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Notes on the geography and natural history of Wake Island

by

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E. H. Bryan, Jr.<sup>1/</sup>

Wake is a V-shaped atoll in the northwestern Pacific, north of the Marshall Islands, between Midway and Guam. Its direction and distance are:

|                  | Direction | Nautical Miles | Statute Miles |
|------------------|-----------|----------------|---------------|
| Wake to Midway   | N. 60°E.  | 1029           | 1185          |
| Wake to Honolulu | N. 85°E.  | 2004           | 2308          |
| Wake to Guam     | N. 75°W.  | 1309           | 1508          |
| Wake to Tokyo    | N. 55°W.  | 1723           | 1985          |

Wake Atoll consists of three islets, Wake islet, the largest, on the southeast, has the shape of a V, the arms of which are about two and three quarters land miles long. Each arm is continued, beyond a narrow lagoon entrance, as a separate islet, Peale islet on the north and Wilkes islet on the south. The western ends of these two islets are connected by a sweep of flat reef, which continues as a narrow border along the ocean side of all three islets. In 1923, the enclosed rectangular lagoon had depths up to fifteen feet. The following is a summary of the land and salt water areas of the atoll:

|  | Area: Square land miles | Acres    |
|--|-------------------------|----------|
| Wilkes (named for Charles Wilkes, USN) | 0.31                    | 197.44   |
| Wake (named for William Wake)          | 2.14                    | 1,367.04 |
| Peale (named for Titian Peale, artist) | 0.40                    | 256.83   |
| Total land area                        | 2.85                    | 1,821.31 |

Area of enclosed lagoon (water and sand flat) 3.75 Square land miles

The names of the two smaller islands were given by Dr. Alexander Wetmore and other members of the U.S.S. Tanager Expedition on July 27, 1923. Lieutenant (later Commodore) Charles Wilkes was the leader of the United States Exploring Expedition, which visited and mapped the atoll, December 20, 1841; Titian Peale was the artist and one of the naturalists on this same expedition.

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This compilation from various notes in the author's geographic files was prepared in August 1957, so that the information could be made available to persons living on or visiting Wake. Portions are taken direct from the author's book, "American Polynesia and the Hawaiian Chain," Honolulu 1942, chapter 57, pages 208 to 214.

This atoll also has been known as Halcyon or Helsing, and some authorities think it may have been the same as San Francisco Island, discovered by the Spanish explorer, Mendana, October 4, 1568. The official discovery, however, is credited to Captain William Wake, in the British schooner Prince William Henry, in 1796. The island was seen in 1823 by Captain Gardner from the whale ship Bellona. He described it as being 20 to 25 miles long [quite an exaggeration], with a reef extending two miles from the east end, with detached rocks on the west [probably those on the curving reef]. He noted that it appeared well covered with trees. It was also seen by Captain James Hunnewell from the Mentor, December 20, 1824. Halcyon Island was said by Captain Kotzebue to have been an American discovery, located at about 19° 23' N., 165° 33' E. After unsuccessful search for it by Captain Sproule of the barque Maria, by Captain Brown in the Morning Star, and by the U.S. Exploring Expedition, the conclusion was reached that Halcyon was the same as Wake. Captain F. W. Beechey, R.N., in H.B.M. ship Blossom, tried to locate Wake Island in March 1827, without success.

The United States Exploring Expedition, under Charles Wilkes, visited and mapped Wake in December 1841. Wilkes' "Narrative" (V: 284-5, 1844) reads:-

"Wake's Island next claimed my attention. On the 19th we reached its parallel, and hove-to till daylight of the 20th, when we discovered it, bearing west-by-north, about nine miles distant. The wind was light from the north-northeast. After breakfast, several boats were sent to survey the island. Wake's Island is a low coral one, of triangular form, and eight feet above the surface. It has a large lagoon in the center, which was well filled with fish of a variety of species; among these were some fine mullet. There is no fresh water on the island, and neither pandanus nor cocoa-nut trees. It has upon it the shrubs which are usually found on the low islands of the Pacific, the most abundant of which was the Tournefortia. Mr. Peale found here the short-tailed albatross, and procured an egg from its nest. The birds were quite tame, although they were not so numerous as we had before met with on uninhabited islands.

"The time of low water took place at one o'clock, and the moon entered its last quarter on the same day: the tide was setting along the shore of the island with much strength to the westward; the rise and fall was three feet. From appearances, the island must be at times submerged, or the sea makes a complete breach over it; the appearance of the coral blocks and of all the vegetation leads to this conclusion, for they have a very decided inclination to the eastward, showing also that the violent winds or rush of the water, when the island is covered, are from the westward. The reef around this island is very small in extent.

"The position of Wake's Island was found by my observations of equal altitudes on shore to be in longitude 166° 31' 30" E., and latitude 19° 10' 54" N.

"By four o'clock, P.M., all the boats had returned on board, when we filled away and proceeded on our course to the westward. Although these coral islands resemble one another very strongly, yet they afforded us some recreation for a few hours, and much satisfaction in obtaining

series of observations in magnetism. Our visit to Wake's Island gave us an opportunity of adding to our collections in natural history.

"In the evening we steered to pass over the position of Halcyon Island, - longitude  $163^{\circ} 30'$  E., latitude  $19^{\circ} 13'$  N.; and on the 27th, we passed immediately over its locality, and had run on its supposed parallel fifty miles on each side of it, but nothing was seen of it. We now felt the current to the southeast  $12'$  in the twenty-four hours."

Following the careful mapping of the island by Wilkes in 1841, several vessels are recorded as having sighted Wake, including the barque Maria, under Captain Sproule, in 1858; as noted by Dr. William T. Brigham, Wake was seen also "from the masthead of the ship Oracle in 1865."

On March 4, 1866, the Bremen barque Libelle, under command of Captain Tobias, went ashore on the east reef. On board were several prominent passengers and a cargo valued at over \$300,000. Among the passengers were Madame Anna Bishop, Miss Phelan, M. Schultz and Charles Lascelles, of an English opera troupe, a Japanese traveller named Kisaboro, and Eugene M. Van Reed, whose account of the experience appears in the Friend /Honolulu for September, 1866. Following a hazardous night on the ship, during which waves broke over the vessel, passengers and crew were landed the following day with great difficulty through the breakers. After three weeks on the island, without finding source of food or water, it was decided to try to reach the Mariana Islands in open boats. On March 27 they set out, passengers in the 22-foot longboat, twenty-two persons under command of the First Mate, and the Captain and remainder of the crew in the gig, with what provisions and water they were able to salvage. After thirteen days of frequent squalls, short rations, and tropical sun, the longboat reached Guam. The Captain with eight persons, in the twenty foot gig, were not heard of again, although a schooner from Guam went in search. The passengers were strong in their praise of the courtesies received from Francisco Moscoso y Lara, Governor of the Marianas.

Several vessels went to Wake to salvage the cargo, which included several hundred flasks of quicksilver. The sloop Hokulele, with a party headed by T. R. Foster, left Honolulu May 9, 1867, reached Wake on May 31st, left there June 22, and returned to Honolulu July 29, with 247 flasks of quicksilver. A brig from China salvaged another 248 flasks at about the same time. Thomas Foster, Captain English, and eight Hawaiian divers landed at Wake from the Hawaiian schooner Moi Wahine in September 1867. Three days after their arrival their schooner, with Captain Zenas Bent in command, mate Wight, and a crew of five, was driven to sea by a gale and not heard of again. The salvage party was rescued by the English brig, Cleo, Captain Cargell, in March 1868, and returned to Honolulu on April 29, with 240 flasks of quicksilver, some copper, anchor and chain.

In 1883 the German warship Leipzig passed close to Wake and a careful determination of its position was made.

During the Spanish-American war, several vessels going to and returning from the Philippines stopped and raised the American flag. One of these visits, perhaps the earliest, was on July 4, 1898, by

General F. V. Green, commanding the second detachment of the Philippine expedition, from the S. S. China. Another, also in July 1898, was by General Merritt, from the U. S. Army Transport Thomas. This landing probably was made in the little cove near the eastern end of Wilkes islet, for on August 2, 1923, just inland from the landing place, the writer found a section of flagpole, about 18 or 20 feet long, on which was burned in block letters, "U.S.A.T. Thomas."

The formal annexation of the island by the United States took place on January 17, 1899, according to an account by Commander Edward D. Taussig in the U.S. Naval Institute Proceedings for June 1935. He commanded the U.S.S. Bennington which made the voyage from Honolulu to Wake for that purpose. The landing was made in the cove noted above, and at 3:22 P.M. the American flag was hoisted by Ensign Wettengell and a salute of 21 guns fired from the Bennington. The position of the flagstaff was determined, from observations on the ship, to be: 19° 17' 50" North, 166° 31' East. The account continues:

"After the salute was fired the flag was nailed to the masthead with batten, and a brass plate with the following inscription was screwed near the base of the flagstaff:

United States of America  
William McKinley, President;  
John D. Long, Secretary of the Navy,  
Commander Edward D. Taussig, U.S.N.,  
Commanding U.S.S. Bennington,  
this 17th day of January, 1899, took  
possession of the Atoll known as Wake  
Island for the United States of America."

During the next decade an occasional American ship stopped, but there is very little recorded history. During this time the island was visited by Japanese poachers, collecting the feathers of sea birds for millinery purposes. Two camps were established: one on the eastern end of Wilkes islet, where the Tanager Expedition in 1923 found a single wooden shack and a grave; and one across the lagoon near the eastern end of Peale islet, where there was a more extensive camp. This is described in the writer's field notes for July 31, 1923, as follows:

"The camp consists of the remains of two large frame buildings with galvanized iron roofs, about 18 feet wide, one 20 feet long, one 30 feet long; two smaller buildings; one tank, and one storehouse, raised on posts which are guarded with tin. Scattered about were a number of barrels, boxes, two large clay water jars, tin cans and metal kettles. Saw part of a Sydney newspaper, a pile of oakum, bamboo frame with lath trays. There was also a boat, a little larger than a skiff. Made a copy of a Japanese inscription inside the bunk house." Later this was translated to read something about leaving the island, with the date, November 13, 1908.

In 1912, the U.S.S. Supply stopped at Wake Island. A whaleboat landed some men who planted coconut palms brought there from Guam. No sign of these was seen in 1923.

The Tanager Expedition made an extensive biological survey of Wake from July 27 to August 5, 1923. Their camp was along the ocean beach opposite the landing place at the eastern end of Wilkes islet. A map of the atoll was made by James B. Mann and Professor Harold S. Palmer, to which the writer added determinations of latitude and longitude, made from a boulder near the camp. Meanwhile soundings were made around the island from the U.S.S. Tanager, under command of Lt. Cmdr. Samuel Wilder King, later Delegate to Congress and Governor of Hawaii. Although the vessel worked as near the reef as it dared, at only one spot was it possible to reach bottom with 100 fathoms of line; this was about 1500 feet off Heel Point, where a sounding of 85 fathoms was made.

A total of 19 species of flowering plants was found growing naturally on Wake. Much of the surface of all three islets was found covered by scrub forest, 12 to 20 feet high. Some of the forest was so dense that one could not walk through it with speed or comfort. Other places, such as the middle portion of the northeastern arm of Wake and the western ends of Wilkes and Peale, there were areas where the trees were low and scattered, with rocky surface and scrubby undergrowth, as if here the sea broke across the rim at time of storms.

The dominant tree on the islands was the Tournefortia or tree heliotrope, also known to scientists as Messerschmidia argentea, a species widespread on Pacific Islands. It grows to a height of about 20 feet, with an umbrella-shaped canopy of rosettes of large leaves, covered with silvery hairs. Even larger in size, but confined to the northwestern end of Wake islet was the "byka" tree (so-called by Gilbert islanders), Pisonia grandis, with massive trunks of very soft wood and sticky flowers and fruit. On Wilkes islet, and apparently spreading rapidly along the lagoon beach of Wake, to the east and north, were tall wiry bushes of Pemphis acidula. In the interior of Wake were small clumps of kou trees (so-called in Hawaii), Cordia subcordata, a hard wood tree, much prized in some regions for woodwork, but here scrubby and worthless. Growing over trees, rocks and bushes, and forming tangles on the ground, was a morning-glory vine, Ipomoea tuba, formerly called Ipomoea grandiflora. The plants observed in 1923 have been listed by Christophersen (1931).

The bird life on Wake consisted of about a dozen species of sea birds, half a dozen migratory species, and the flightless rail, Rallus wakensis, the only native land bird. The only mammal was the Polynesian rat, Rattus exulans. Of reptiles there were two kinds of geckos and two kinds of skinks, to be described later. A number of species of insects were collected and many kinds of marine life, both fishes and invertebrates.

To those of us who camped on Wake in 1923, as much a pest as the rats were the hermit crabs. One large, red-legged species, Dradanus punctulatus, got into our provisions, ran off with our soap, and combined the activities of pack rats with those of being the garbage department of the island.

In 1935 Wake Island was placed under jurisdiction of the United States Navy Department by Executive Order. That same year Pan American

Airways established a modern airport, using the south shore of Peale islet, just west of Flipper Point, as the site of pier, shops, water tanks, and a modern hotel.

Then the threat of war descended on Wake. On February 14, 1941, President Franklin D. Roosevelt signed an Executive Order making the island a national defense area.

The military importance of Wake Island led to great activity on the part of the United States to fortify the island during 1940 and 1941. The defense force was small and although gallant, not equipped to defend the island against overwhelmingly superior numbers.

It is not an object of this account of the natural history of Wake to expand upon the World War II's history of the island. That has been done by Major James P. S. Devereux, the commanding officer of the Marine forces (1947), by R. D. Heinl, Jr., in the official Marine account of the defense of Wake (1947), by Rodney Kaphart (1950), and D. C. Woodbury (1946). There is also a brief official Naval release in the Paradise of the Pacific for February 1942 [pages 10 to 12].

The air attack began on December 8, 1941 and continued for several days as wave after wave of Japanese planes bombed the little island. The end is told in a historical marker, set up following the war on the south shore of Wake islet:-

"In this area occurred the principal fighting which led to the island's surrender. About 1000 Japs were landed between 0120 and 0430, 23 Dec. 1941. They were opposed by 85 U.S. Marines who fought ferociously and valiantly until 0030 in the best traditions of their corps until ordered by their superiors to surrender to save American life because the situation was hopeless. Marine forces were composed of portions of the First Marine Defense Battalion under Major Devereux and Marine Fighting Squadron 211, under Major Putnam."

The Japanese renamed Wake "Otori" and held the island until the end of the war, surrendering to an American force September 7, 1945. The capture achieved very little for the Japanese. The island was bombed repeatedly by American forces and its isolation made it difficult to supply. The garrison, at times numbering more than 4,000 Japanese, suffered great privation from lack of food and water.

Mute evidence of the Japanese efforts to fortify Wake, and the American work of destruction is to be seen everywhere on the island. Pathetic little garden plots tell their own story of starvation. Wrecks of Japanese vessels dot the beaches.

One of the blackest and saddest paragraphs in the whole war story has to do with the fate of the 98 American civilians, who could not be evacuated by the Japanese. They were marched to the beach, and

there cruelly slaughtered by command of Admiral Sakaibara, who after the war was tried and hanged for this act.

Wake Island came into the limelight in October 1950, when it was the meeting place for President Truman and General Douglas MacArthur, in their discussion of the Korean situation.

Another event, which will long be remembered by the 550 persons who were on Wake, was typhoon Olive which hit the island in September 1952. It cost some \$1,600,000 to rebuild installations destroyed or damaged by this tropical storm.

At present (1957) Wake Island is in the charge of the Civil Aeronautics Administration, which maintains and controls the airport and runway.

Four short visits were made to Wake by F. R. Fosberg during which he made collections, principally of plants, and observations of the vegetation and on the general ecology of the atoll. These were, in order, on October 23, 1951, April 19-21, 1952, July 18, 1952 and October 22-23, 1953. His observations on birds and other vertebrate animals, with a section on pest control, have been incorporated into the present article. For his account of the vegetation and flora see the separate article by him immediately following this one.

Notes on rats and pest control on Wake Island, 1952.—Contributed by  
F. R. Fosberg

On a brief visit in October, 1951, rats were noticed in the Pan American Airways dining hall, but no particular attention was paid to them. They were at that time or somewhat earlier, said to be so numerous that they bothered the Pan American plane crewmen sleeping in the hotel.

In April, 1952, two days were spent on Wake, much of the time in the field with Fred Schultz, at that time in charge of pest control for the Civil Aeronautics Administration on the island.

During the previous year Mr. Schultz had waged an extremely successful campaign against rats on the island. He started by studying the habits of the rats rather carefully. He found that they lived largely in the clumps of bushes, especially those which were covered by tangles of the wild white morning glory, *Ipomoea tuba*. He found that they utilized the enlarged immature fruiting calyces of this species in lieu of a water supply. He said there were four kinds of rats on the island.

In the two days of actively looking for rats, along with other animals and plants, only one rat was seen, this a large blackish one.

Schultz had for many months carried out an active poisoning program, using Warfarin in rolled oats, placed in small quonset-hut-like shelters about a foot long, and renewed frequently. These Mr. Schultz strung in two series of lines across the center of the island from lagoon to outer shore a short distance apart. These were visited

every day, examined, the bait renewed, till the baits were not disturbed much any more. Then the series of lines were moved a little farther apart. This was continued until the entire atoll had been covered, and the rats greatly reduced. After this a few lines were maintained, scattered at intervals over the islands, and visited and the bait renewed once a week. As long as less than 10% of the baits were disturbed the rats were considered controlled.

Flies and mosquitoes were also the special objects of Mr. Schlutz' efforts. At the beginning of 1951 there were untold numbers of these insects on Wake Island. Garbage and other fly breeding material was eliminated. Garbage dumps were regularly burned and buried. Old tires, cans, and other breeding places for mosquitoes were systematically drained and punctured, and larger bodies of water, such as ponds, bomb craters, and cisterns were stocked with mosquito fish. Three species of mosquitoes had been known from the island, Culex quinquefasciatus, Aedes aegypti, and another Aedes, possibly A. scutellaris or A. albopunctata.

The success of these measures may be judged by the fact that in two and a half days spent in covering the island, mostly in company with Mr. Schultz, only one rat, no mosquitoes, and a very few flies were seen. In his weekly examinations of his poisoned baits at this time he commonly found less than 5% of them touched by rats.

#### LAND AND FRESHWATER VERTEBRATES

##### MAMMALS

In 1952 domestic dogs and cats were seen by F. R. Fosberg, but none were specifically noted in 1953.

Although Mr. Fred Schultz stated that prior to his activities, described above, there were four species of rats on Wake, a check by Dr. D. H. Johnson of the collections at the U. S. National Museum shows that only Rattus exulans Peale is represented by specimens from this island. He suggests that the others noted by Mr. Schultz were probably forms of Rattus rattus, the common house rat, though it is possible that Rattus norvegicus, the Norway rat, could have established itself there also. A series of skins and skulls collected to represent the rat populations living on the island would be very desirable to settle this question.

##### BIRDS

Now that the Wake Island rail is gone, only sea and migratory birds are found on Wake Island. Dr. Alexander Wetmore made a careful survey of the birds of Wake during July and August 1923, but no detailed report resulted. The rail was present at that time. In 1940, the writer prepared a list of the birds likely to be seen on Wake for Torrey Lyons, who was working on the island, but this was made from memory and notes, without an actual survey. In 1952, Dixon and

Starrett reported various birds seen at sea near Wake during 1945 and 1946. Writing in the *Elepsio* for January 1953, H. Paul Porter praised "the brave young birds of Wake Island," on their ability to ride out a typhoon which left some ten million dollars damage in its wake; but he mentioned only "terns."

The only detailed recent account of the birds which I have seen gives a rather discouraging picture of what the war left on the island. Dr. Alfred M. Bailey, "Notes on the birds of Midway and Wake Islands," 1951, says: that the main island is nearly devoid of bird life, other than a few sea and migratory species. Wake rails had not been seen since the island was reoccupied by Americans. He quotes from the diary of a Japanese officer regarding daily bombing by American planes.

"An order has just come out," states the diary, "forbidding us to catch gooney birds [albatrosses] lest they be wiped out." Dr. Bailey continues:

"The effort of this officer to protect the 'gooney birds' must have been largely in vain. Most of the birds were destroyed by the starving soldiers, although a great colony of sooty terns (Sterna fuscata) was guarded so that the eggs could be gathered regularly. The sooty tern colony on Peale Island ... was the largest I had ever seen. On May 15 [1949] I saw thousands of birds on their eggs. The downy young were beginning to hatch on that date.

"A few man-o'-war-birds (Fregata magnificens) were sitting about on the rusted iron skeletons of bombed naval buildings. Small groups of noddy terns (Anous stolidus) were nesting in the dwarfed trees known locally as bukas (Pisonia grandis). I saw two white-tailed tropic-birds. It was apparent that the bird population had suffered from the Japanese occupation, for aside from what I have just mentioned, there were no birds. We did not see any boobies (Sula), red-tailed tropic-birds, or albatrosses. A search for such burrow-nesting birds as petrels and shearwaters was out of the question, for my time was so short. I saw nothing of either."

Despite this discouraging statement, I venture to repeat my list of birds which might be expected to occur on Wake, with brief description of each:-

Family DIOMEDEIDAE, albatrosses

Diomedea immutabilis Rothschild, the Laysan Island albatross\*, and Diomedea nigripes Audubon, the black-footed albatross, might possibly stray as far as Wake from their regular area between the N. W. Hawaiian and Bonin Islands.

Family PROCELLARIIDAE, petrels and shearwaters

Puffinus pacificus chlororhynchus Lesson, the wedge-tailed shearwater, is the most likely member of this group; 17-19 inches long, it is a large shearwater, with long, wedge-shaped tail; upper parts sooty brown, crown neck and wings darker, forehead paler; under parts paler than upper, some bellies quite white.

\* One can be seen in front of hotel in post-war photo (Kaucher, 1947).

Pterodroma hypoleuca hypoleuca Salvin, stout-billed gadfly petrel or Bonin Island petrel; 12-14 inches long; upper parts grayish, deep slate on forehead, margined with white; under parts white except sides of breast sooty black.

Family PHAETHONIDAE, tropic birds

Phaethon rubricauda rothschildi (Mathews), red-tailed tropic bird; 18 inches long; including long, slender tail feather, black shaft, bright red webs; plumage silky white, some tinged with rose; a few black spots, especially in young. Nest a hollow in sand; secluded beneath a bush, bunchgrass, or slab of rock.

Family SULIDAE, boobies and gannets

Sula sula rubripes Gould, red-footed booby; 23-28 inches long; adult white, head and neck tinged buffy, wings with hoary-gray markings; tail white; feet red. Young: sooty-brown above; head, back and lower parts smoky-gray; recognized by red feet. Nests in any available bush or tree, almost never on ground; lays a single egg in a crude platform of leaves and twigs. One seen returning to the island just before sunset, on July 18, 1953, by Fosberg.

Sula leucogaster plotus (Forster), brown or brown-vested booby; 30-31 inches long. Adult head, neck, back, wings and upper breast deep sooty brown; all white below. Young: brownish-gray, upper parts darker than lower. Builds nest of twigs on ground or low scrub; lays two bluish-white, chalky eggs. In 1953 Fosberg saw a number of brown boobies flying on Peale Islet. In April 1952 boobies were seen on Peale Islet, nesting in trees, but the species was not determined with certainty.

Sula dactylatra personata Gould, masked or blue-faced booby; 25-29 inches long. Adult: white, with wing-coverts, primaries, secondaries and most of tail sooty-brown; mask bluish or olive, legs and feet deep brown. Young: upper parts grayish-brown, white below. Lays two limy-white eggs on bare sand. In 1953 Fosberg saw a very few blue-faced boobies on Peale Islet.

Family FREGATIDAE, frigate or man-o'-war birds

Fregata minor (Gmelin), Pacific man-o'-war bird. Adult male: large, blackish, with forked tail; head and back glossy purple; breast lighter than belly; large red patch under chin which inflates like a child's balloon. Female like male but head blacker, chin and throat grayer, breast whiter. Exact subspecies is uncertain; could be minor of western Pacific and Indian Ocean, or palmerstoni of Hawaii. Nestling is fluffy, white "puff-ball;" becomes rufous or cinnamon before becoming black adult. Both parents sit on nest, which is large pile of sticks. Obtains fish by harassing other birds, especially boobies, in air. In 1952 many frigate birds were seen by Fosberg, mostly roosting on the remains of an old pier on Peale Islet. In 1953 there were many more, hundreds of them, flying or roosting on an old steel frame or on power lines.

Family RALLIDAE, rails, gallinules, coots

Rallus wakensis (Rothschild), the Wake Island rail; 9 inches long; upper parts dark ashy brown, chin and upper throat whitish, neck gray, under parts ashy brown, barred with white. Wings about 4 inches long and so soft as to suggest little power of flight. Endemic to Wake [See Mayr, 1945]. Believed to be extinct.

Family CHARADRIDAE, plover

Pluvialis dominica fulva (Gmelin), Pacific golden plover; 10 inches long; summer adult: mottled black above with golden and ashy; dull dusky black beneath; whitish frontal band and eyebrow. Winter adult (plumage most likely to be seen): without black on under parts, whitish on throat and belly; light brown, streaked with gray, elsewhere. No hind-toe. Arrives from north in fall; flies north in spring. Breeds in northern Asia and Alaska. On April 20, 1952, only two plovers were seen by Fosberg, but he was informed by Mr. Fred Schultz that there were many of them only a day earlier. In October, 1953, several dozen plovers were seen feeding in ponds, and a few scattered elsewhere.

Family SCOLOPACIDAE, snipe, sandpiper

Numenius tahitiensis (Gmelin), bristle-thighed curlew. Length 17 inches; bill 3- inches. Dusky brown above, varied with buff; tail ochraceous, barred dark brown; dull buff beneath; cheeks, neck, chest with brown markings; thighs with bristle-like points. Migratory species.

Heteroscelus incanus (Gmelin), wandering tattler; 10-12 inches long; olive-gray above, white below and on throat and chin; lower parts streaked and barred with dusky in summer (when arrive from north also), but soon molt and lose this. Feeds close to the beaches on small marine creatures. One tattler was seen by Fosberg in April, 1952, and one in October, 1953.

Arenaria interpres (Linnaeus), turnstone, 8 inches long; in winter: dusky brown, feathers edged with ashy-brown; abdomen white; upper parts marked with black and rufous or chestnut. In summer: sides of neck and breast black. Migratory species, usually seen in small flocks, which rise together. On wing recognized by distinct flicker of black, white and (in summer) chestnut. Frequents sea beaches and mud flats, turning stones in search of worms and marine creatures; roosts at night on rocky points near shore. One turnstone was seen by Fosberg in October, 1953.

Crocethia alba (Pallas) [formerly called Tringa arenaria], sanderling; 7-8 inches long; in winter: pale gray above; head, back, rump with black central area on each feather; under parts white; bill and feet black. In spring, becomes spotted and streaked with black. Catches marine organisms following retreating waves, on beaches. Migratory species.

Erolia acuminata (Horsfield), sharp-tailed sandpiper; 8 inches long [probably rare]. Winter adult: grayish-brown above, streaked and striped dusky; white stripe over eye; chest sides and breast pale grayish-buff; abdomen white. In summer: upper parts brighter, with rusty and black; lower parts streaked dusky and grayish-brown V-shaped marks. Migratory species Siberia to New Zealand.

[Other possible migratory species which might visit Wake]

|                       |  |
|-----------------------|--|
| Green-winged teal,    | <u>Anas crecca carolinensis</u> Gmelin             |
| Pintail [duck],       | <u>Anas acuta tzitzihua</u> Vieillot               |
| Widgeon [duck],       | <u>Anas penelope</u> Linnaeus                      |
| Canvasback [duck],    | <u>Aythya valisineria</u> (Wilson)                 |
| Black-bellied plover, | <u>Squaterola squaterola</u> (Linnaeus)            |
| Semipalmated plover,  | <u>Charadrius hiaticula semipalmatus</u> Bonaparte |
| Mongolian dotterel,   | <u>Charadrius mongolicus stegmannii</u> Stresemann |
| Whimberel,            | <u>Numenius phaeopus variegatus</u> (Scopoli)      |
| Greater yellow-legs,  | <u>Tringa melanoleuca</u> (Gmelin)                 |

Family STERNIDAE, terns [by some included with gulls in the Laridae]

Sterna fuscata oahuensis Bloxam, sooty tern; very abundant, according to Bailey. Sooty-black above; forehead, sides of head, outer tailfeathers and underparts white; bill and feet black; 15-17 inches long. Lays one creamy-white egg, with variable spotting, in nest among bunchgrass. Catches small squid and fishes. In April 1952 a considerable rookery of sooty terns was observed by Fosberg on the lagoon side of Peale Islet. There were many young, varying from the pin-feather stage, light gray downy beneath and sooty brown on back and sides, to fully feathered, sooty brown speckled with white on the back, sooty gray beneath. This was not an especially large colony compared with those seen in the northern Marshall Islands. On July 18, 1952, C. J. Johnson reported that these birds had eggs. In 1953 this colony had moved to near the west end of Peale Islet after having been deliberately driven away from their old nesting place near the LORAN station. Their nesting was said to have been finished in July. In October a small number of adult birds were seen around the west end of Peale Islet. On the nesting site here were a small group of almost fully grown but more or less crippled young birds, also some dead ones. There was no obvious reason for the condition of these young birds.

Sterna lunata Peale, gray-backed or spectacled tern; 16-17 inches long; forehead, broad stripe over eye and underparts white; stripe through eye, top of head and nape black; upper parts dark ashy, paler on back of neck; bill and feet black.

Anous stolidus pileatus (Scopoli), noddy tern; 13-17 inches; sooty brown, grayer on neck, light gray on forehead. Young birds similar, but lack white on crown. Eggs less speckled than those of other terns, one laid in nest on ground. In April 1952 a few common noddies were seen by Fosberg, with one nest, but this may not have been occupied. In October, 1953, many more were seen on Peale Islet, roosting or flying with the frigate birds. One nest had a half-grown young.

Anous tenuirostris marcusii (Bryan), white-capped noddy; 13 inches; resembles noddy, but smaller; back, neck and under parts sooty black; forehead and crown white, becoming grayer on nape to merge with blackish on shoulder; narrow black mark over eye, white streak below eye. Prefers to nest on bushes; lays one egg.

Gygis alba candida (Gmelin), white tern, fairy tern or "love bird"; pure white except for black ring around eye and black feet. Balances single egg on limb of tree or bush fork. A few fairy terns were seen by Fosberg in both 1952 and 1953, mostly flying around the Pisonia forest.

[Other terns which might visit Wake Island]

Sterna sumatrana Raffles, black-naped tern; small, forked tail; plumage white, parts with pinkish cast; back, rump, tail, wing-coverts pale pearl-gray.

Sterna anaetheta Scopoli, bridled tern; like sooty tern but smaller, 14-15 inches, narrow white band on forehead extending back behind eyes; grayish brown below.

Thalasseus bergii pelecenoides (King), crested tern; large, white, with back, rump, tail, etc. pearl-gray; crown black with crest.

[For data on Micronesian birds, see Baker, Avifauna of Micronesia, U. of Kansas, 1951. Descriptions of sea birds: W. B. Alexander, Birds of the Ocean.]

REPTILES

The Tanager Expedition, in 1923, collected specimens of two species of geckos and two species of skinks on Wake Island. These can be distinguished as follows:

A. Geckos have their body covered with small granules or minute scales; the top of the head is without symmetrical shields; the digits (toes) are dilated, and the pupil of the eye is vertical. GEKKONIDAE

1. The chin (below the mouth) has small scales, not forming shields; inner digits have a compressed distal phalanx which extends somewhat beyond its tip, like a claw; color pale with dark spots or markings.

Lepidodactylus lugubris.

1'. Chin-shields large for at least two rows; inner digits without a distal, compressed phalanx; a series of transverse plates under the tail.

Peropus mutilatus.

B. Top of head with large symmetrical shields; body scales large, cycloid (thin, partially overlapping, with round outer edge, showing concentric growth lines); digits not dilated; pupil rounded. Skinks, SCINCIDAE

2. Eyelids well developed, movable; distinct light line down exact middle of upper surface from tip of snout to tail; bright blue-green tail. Emoia cyanura.

2'. Eyelids indistinguishable, not movable; without a light-colored, mid-dorsal line. Cryptoblepharus or Ablepharus boutonii poecilopleurus.

#### GECKOS

Lepidodactylus lugubris (Dumeril & Bibron), the "sad" or mourning gecko, has a variable coloration, ranging from pale gray, brown, tan or pinkish on the back, with dark spots or blotches, and white or pinkish lower surface, to very dark specimens, with or without a dark streak through the eye and along the side of the head. It is found from Indonesia to southeastern Polynesia, including Fiji, Samoa and many of the low sandy islets of the central Pacific. It is the commonest gecko in Hawaii, and is widespread in Micronesia. It lays pear-shaped eggs with white, hard, thick shells, about 9 by 6.5 mm., capable of falling and bouncing without breaking. These are found cemented together or to a vertical surface, with clusters in cracks, under loose bark or stones, and against boards.

Percopus mutilatus (Wiegmann), the stump-toed gecko, gets its specific name from the fact that its skin is so thin and tender that one can scarcely catch a specimen without its being "mutilated" in some way. Struggles of the gecko against one's fingers are likely to tear rents in the skin, and the tail is easily broken off. The color of this species also is variable, changing from light to dark to agree with the habitat in which it is found. The under parts are more or less tinted with yellow, which is more intense on the hind legs and belly. This species is widely distributed on Pacific islands from Mexico to the Philippines, especially on such low, reef islets as the Tuamotus and central Pacific atolls, also on higher islands such as the Society, Austral, Marquesas, Hawaii and Marianas.

#### SKINKS

Cryptoblepharus boutonii poecilopleurus (Wiegmann) formerly in Ablepharus, the snake-eyed skink, may be recognized most easily by the absence of eyelids and the absence of a light line down the exact middle of the back. Color is worthless in describing this species, for it may range from entirely dark to olive, brown, slaty, or even blue-green, uniform or having two to four lighter stripes on the back, but never an odd number (that is, with one in the exact center.) It is distributed throughout Polynesia (including Hawaii), and most of Micronesia. It loses its tail easily, but may regenerate a new one.

Emoia cyanura (Lesson), the azure-tailed skink, is recognized easily by its sharply defined, light mid-dorsal line, which extends from the tip of the snout to the tail, which is bright blue. Most adults have the central light strip on an even, dark brown to black ground; some have three yellow or white stripes; in older specimens these may fade and almost disappear. Some authorities place this species in the genus Lygosoma. It occurs in many islands in the Pacific, and is found throughout Micronesia. The egg measures 7 by 11 to 14 mm.; the skinks, 120 to 138 mm. in overall length. In 1952 this skink was fairly common about the island and Fosberg collected one on the ground in an open place.

In March 1949, C. Morgan Holmes collected what is believed to have been a "cat snake" in a tree on Wake. This snake has been identified as Boiga irregularis (Merrem), family Colubridae, subfamily Boiginae. It may be recognized by its large ventral plates, which stretch across the lower surface, several times longer than dorsal scales. It has 17 to 23 rows of scales, counted around the middle. The color is highly variable: yellowish, gray, olivaceous, bluish, greenish and brown above, uniform or spotted. It has been found in New Guinea, the Bismarck Archipelago, and the Solomon Islands, and probably reached Wake from one of these.

#### FRESHWATER FISH

##### Gambusia affinis

##### Mosquito fish.

In 1952 mosquito fish were seen by F. R. Fosberg in ponds and bomb craters, as well as in a large cistern. These had been spread about 8 months earlier to the ponds and bomb craters by Mr. Fred Schultz, as a part of his campaign against mosquitoes, from a stock introduced into the concrete cistern on Peale Islet 4 years before from Hawaii. They were very numerous in October, 1952, although it was not clear what they lived on, since the mosquito population had been reduced almost to the vanishing point.

#### INSECTS AND OTHER LAND ARTHROPODS

The insects collected by the "Tanager Expedition" were reported in Bulletin 31 of Bishop Museum, by the writer and collaborators, 1926. Other notes on insects are given by Aldrich, 1931, Bryan, 1948, Cresson, 1934, Hull, 1937, Jacot, 1928, 1929, Jordan 1939, Reeves, 1953, Rosen, Reeves and Aarons, 1948, Thompson, 1938, Usinger, 1937, 1941, 1946, 1949, and 1951, Van Zwaluwenburg, 1948, Wheeler, 1934, and Williams, 1945 (see Bibliography for complete citations).

More recent collections made by Col. G. W. Bickness, A. T. Gramilini, P. C. Hadden, Dr. C. R. Joyce, Dr. M. L. Kenler, N. L. H. Krauss, J. P. Martin, and others, are being worked up by specialists and reported upon in the "Insects of Micronesia" series. In view of the fact that only a portion of these reports have appeared to date, it would be premature to attempt to list the insects of Wake Island at this time.

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