name.

Beck (1907), during his short visit to Clipperton, recorded the occurrence of three individuals of the Peruvian Booby (*Sula variegata*) and stated that he had succeeded in collecting one specimen. A continuous search during our visit to the island in 1958, however, failed to reveal any trace of this species. A search of the Rothschild material in the American Museum of Natural History taken by Beck on Clipperton Island on November 19, 1901, the date that Beck gave for the collection of the specimen of *variegata*, fails to reveal a specimen of this species. Rothschild (1902) in his study of *Sula dactylatra* points out that previous workers have tended to confuse the young plumage of *Sula dactylatra* with that of *Sula variegata* and that specimens from the Galápagos Islands that were formerly considered to be *Sula variegata* are actually young birds of *Sula dactylatra*. *Sula variegata* is apparently restricted to the coastal waters of Perú and Chile (Peters, 1931). Beck's specimen of *Sula variegata* from Clipperton can apparently be accounted for in the same manner, as Beck (1907:110) himself mentioned that, "amongst the thousands of Blue-faced Boobies, two of this species [*variegata*] were seen and one of them, a female, shot. The other seemed to be paired with a Blue-faced Booby."

*Sula sula websteri*. Red-footed Booby. On August 9, 1958, a solitary Red-footed Booby was observed sitting atop a coco palm at the east side of Clipperton Rock. No other individuals were noted on this date. The presence of this bird on Clipperton constitutes the first record of the species for the island. Earlier workers on the island failed to record the presence of *Sula sula* and this may be entirely due to the lack of vegetation at the earlier dates, as *Sula sula* is known to require trees or at least low bushes for nesting sites. The lone Red-footed Booby was again observed in the same small grove of coco palms on August 13. On August 14, two Red-footed Boobies were observed sit-

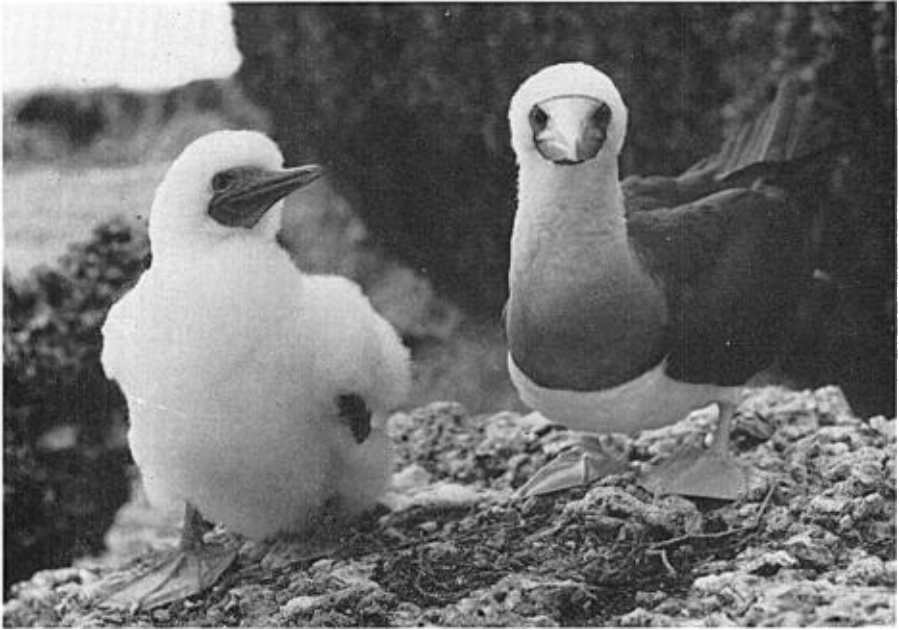


Fig. 2. Male White-bellied Booby (*Sula leucogaster*) with downy young.

ting on the fronds of a coco palm in the main grove on the west side of the island. On August 25, prior to leaving the island, the solitary bird in the coco palm at Clipperton Rock was collected. The specimen (LACM 35315) is an adult male in white plumage and agrees in size with the specimens from the Galápagos and Revilla Gigedo islands.

*Sula leucogaster nesiotae*. White-bellied Booby. The White-bellied Booby was the most abundant species of booby on Clipperton during our stay and was the only species I observed nesting in that period. The Clipperton population of *Sula leucogaster* did not appear to exceed 500 individuals.

Nests made of dry *Ipomoea* runners, grass and an occasional green branch of *Heliotropium* (Sachet, 1962b) contained either eggs or young of all ages. The largest nesting concentrations were on the rusting hulk of the naval vessel and atop Clipperton Rock. Numerous nests were found along the margin of the lagoon wherever ledges of the phosphatic rock occurred and pieces of the rock had broken away to form small pinnacles in the lagoon. The nests were placed on these water-surrounded rock fragments, apparently to escape predation by the foraging feral pigs. A few nests were found on the coral sand of the atoll wherever a rusting piece of the wrecked naval vessel or other bit of military equipment afforded a barrier from the prowling pigs.

A comparison of specimens of *Sula leucogaster* from Clipperton Island with a series of skins from the coastal waters of México show that the race *nesiotae* described by Snodgrass and Heller (1902) is apparently valid. Clipperton birds average considerably larger and the males are much lighter in coloration on the head, neck, and chest than are the birds from along the Mexican coast. I have not had the opportunity to examine specimens of *Sula leucogaster* from Cocos Island or the Revilla Gigedo Islands, but examination of birds from the Tres Marias Islands shows them to belong to the smaller and darker headed race *brewsteri*, rather than to *nesiotae*. Comparative measurements are as follows:

*Sula leucogaster nesiotae*.—4 ♂♂ wing, 389 mm. (386–398); tail, 196 mm. (195–196); culmen, 95.9 mm. (93.5–97.4). 2 ♀♀ wing, 413 mm. (410–415); tail, 200 mm. (193–206); culmen, 104 mm. (97.9–110.2).

*Sula leucogaster brewsteri*.—4 ♂♂ wing, 372 mm. (365–378); tail, 176 mm. (172–183); culmen, 89 mm. (84–91.4). 2 ♀♀ wing, 397 mm. (390–403); tail, 182.5 mm. (182–183); culmen, 94.6 mm. (92.6–96.5).

*Fregata minor ridgwayi*.—Lesser Man-o-War Bird. Lesser Man-o-War Birds were common on Clipperton during the period of our stay but none showed any indication of breeding activity. A large roosting colony, numbering approximately 250 birds, occupied a flat area on the eastern side of the atoll (fig. 1). The colony, consisting of males, females, and immature birds, rested upon algal-blackened chunks of coral or upon the open sand. Numerous birds were present in the air above the resting colony, as individuals were continually arriving or departing from the area. A few *Fregata* roosted in the palm trees on the east side of Clipperton Rock and atop the rock itself. The coco palms of the main grove on the west side of the atoll also held numbers of roosting birds, but again no evidence of nesting was detected. The main roosting colony could frequently be seen rising in a large cloud whenever a feral pig foraged into the roosting area.

Snodgrass and Heller (1902) recorded frigate birds as occurring on Clipperton but secured no specimens. They did, however, identify them as belonging to the species *Fregata aquila* (= *Fregata minor*). Gifford (1913) did not report frigate birds from the island, but noted two or three hundred birds soaring over the island in the forenoon. At noon, however, he reported that they all headed out to sea in an easterly direction. The first specimens of record for the island appear to be the four specimens taken by me on August 25, 1958. The series consists of two adult males, one adult female, and one immature female, all four readily identifiable as *Fregata minor*.

There has been considerable confusion as to the subspecific determination of *Fregata minor* in the eastern Pacific. Mathews (1914) described the race *ridgwayi* from Culpepper and Wenman islands of the Galápagos Archipelago and Oberholser (1917) assigned the birds of the eastern Pacific to the race *palmerstoni*, basing his action upon Mathews' (1914) remarks pertaining to the distribution of *F. m. palmerstoni* in the central Pacific, but apparently he overlooked Mathews' description of *F. m. ridgwayi* in the same paper. Several authors have followed Oberholser and have assigned frigate birds from the Revilla Gigedo Islands to the race *F. m. palmerstoni*.

A careful examination of specimen material in the Los Angeles County Museum, however, clearly shows that the birds of the Revilla Gigedos belong to the Galápagos race, *ridgwayi*. Specimens of *F. m. palmerstoni* from Laysan Island have dorsal feathers of rich metallic violet; whereas specimens from Clarion Island in the Revilla Gigedos have dorsal feathers of a metallic oil green, identical in color with specimens of *F. m. ridgwayi* from Tower Island in the northern Galápagos. An examination of the series of four specimens taken on Clipperton Island, August 25, 1958, shows them to be definitely assignable to the green-backed subspecies, *F. m. ridgwayi* of the Galápagos.

*Ixobrychus exilis hesperis*. Least Bittern. On August 13, 1958, a Least Bittern was observed standing on the shore of the lagoon at the edge of Clipperton Rock. The bird was in a resting position, but was not concealed in vegetation, although cover was available nearby. The specimen (LACM 35318), a female, agrees in size and color with a series of *Ixobrychus exilis hesperis* in the Los Angeles County Museum. The species has not been previously recorded from Clipperton. Measurements: wing, 122 mm.; tail, 48 mm.; culmen, 44.7 mm.; tarsus, 40.0 mm.

*Pandion haliaetus*. Osprey. A single Osprey was observed at close range on August 12, 1958, as it soared low over the northwest portion of the atoll. The bird was noted in the same area on all subsequent visits to that part of the atoll and was usually seen being pursued by small numbers of *Anous stolidus* and on one occasion by a frigate bird. The bird was occasionally seen perched atop coco palms. The Osprey has not previously been recorded from Clipperton. No attempt was made to collect this individual and no additional birds were observed.

*Fulica americana americana*. American Coot. Beck (1907) reported the presence of two coots on the lagoon, but did not secure a specimen. In 1958, coots were present and breeding in large numbers. Numerous nests with eggs were noted at different areas around the shore of the lagoon, but the greatest concentration appeared to be in the southwest quadrant. All nests noted were placed either on pieces of coralline limestone that had broken away from the beach ledges and were therefore surrounded by water, or were placed on pieces of rusting military equipment that jutted out into the lagoon and were overgrown with the vines of *Ipomoea*. Clutch sizes appeared to be small, as no nest of heavily incubated eggs was found to contain more than four eggs. Adult birds with newly hatched young were observed swimming on the lagoon and full-fledged young were common.

The coot population on Clipperton appeared to be suffering from some type of disease or malnutrition during our stay on the island, as sick birds were frequently encountered around the periphery of the lagoon. Some of the sick birds were blind in one or both eyes; others had greatly enlarged



Fig. 3. Nest of American Coot on coral rock fragment.

ankle joints and some were suffering from a combination of both types of ailments. Three males (LACM 35330-32) agree in size with a large series of *Fulica a. americana* from California.

*Pluvialis dominica fulva*. Golden Plover. On August 22, 1958, the botanist, Miss Sachet, captured a Golden Plover by hand as it ran along the beach on the southwest portion of the atoll. The specimen, a male (LACM 35324), was crippled due to the complete loss of the right wing. No trace of the humerus was present and the injury was completely healed. The bird appeared to be in good health except for its flightless condition. How the loss of the wing occurred can only be left to speculation. In size and color the specimen agrees with examples of *Pluvialis d. fulva*. The species has not been previously recorded from Clipperton.

*Actitis macularia*. Spotted Sandpiper. A single Spotted Sandpiper was observed and collected on August 25, 1958, as it foraged along the lagoon edge at the north end of the atoll. The specimen, a male (LACM 35321), is in nonbreeding plumage. *Actitis macularia* has not previously been recorded from Clipperton Island.

*Heteroscelus incanus*. Wandering Tattler. Wandering Tattlers were found to be common on Clipperton during our stay. Single birds to flocks of as many as 25 individuals were encountered daily in all areas around the atoll. A male (LACM 35319) was collected on August 8, 1958.

*Arenaria interpres interpres*. Ruddy Turnstone. A flock of seven Ruddy Turnstones was flushed from the border of a fresh-water pool on the southeast portion of the atoll on August 9, 1958. Two specimens, a male and female (LACM 35322, 35323) were collected from the flock. The remaining five birds of the flock were observed on numerous subsequent dates at different areas around the atoll, often in the company of *Heteroscelus incanus*. The Ruddy Turnstone has not been previously recorded from Clipperton Island.

*Steganopus tricolor*. Wilson Phalarope. A single female (LACM 35320) in nonbreeding plumage was collected on August 16, 1958, from the margin of the lagoon on the east side of the atoll. The species has not been previously recorded from Clipperton Island and it is unusual to find this phalarope so far from the mainland. The only other record of the occurrence of this species on far off-shore oceanic islands, of which I am aware, is the record of the three specimens reported by Gifford (1913:57) from the Galápagos Islands.



*Chlidonias nigra surinamensis*. Black Tern. The Black Tern is a bird of inland fresh water marsh regions and apparently approaches the sea only during its migration to and from its wintering grounds in South America. It is known to fly over the Gulf of México (Bent, 1921) and there is one record of its occurrence in Bermuda (Bent, 1921). Its movements, however, are generally close to the coastline and it seldom ventures far out to sea.

It is of considerable interest to record the presence of this species from remote Clipperton Island on August 9, 1958. On this date I fired at a flock of Ruddy Turnstones that had alighted on the margin of a small pond at the edge of the lagoon. Upon retrieving the turnstone specimens I found that I had also secured a specimen of the Black Tern. The specimen is a male (LACM 35275) in fresh post-nuptial plumage. According to Bent (1921), *Chlidonias nigra* molts into the striking winter plumage in July, August, and September. No other terns of this species were noted during the subsequent days of our stay on the atoll. The Black Tern has not been previously recorded from Clipperton Island.

*Sterna fuscata crissalis*. Sooty Tern. An initial reconnaissance of the atoll on August 8, 1958, revealed two large colonies of *Sterna fuscata* at the extreme northern tip of the island (fig. 1). Each colony held approximately 1000 birds but no eggs were present. By August 12, 1958, the two colonies had consolidated and moved to the old phosphate deposit area (fig. 1) and laying had commenced. A scattering of Sooty Terns was observed roosting on the remnants of the "egg islands" in the northwest corner of the lagoon. At this location they were mixed in a heterogeneous grouping of *Anous stolidus* and *Sula dactylatra*. On August 13, 1958, accompanied by the late Conrad Limbaugh, I visited the new nesting colony for the purpose of collecting some fresh tern eggs for camp use. We obtained a number of eggs with what appeared to be a minimum disturbance to the colony, but the nesting site was abandoned on August 14, 1958, in favor of a new and final nesting area on the land strip to the north of the two previously mentioned areas (fig. 1). Nesting continued at this latter site throughout the remainder of our stay on the atoll. The eggs were deposited singly among the rough algal-blackened coral, often with no trace of additional nest material. Occasionally, however, bits of dry twigs of *Ipomoea* or *Heliotropium* were fashioned into a rough nest to support the egg. The



Fig. 4. Common Noddy Terns (*Anous stolidus*) with nest among white coral fragments.

nesting birds were frequently observed to rise into the air in large numbers and observation repeatedly revealed a foraging pig to be the intruder. On August 25, 1958, a series of six specimens (4 ♂♂, 2 ♀♀) were collected from the colony.

*Anous stolidus ridgwayi*. Common Noddy Tern. The Common Noddy was found to be the most abundant and widely distributed avian species on the atoll during our stay in August, 1958. Nesting activity ranged from paired birds at empty nest sites to birds with downy young. Nesting birds were noted at numerous locations around the atoll where they utilized a large variety of nest sites. Some nested in the beds of *Ipomoea*, some upon the exposed white coral gravel and rock, while others sought more elevated sites. In this latter group, some had nests among the fronds of the coco palms, others nested on Clipperton Rock and the remainder placed their nests upon every available piece of rusting military equipment, such as landing craft, amphibious tractors, fork lifts, and quonset huts.

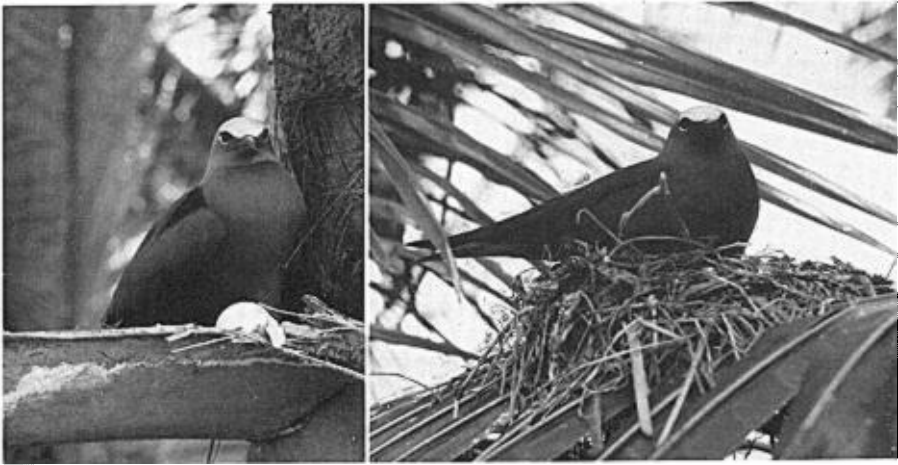


Fig. 5. Left, Common Noddy Tern (*Anous stolidus*) with nest on limb of coco palm; right, Black Noddy Tern (*Anous tenuirostris*) with nest on palm frond.

The nests placed on dark objects, such as rusty war material or algal-blackened coral, consisted simply of bits of white coral and shell. Whenever nests were placed on the brilliant white coral rock, bits of contrasting dark twigs of *Ipomoea* and *Heliotropium* were used. The use of contrasting colored material made the nests readily visible and it may well be that this is important to the nesting bird in nest site recognition. When nests were placed among the green leaves of the *Ipomoea*, both light and dark materials were used.

In coloration, the Clipperton noddy is intermediate between *A. s. galapagensis* of the Galápagos and *A. s. ridgwayi* to the north. The crowns of Clipperton birds are a darker ashy-white than the crowns of birds from along the Mexican coast (Isabel Island) but lighter than those of the Galápagos. In overall coloration the Clipperton birds most closely resemble the noddys from along the Mexican coast (Isabel Island), as *Anous s. galapagensis* is a much darker race. There is no appreciable difference in size between specimens from Isabel Island, Clipperton, or the Galápagos, except for bill depth, which is slightly greater in the Clipperton specimens. Measurements of 10 specimens from Clipperton are as follows: wing, 273 mm. (263–281); tail, 158 mm. (150–163); culmen, 41 mm. (38–43); depth of bill at base, 10 mm. (9.2–11).

*Anous tenuirostris diamesus*. Black Noddy Tern. Although not as numerous as *Anous stolidus*, the Black Noddy is nevertheless an abundant species on Clipperton Island. In 1958, the population of Black Noddys was concentrated primarily at Clipperton Rock, a terrain feature that afforded the greatest number of nesting sites. The coco palms at Clipperton Rock and the large coco palm grove also had numerous nests of this species. On Clipperton Rock, the Black Noddy utilized spaces too small for the nesting boobies, especially the projections on the vertical rock face. The nest sites among the coco palms were along the dorsal side of the rib of the palm frond, sometimes well out on the frond, but most frequently near the proximal end, which offered more support.



Fig. 6. Nesting colony of the Black Noddy Tern on Clipperton Rock.

The nest of *Anous tenuirostris* is a more substantial structure than that of *Anous stolidus*. On Clipperton many of the nests were constructed of twigs of *Heliotropium*, heavily cemented with deposits of guano. Many of the nests on Clipperton Rock appeared to have been reused for many nestings, as indicated by their size and encrustation with guano.

During our stay on the island it was found that nesting activity ranged from fresh eggs to fully-fledged young. A series of six adults (4 ♀♀, 2 ♂♂) and three fully-fledged young were secured (LACM 35276-35284).

*Gygis alba pacifica*. Fairy Tern. Although not present in large numbers, as are the other species of terns on Clipperton, the Fairy Tern is nevertheless a well established and breeding species on the atoll. In August, 1958, the Fairy Tern population of Clipperton totaled approximately 25 pairs. These attractive birds were widely distributed around the island, but the largest segment of the population was in and near the large coco palm grove.

Many of the terns were paired and had either eggs or downy young. The young ranged in size from newly hatched to large young. None of the young, however, were fully-fledged. Nest sites included limbs and stumps of the coco palms, the abandoned quonset huts, and large chunks of coral rock. Several nests were inside the rusting quonset huts, with eggs being deposited on shelves, or atop lockers and partitions.

Most authors agree that the Fairy Tern lays but one egg. It was therefore of interest to note that three of the nests examined contained two eggs each (see fig. 7). In no instance, however, were brooding birds found with more than one young. It is quite possible that the two-egg condition is the result of the nesting bird incubating an addled egg along with a fresh one. Proof of this was obtained when a tern incubating two eggs on a narrow ledge within one of the quonset huts, accidentally dislodged one of the eggs as it rose from the nest. The broken egg proved to be addled. Wilson (1904) reports a Fairy Tern incubating a single addled egg on the island of South Trinidad.

The four specimens (LACM 35291-35294) taken on Clipperton consist of 3 males and 1 female and are in worn plumage. A number of authors have pointed out the need for a comprehensive study of this species (Peters, 1934), but such a study is yet to be made. Baker (1951) has considerable to say regarding the taxonomic status of this species and I follow him in assigning the Clipperton birds to the race *pacifica* rather than *G. a. candida* of earlier authors. The measurements of the four speci-



Fig. 7. Fairy Tern (*Gygis alba*) at nest containing two eggs.

mens from Clipperton are as follows: wing, 236 mm. (230–240); tail, 117 mm. (114–118); exposed culmen, 38.9 mm. (37–41.2); depth of culmen, 9.9 mm. (9.1–10.3) and tarsus, 12.4 mm. (11.8–13.3).

*Coccyzus melacoryphus*. Azara Cuckoo. On August 13, 1958, a cuckoo was collected from high up among the foliage of a coco palm at Clipperton Rock. Upon retrieving the specimen it was of interest to find that it was *Coccyzus melacoryphus* rather than *Coccyzus minor ferrugineus* of Cocos Island to the southeast. *Coccyzus melacoryphus* is a widespread species in South America and also occurs on many of the islands of the Galápagos archipelago. The specimen (LACM 35317) is an adult female in unworn plumage and agrees well in size and color with a large series of skins in the Los Angeles County Museum from various South American localities. The species has not been previously recorded from Clipperton Island. Subsequent search of the island failed to disclose additional individuals of this genus.

*Progne subis* ssp. Purple Martin. The presence of Purple Martins on Clipperton Island in 1958 was first noted on August 10, when two individuals were observed sitting on the antennae of our radio. One of the birds was collected on this date and proved to be an immature male. On August 11, a total of four martins was observed sitting on the radio antennae and one of these was also collected. The second bird also proved to be a male in immature plumage. During the subsequent days of our stay upon the atoll the number of martins observed on the antennae varied from one to six individuals. The birds could generally be found in the vicinity of the radio antennae, as no other part of the island afforded the luxury of this type of perch. In this area they were frequently observed feeding on the wing. Observation of the perching birds with binoculars indicated that all of them were either adult females or males in juvenal plumage.

No attempt is made to assign the two specimens to a race, due to the immature plumage of both birds. The two males (LACM 35325, 35326) are relatively small, with measurements as follows: wing, 136, 140 mm.; tail, 58, 59 mm.; exposed culmen, 10.6, 11.2 mm.

*Dendroica petechia* ssp. Yellow Warbler. A female Yellow Warbler (LACM 36915) was collected from among the fronds of the coco palms at our campsite on August 16, 1958. No other individuals of this species were observed during our stay on the island, nor has the Yellow Warbler been pre-

viously recorded from Clipperton. No attempt has been made to assign this solitary specimen to any of the several currently recognized subspecies of *Dendroica petechia*.

*Dendroica dominica albilora*. Yellow-throated Warbler. On August 22, 1958, an adult male Yellow-throated Warbler (LACM 36099) was observed and collected from the small group of coco palms at the east side of Clipperton Rock. The specimen is easily assigned to the race *albilora* on the basis of its broad, white, superciliary stripe. *Dendroica dominica* has not been previously recorded from Clipperton Island.

*Setophaga ruticilla*. American Redstart. Several individuals of this species were observed at frequent intervals and at different locations around the atoll during August, 1958. All redstarts observed, or collected, were either females or immature males. They frequented the coco palm groves and foraged in the low bushes and thickets among the palms, rather than higher up among the palm fronds. An immature male (LACM 35329) was collected on August 14, 1958; another on August 23, 1958 (LACM 35327); and a female (LACM 35328) was taken on August 25, 1958. The species has not been previously recorded from Clipperton. Gifford (1919) records the collection of a female *Setophaga ruticilla* that came aboard ship, August 2, 1905, to the north of Clipperton, latitude 12° 2' N, longitude 109° 11' W.

The finding of these three species of wood warblers as migratory waifs on Clipperton Island brings the recorded number to five, as Howell (1959) has previously reported the occurrence of *Vermivora peregrina* and *Dendroica castanea* on the island.

#### CHECK-LIST OF THE BIRDS OF CLIPPERTON ISLAND

A careful tabulation of all species recorded by previous ornithologists, and from information resulting from my own work on the atoll in 1958, is given here as an aid to those workers who may visit this remote island in the future. Species listed as accidental are records of but one individual specimen. Species for which a number of individuals have been reported are listed as casuals. The various persons who have reported on the birds of Clipperton are listed by number as follows: 1, Snodgrass and Heller (1902); 2, Beck (1907); 3, Gifford (1913); 4, Wetmore (1939); 5, Howell (1959); 6, Stager (present paper). The asterisk indicates a sight record only, with no specimen collected.

<i>Phaethon rubricauda melanorhynchus</i>	Accidental	6
<i>Sula dactylatra granti</i>	Breeding	1, 2, 6
<i>Sula sula websteri</i>	Casual	6
<i>Sula leucogaster nesiotis</i>	Breeding	1, 3, 4, 6
<i>Fregata minor ridgwayi</i>	Breeding	1*, 3*, 6
<i>Ixobrychus exilis hesperis</i>	Accidental	6
<i>Plegadis</i> sp.	Accidental	2*
<i>Anas acuta</i>	Casual	2*
<i>Anas discors</i>	Casual	2*
<i>Mareca americana</i>	Casual	2*
<i>Spatula clypeata</i>	Casual	2*, 3
<i>Aythya valisineria</i>	Accidental	2*
<i>Pandion haliaetus</i>	Accidental	6*
<i>Fulica americana</i>	Breeding	2*, 6
<i>Squatarola squatarola</i>	Accidental	2*
<i>Pluvialis dominica fulva</i>	Accidental	6
<i>Numenius phaeopus</i>	Accidental	2*
<i>Actitis macularia</i>	Accidental	6
<i>Heteroscelus incanus</i>	Casual	3*, 6
<i>Arenaria interpres interpres</i>	Casual	6
<i>Steganopus tricolor</i>	Accidental	6
<i>Chlidonias nigra surinamensis</i>	Accidental	6
<i>Sterna fuscata crissalis</i>	Breeding	1, 3, 4, 6

<i>Anous stolidus ridgwayi</i>	Breeding	1, 3, 4, 6
<i>Anous tenuirostris diamesus</i>	Breeding	1, 3, 4, 6
<i>Gygis alba pacifica</i>	Breeding	1, 3, 4, 6
<i>Coccyzus melacoryphus</i>	Accidental	6
<i>Progne subis</i>	Casual	6
<i>Vermivora peregrina</i>	Accidental	5
<i>Dendroica petechia</i>	Accidental	6
<i>Dendroica dominica albiflora</i>	Accidental	6
<i>Dendroica castanea</i>	Accidental	5
<i>Setophaga ruticilla</i>	Casual	6
<i>Piranga rubra</i>	Accidental	5

#### ANALYSIS OF THE AVIFAUNA

Of the 34 species of birds recorded from Clipperton, 8 (24 per cent) can be considered resident and breeding. Seven of the resident species are oceanic forms such as boobies, frigates, and terns. These oceanic species have apparently utilized the atoll as a breeding ground for a long period of time. The eighth resident species, *Fulica americana*, appears to have established itself within the past 60 years, as Beck (1907) reported seeing but two birds in 1901.

Of the 9 (26 per cent) species classed as casual, all are migratory forms with the exception of *Sula sula*. The Red-footed Booby represents a potential breeding species, as the vegetation on the island now appears to provide the requisite nesting sites.

The accidental or vagrant population totals 17 species (50 per cent) and consists primarily of migratory waifs from the American mainland, presumably blown off course by meteorological disturbances.

One species, *Phaëthon rubricauda*, although listed as an accidental, probably represents a potential breeding oceanic species and its presence on the atoll should be watched for by subsequent observers.

#### SUMMARY

An intensive survey of the avifauna of Clipperton Island in August, 1958, revealed the presence of 23 species, 14 of which had not previously been reported from the atoll. The resident sea bird populations were found to be greatly reduced in numbers, as compared to the numbers reported by earlier visitors to the island. A heavy concentration of feral pigs on the atoll was suspected as being a prime deterrent to the ground nesting sea birds. The entire feral pig population was destroyed in August, 1958, as an aid to restoring Clipperton Island as an important breeding ground for oceanic birds in the eastern Pacific.

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