THE ELEPAIO

Journal of the Hawaii Audubon Society

For the Better Protection of Wildlife in Hawaii

VOLUME 25, NUMBER 8 FEBRUARY 1965

NATURAL BIRD REFUGES IN THE GALAPAGOS

By F. R. Fosberg

For several weeks in January and February 1964, I was privileged to be a member of the University of California International Expedition to the Galapagos Islands.* This was a major scientific event, including a shipboard symposium on island geology and biology, and participated in by some 60 scientists, many of them international authorities on insular phenomena of various sorts. In addition to dedicating the newly established Charles Darwin Research Station, the expedition aimed at two major accomplishments: (1) to bring into contact students of islands from various scientific disciplines for mutually stimulating discussion, and (2) to give each scientist a chance to work for a few days or weeks on a field problem of his choice. These aims were accomplished in good measure. The tangible results in the form of scientific reports and papers will be coming out over a number of years, and the specimens and data collected will be of continuing value to students of island problems for a long time to come.

The Galapagos Archipelago, lying on the equator about 500-600 miles west of the South American coast, has had a history of scientific exploration that, though fascinating, need not be detailed here. Suffice it to say that in all this history, one of the islands, called Culpepper, or Darwin Island, has, for a very good reason, until the University of California Expedition, remained unexplored. Landings have been made on the rocks at the base of the basalt cliffs that surround this bit of rock but the cliffs have protected the plateau-like land surface of the island.

The first scientific visit to Culpepper and the similar Wenman islands was probably by the Webster-Harris Expedition in 1897. Diaries of this expedition by C. M. Harris and F. P. Browne were published in Novitates Zoologicae 6: 86-135, 1899. Harris, p. 89, says of Culpepper, "worked on the east edge of the island. It is the only part of the island that can be worked." "No chance whatever of reaching the top of the island." Browne, on a sketch of Culpepper reproduced on p. 108, indicates that the collecting was done on the lower east slope. Snodgrass and Heller (Robinson, Proc. Amer. Acad. 30: 247, 1903) in 1898 collected several plants on the talus at the base of the cliffs on the leeward side, including one, Thinogeton miersii, not found by us, but reported that the main part is inaccessible. The California Academy of Sciences Expedition visited Culpepper in 1906 (Slevin, Occ. Pap. Calif. Acad. 17: 150, 1931). They landed at the base of a 500-foot cliff. "A few sea iguanas seemed to be the only inhabitants about this spot, the birds being all about the top of the rock....Finding the summit quite inaccessible, we gathered a few sea iguanas and shoved off for the schooner." Thanks to exploration methods not before used in these islands, some of the secrets of this 167 meter

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*Supported in large part by NSF grant GE-2370

high about 250 acre bird refuge may now be told. Because Culpepper Island, and the rather similar nearby Wenman (or Wolf) Island, are, par excellence, bird refuges, the readers of THE ELEPAIO may find some interest in an account of our visit to these two little known bits of land.

The conquest of Culpepper and Wenman, as well as a large proportion of the other achievements of the expedition, would not have been possible but for the invaluable assistance of the officers and crew of the U.S.S. Pine Island, seaplane tender of the U.S. Navy. Maneuvers of this ship were so arranged that it could provide helicopter transport, as well as shipboard hospitality and many other courtesies to the members of the expedition. The helicopters landed a party of 9, with water, supplies and equipment on top of inaccessible Culpepper Island on the morning of January 29, picked them up on the evening of January 30, deposited them on Wenman, and returned for them on the afternoon of February 1. The astonishment and annoyance of the birds at this invasion were, to understate it, audible.

The members of this party were:

Robert I. Bowman (ornithologist)
Nathan W. Cohen (photographer)
David Cavagnero (entomologist)
Peter Ashbaugh (entomologist)
John R. Hendrickson (herpetologist)
Stephen Billeb (ornithologist)
E. Yale Dawson (botanist)
Allan Cox (geophysicist)
F. R. Fosberg (botanist)

It is a rare privilege, in the last half of the Twentieth Century, to visit a place where the birds have never been disturbed by man: Such a place is Culpepper Island. The birds have not learned that it is safer to be afraid of man. Their numbers are as impressive as their fearlessness. It is safe to say that every member of the party was conscious of the birds all the time he was ashore on the two islands except possibly when he was asleep. Even then the noise went on unabated.

Descriptions of the two islands will be of interest, as a background for some more specific observations on the birds. Since these islands are very poorly known, more ample accounts are in order than would otherwise be warranted here.

Culpepper, from the air, is a small, cliff-girt plateau, the top made up of two low gently sloping hills separated by a shallow hanging valley and ravine. The surface is wooded with low trees, densely so in most parts. Several green, meadowlike openings are scattered here and there, mostly around the periphery, as well as a bare area with only sparse vegetation. The helicopter landed in the largest of these meadowlike areas, amid a cloud of astonished boobies and sooty terns.

The low green plants occupying these openings turned out to be Alternanthera helleri, a compact, densely branched dwarf shrub or suffrutescent herb with gray-green Chenopodium-like leaves, usually less than 30 cm tall. Between the Alternanthera clumps, which were usually not quite touching each other, were a few other herbs--Cyperus sp., Amaranthus sp., a slender grass, Portulaca sp., and on the Alternanthera a few wisps of Cuscuta. A Cenchrus was, at the time of our visit, completely dead, identifiable only by the old burrs that still persisted in the root crowns.

The "forest" or scrub that is the principal vegetation of the island is a practically pure stand of a form of Croton scouleri, slender diminutive trees about 3-4 m tall, with broad oblong slightly fuzzy leaves, trunks up to 5 or 6 cm thick. The density of this vegetation varies from a completely closed canopy to open scattered trees, with no under-layer in the densest part to a complete layer of Alternanthera or locally, Portulaca, where the trees are widely spaced and light is abundant. Thin wispy grass and Amaranthus, as well as occasional Alternanthera clumps, occur

where the scrub is thin but not really open. In the Croton "trees" red-footed boobies (Sula sula rubripes) are nesting in great numbers, in places almost every tree having one or even two nests.

One of the astonishing sights, to one accustomed to sooty terns in the Central Pacific, was to see these birds in enormous numbers nesting under closed-canopy scrub-forest. There seemed no way to estimate the numbers of sooty terns (Sterna fuscata crissalis) in the Culpepper colony. They were simply everywhere in the forest, in openings, even in Opuntia clumps, and the din they made never stopped during the time we were there. There were so many tern eggs on the ground in the forest that it was difficult to walk without breaking them. Tiny chicks, also, were abundant and young with wing feathers. In some openings the terns were even more abundant than under the trees, but mostly seemed to be just resting rather than nesting. Many eggs had holes pecked in them.

Darwin finches, in this case the sharp-beaked ground finch (Geospiza difficilis), were common and had nests in the clumps of Alternanthera. In spite of the tremendous reputation these birds have, as the inspiration for Charles Darwin and the raw material for his evolution theory, they are really very plain sooty or blackish birds. The more elusive, smaller warbler finch (Certhidea olivacea) likewise, is a plain one. The finches are obviously the pollinators of the Opuntia flowers as they were very frequently seen pushing their heads into the flowers, coming up covered with pollen.

One of the first things to attract attention around the "meadow" of Alternanthera, where we landed and camped, was the curious nature of the pebbles that covered the ground. The Galapagos are strictly volcanic, and Culpepper is no exception, though there has been no very recent activity. However, the pebbles did not feel or look quite right. They were lighter than volcanic pebbles should be, and tended to be soft and crumbly. The specimens collected have not yet been analyzed, but it is fairly certain that they have been thoroughly phosphatized. The birds, of course, have been there in great numbers, supplying guano, for a long time.

Exploration into the interior of the island, up toward the high point, showed that the Croton tends to grow a bit more open on the highest ground. Thin grass is general, and in a shallow ravine are clumps of a relatively low growing (1 m or less tall) Opuntia. This is ferocious-looking, but the spines turn out to be soft, flexible, and little more than clumps of stiff hairs.

Here on these upper slopes we had our first view of a truly handsome bird, the Galapagos swallow-tailed or forked-tailed gull (Creagrus furcatus). It is a large gull, with a smooth gray back, white under parts, and a black head with a conspicuous bright red ring around the eye. These birds did not permit one to approach closer than a few yards--not flying away but simply walking away as fast as one could approach. However, when one was found nesting, it was only with difficulty that it was pushed aside to permit examination of its large egg--pale blue green-gray, speckled with gray and very dark brown. It was under an Opuntia bush, and there was little or no pretense at any actual nest.

One immature forked-tailed gull was seen. It was speckled gray and white, the beak and eye entirely black, with no red eye-ring.

In a high, open place, two or three acres in extent, with a few scattered Croton and Alternanthera, and some Portulaca, hundreds of masked boobies (Sula dactylatra granti) were nesting. These have a pinkish beak, rather than the bluish-yellow beak seen on the Micronesian birds of this species. Masked boobies also nest in large numbers on a bare strip between the edge of the forest and the edge of the cliffs that extends for considerable distances along the cliffs in many parts of the periphery of the island. Here they were an actual hazard to the walker, especially

one wearing shorts, as they would viciously jab and bite his ankles with their sharp beaks. When approached while sitting on their eggs, they would scream frantically and bite. In the population were eggs, newly hatched young and older downy young like large balls of cotton.

East of the camp was an area of Croton scrub with an irregular under layer of Opuntia and Alternanthera. In very open parts of this area Portulaca was very abundant. Here, just back of the cliff-edge, was a single tree of Erythrina velutina, so far as I could determine the only one on the island. A pair of the fascinating gray-collared brownish Galapagos mockingbirds (Nesomimus parvulus) had a nest here. One was sitting, the other seen bringing a cricket to it. When I disturbed the sitting bird in order to see the eggs, the other one attacked me, pecking me on the head. Both made a great fuss. The three beautiful blue-green eggs were spotted with dark maroon on the larger end. These mockingbirds are common on the island, have outstanding personalities, and are a constant source of entertainment. They were usually seen in pairs, playing together, one pursuing the other with mild pecks. One would sit occasionally on our tent poles and sing. The high point in this was an occasional battle with one of the huge 8- or 10-inch centipedes (Scolopendra sp.). These animals are common, and caused great consternation when they crawled into bed-rolls or sleeping-bags. They seemed to be objects of special animosity to the mockingbirds, which attacked them fearlessly. The bird would dart in and peck, often detaching a leg, jumping back just in time to evade a lunge by the centipede's head with its great poison jaws. The battle reminded one of Kipling's description of the battle between the mongoose Riki-Tiki-Tavi and the cobra. Each detached leg was promptly swallowed. After ten minutes or more of this the bird would get the upper hand, the centipede would gradually slow down, and after a coup-de-grace, the mockingbird would triumphantly carry off the carcass.

Some distance west of camp a small canyon was cut in the volcanic rock, its bottom worn smooth by running water and stones. A few tiny litter-filled pools were scattered in the bottom. Here the Alternanthera reached a meter or more in height. While seated pressing plants near the head of this canyon, I noticed on the other side two small bright brown quail-like birds. I studied them carefully through the binoculars. They walked with the characteristic head-bobbing motion of pigeons, and later I found that they were the endemic Galapagos ground dove (Nesopelia galapagoensis). As I looked at them very quietly I heard a slight noise behind me and turned my head. Here were two of the same doves scarcely a meter from me. They are truly beautiful birds. The back is a dark red-brown with white marks on the outsides of the wings, a white wing patch seen when they fly, iridescent green areas on the sides of the neck, coral red feet, a black bill slightly curved downward at the tip, and a bright blue ring around the black eye.

This canyon was sheltered from the wind and as hot as an oven. The dominant sound here was the crying of the forked-tailed gull, a noise between a wailing, squealing and whistling. The boobies and young frigate birds sitting on their nests were panting with open mouths. But the view from the hanging mouth of this canyon was worth all the discomfort. Hundreds of feet below, the water showed a typical tropical display of color. Just to the right a guano-stained stack of lava rose from the blue water, resembling the leaning tower of Pisa. On its cliffs were scattered clumps of Croton and Alternanthera, boobies on the ledges, and near the top what appeared to be several very large clumps of bright red flowers. After trying to guess what they were without much success I looked at them with field glasses and saw immediately that they were black male frigate birds (Fregatta minor ridgewayi) with their huge scarlet throat bladders inflated and distended out of all proportion to the size of the birds' heads. The frigate birds were common but not abundant on the cliffs around the island, and a considerable number of them were seen on and around this towering rock.

About mid-morning of the second day I was looking around the Alternanthera "meadow" in front of our camp for better specimens of the parasitic Cuscuta when I saw, down the slope a bit, sitting on the ground in bright sunlight, a short-eared owl (Asio galapagoensis)--the first I had seen in the Galapagos. I had a camera hanging around my neck, so I stalked the bird very carefully. It was watching one of the beautiful little ground doves which walked around, circling the owl, keeping just about a meter from it, seeming not at all worried by the nearness of such a fierce creature. After taking several pictures at different distances we finally found that our presence did not bother the owl at all, and we could take close-up pictures at will.

From the cliffs east of camp could be seen an arched rock with a flat top a quarter of a mile or so out to sea. It has some resemblance in shape to the Arc de Triomphe in Paris. On its top is a bit of green, probably Alternanthera.

The number of birds was a source of astonishment even when we had become accustomed to it. The air was continually full of birds, especially out over the sea from the cliffs. The sooty terns were innumerable. The frigate birds, when most of them were in the air, seemed very numerous. Red-footed and masked boobies were there in untold thousands. An odd thing was noticed about the red-footed boobies. On some nests the eggs were being incubated by birds in the brownish gray immature plumage. Beck (Condor 6: 9, 1904) says that "In the Galapagos nineteen out of twenty of the breeding birds are of the grayish type, while in the Revillagigedo Islands, about 1200 miles to the northwest, ninety-nine out of a hundred are of the white type." I did not count the two kinds, but certainly the gray ones were not in the majority.

On the second afternoon while I was being pecked by the mockingbird, the rest of the party was enjoying the ceremony of burying a bottle under a cairn at the top of the cliff, flying a home-made Ecuadorean flag. In the bottle was a record of our visit.

One would think that a few hours would be enough to explore pretty thoroughly the few acres on top of this lonely rock. However, when the helicopters arrived at about five the second afternoon we could think of nothing but the things we had not had time to do.

We flew quickly to the somewhat larger and higher (253 m) similar Wenman or Wolf Island, the other of the two northernmost and least known of the Galapagos. Wenman has been visited at least three times previously. Members of the Webster-Harris Expedition, in 1897, apparently climbed to the northeast terrace, and made observations on the birds and in their diaries made a few remarks on the vegetation, noting "about a dozen trees, 20 ft. or so high, resembling our wild apple" (Drowne, op. cit. p. 110). Snodgrass and Heller, in 1898, collected mostly on the small detached island north of the main island, but they apparently did ascend to the same terrace. They collected 11 species of plants (Robinson, op. cit. p. 251-252). The California Academy of Sciences expedition visited Wenman in 1906 (Slevin, op. cit. p. 149). They spent a few hours on Wenman, climbing to the "plateau", probably the terrace on the northeast end, and collecting in clear spaces around the edges of the plateau. They describe the plateau as "covered with a dense growth of a low-growing Opuntia" which "made travelling somewhat difficult". They found the Galapagos dove quite plentiful.

Here we landed in an opening on the northwest extension of the island. The opening, like others seen later, was largely occupied by Alternanthera as on Culpepper, but Opuntia, the same soft-skinned bushy one, is very common. Morning glories, Portulaca, Boerhavia, and several other plants suggested that we would find a richer flora here. The "forest" around the openings is here, as on Culpepper, an almost pure stand of Croton scouleri, but here a form with narrower leaves and a narrow, fastigiate habit--the branches strongly ascending to almost erect. The spacing is fairly close, but the crowns are so sparse and narrow as to give an almost open

aspect to the scrub or dwarf forest. The first thing that struck us about the bird-life was an absolute lack of the sooty terns that dominated the scene on Culpepper. Not a single one was seen during two days on this island, which was otherwise crowded with birds.

The ground near where we landed was thickly covered by lava boulders of incredibly sharp and ragged shapes, and up to a half meter across. Prospects of a place to put down our sleeping bags looked dim indeed. However, when we started to try to clear away a space, we found that the layer was only one boulder deep, over fine soft black soil. Several half-grown frigate birds were sitting on nests and dead stumps in the area where we made camp. These were really forlorn youngsters by the time we left after two nights. During this time only once did we see a parent bird attempt to visit one of these young, this late on a very dark night.

Walking, on this island, was generally much rougher than on Culpepper, both because of the abundance of sharp boulders and the much more broken terrain. We were landed on a large terrace, perhaps 100 m above the sea. From this, at one corner a steep sharp ridge rose at least another couple of hundred meters to a sharp peak, separated by a practically impassable knife-edge ridge from the main body of the island, which was a sloping plateau several times the size of Culpepper.

Croton scrub dominated most of the island. In a large opening on the lower terrace about two-thirds of the Croton is dead, some standing but mostly fallen. Some of these are rather freshly dead and almost all lying in one direction, while older dead ones are lying at random. This area has no large boulders, only sharp pebble- and cobble-sized volcanic debris lying on the soil surface.

Red-footed boobies are here also abundant, nesting in the Croton. Where most of the Croton is dead, the boobies nest in the fallen trees as well as living ones. They were also nesting in the trees in a strip of Erythrina at the top of the east cliff of this lower terrace. Here I noticed something so strange that I scarcely believed it myself and resolved not to tell the ornithologists about it and risk gaining a reputation as a liar. A pair of Darwin finches, Geospiza difficilis again, or something very similar, were bothering a red-footed booby that was sitting on its nest. One finch would light on the tail of the booby and walk up and reach under the tail coverts to pick at something--I supposed lice. After some picking around,it would back off, hop over to a nearby twig and wipe its beak while the other one would repeat the process. The booby would flick its tail now and then but did not seem to mind too much. I examined this process closely--the birds paid no attention to me. The beaks seemed bloody. Examination of the booby's tail showed that the roots of the main feathers were pecked open and bleeding. The finches were sipping the blood. This went on a good twenty minutes before the finches finally left. That evening at dinner the ornithologists were talking in some astonishment about the finches pecking at the elbows of the wings of the masked boobies on the tops of the cliff-edges, causing them to bleed, and drinking the blood. So I had less hesitation about telling my own story.

It seems that Rollo Beck reported something of this sort on Wenman but was not particularly believed, according to my companions on the visit to the island. I have looked for a printed reference to this but have not been able to find anything on exactly this behavior. Harris, in his diary (op. cit. p. 91) said "the geospiza are carrion-feeding birds, eating from the dead carcasses of seal; also observed them feeding on the boobies, standing on the feet and backs of the boobies for that purpose". Drowne, in his diary (op. cit. p. 110), said "Noticed some of the finches climbing on a booby's back and pecking the feathers--probably in search of parasites. Saw three finches on one booby at a time." Gifford (Proc. Calif. Acad. Sci. 2(2): 242, 1919) quotes Beck's notes on what he called Geospiza septentrionalis as follows, "Whenever I shot a bird several others would gather about it and pick at the blood."

All of these observations refer to the birds on Wenman. Curiously, we had not seen this behavior pattern on Culpepper, though all the protagonists were there in abundance. Apparently the finch population on this island had made a discovery and exploited it, just as the mockingbirds on Culpepper had become predators of the great centipedes.

The Erythrina grove is on much less bouldery soil, though a few enormous rocks are scattered around. Seedlings and small plants of a number of species were collected here that were not seen elsewhere: Acalypha, Cardiospermum, Heliotropium, several Ipomoea species. Fleurya, Galactia (?), Physalis, Amaranthus, Setaria were mostly found only here. The Fleurya and Heliotropium only were seen commonly elsewhere.

Up the main ridge from the Erythrina, was a strip of open ground at the top of the cliffs populated by a great number of masked boobies and some frigate birds. From this cliff one could see a number of beautiful red-billed tropic birds (Phaethon aetheris mesonota) flying, their white tail feathers streaming behind, and hear them crying "dee dee dee dee dee." This species I had never seen before. Many forked-tailed gulls were flying here, too. On the cliff tops of this ridge and down over the edge were a few dark compact bushes. The first one seen was down a talus slope just at the point where it slid over the brink, a couple of hundred meters above the sea below. It was a ticklish job getting to it and collecting its white flower heads--a dwarf species of Scalesia, the amazing endemic genus of tree Compositae. Afterward I was chagrined to find that I had walked to within a few feet of a fine plant of this right on the main ridge.

Just below the top this ridge spread out against the cliffs surrounding the first peak of the upper level of the island. On the ledges of this cliff grows a woody Euphorbia, reminiscent of those in Hawaii, and several other plants, including one of the endemic species of Mollugo, for which the Galapagos are known.

On the top of this peak, only a few meters across, is thin Croton scrub with a few small Scalesia bushes, Opuntia, and the only plants of Cordia lutea seen on this island. Its occurrence here fairly well settles the matter of whether or not this species is indigenous in the Galapagos. The peak is surrounded by frightening cliffs and connected with the larger part of the island by a knife-edge with a vertical cliff several meters high at the other end. It did not look passable. One of my companions, Cavagnero, managed to climb around this at a lower level, scale the upper cliff and explore the plateau beyond, but I was not quite brave enough.

The first part of the descent was exciting enough--as I took a different, and worse, route down.

Back down, on the cliffs of the west side, the entire cliff edge for a long distance, and on a knife-edge isthmus connecting with another peninsula, the masked booby population was enormous. I noticed that some of these boobies had different voices. Some had an especially raucous scream when disturbed; others seemed to try to make the same noise but were so hoarse that they made a very squeaky version. The latter, I was told, were the males. Both sexes were sitting on eggs. From the edge I could see large numbers of a very trim, graceful petrel with curved wings, black above, white beneath, flying in and out of the cliff opening below. It was possibly the Galapagos petrel (Pterodroma phaeopygia) or the dusky shearwater (Puffinus obscurus subalaris (Ridgw)).

In one opening a beautiful jet-black male frigate bird with distended red pouches was sitting on a nest with a large white egg. Frigate birds are common here, nesting in the Croton with the red-footed boobies. There are said to be two species here but I could only see one, which seemed to me the same species I knew in Micronesia, the great frigate bird (Fregatta minor).

In the wooded areas on the terrace were many of the same beautiful doves seen on Culpepper.

Some of the others had mentioned seeing noddy terns (Anous stolidus galapagensis) at the end of a narrow point below where we camped, at less than 100 meters, about the lowest point on the rim of this cliff-girt island. I went to look for them but failed to see them. Masked boobies, forked-tailed gulls, and frigate birds were common here. A small black marine iguana (Amblyrhynchus cristatus) was climbing around the cliff edge, equally at home hanging upside down from a protruding ledge as on top of it. Shore crabs, too, were common here, high above the water. They were not seen on the east side of the island.

The helicopters came for us all too soon. Our pilot, when he heard I wanted to take pictures, circled the island a number of times, giving me a wonderful view of it, and showing me the numerous interesting looking spots that I would like to have investigated.

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ALOHA to our new junior member: Robert Bixler, 6240 Milolii Place, Honolulu, Hawaii.

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FEBRUARY ACTIVITIES:

February 8 - Board meeting at the Honolulu Aquarium Auditorium at 7:00 p.m. Members are always welcome. PLEASE NOTE CHANGE OF TIME.

February 14 - Field trip to study shore birds. Bring lunch, water, and if possible, your car. Transportation cost ($1.00) to be paid to the drivers. Meet at the Library of Hawaii at 8:00 a.m. Leader: Mike Ord, telephone: 587-328.

February 15 - General meeting at the Honolulu Aquarium Auditorium at 7:30 p.m. Program for the night: Dr. Hubert Frings will talk on animal communication.

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