'ELEPAIO

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NOTES ON THE ECOLOGY OF THE HIGH ALTITUDE AEOLIAN ZONE ON MAUNA KE'A

by Francis G. Howarth and
Steven L. Montgomery

The summit regions of Hawaii's two highest mountains, Mauna Ke'a, 13,796 ft. (4207 m) and Mauna Loa, 13,677 ft. (4171 m), have been widely assumed to be biological deserts. This assumption has been based on the near absence of conspicuous plant life, the relative youth of the habitat, and the extreme environmental conditions, including nightly freezes. However, similar environments elsewhere in the world are often inhabited by obligate scavengers specialized to feed on the organic debris carried up the mountain by the orographic wind (Mani 1962). This altitudinal zone above the alpine zone is called the aeolian zone (Swan 1968).

The discovery of the neogeoaeolian ecosystem (that is an aeolian ecosystem on young, unvegetated lava flows) near Kilauea between 900 and 1200 m altitude (Howarth 1979) led to the speculation that high altitude aeolian animals may also exist in Hawaii.

During the two one-day sorties (September 2, 1977 and September 2, 1979) to the summit area of Mauna Ke'a we have found a number of new animals. These indicate that an ecological study is needed as part of the planning for any proposed land use changes there. On Pu'u Wēkiu, the summit cone of Mauna Ke'a at 4200 m, we discovered a remarkable new flightless lygaeid bug, which has been identified as a highly aberrant new species of the world wide genus *Nysius* (W. C. Gagné and P. Ashlock, pers. commun.). We found the bug (called "the Wēkiu bug" by Mull and Mull (1980)) under rocks and cinders, where it was preying on the moribund insects arriving on winds from the lower slopes. There are numerous *Nysius* species endemic to Hawai'i and all are believed to be seed predators. Therefore, this new "Wēkiu bug" represents a remarkable shift in both feeding behavior and habitat preference. When the surface is dry, the bug is found most commonly under large boulders and among the cinders nearby in areas where the permafrost is 10-25 cm below the surface. These boulders offer humid. sheltered hiding places for the bug and also act as traps for concentrating the windborne material. This windborne debris originates from the lower slopes of the mountain and is composed of mostly small insects caught up in the rising diurnal convection currents.

Three species of spiders also share the habitat. Two are small sheet web spiders, Linyphiidae, which build their snares on the under-surfaces of the larger boulders. One is probably an endemic *Erigone* and, like the bug, appears also to be restricted to this habitat. The other small spider remains unidentified. The largest native animal living in this habitat is a lycosid wolf spider. It is doubtfully restricted to the summit area but may be endemic to Hawai'i Island. Many lycosids are highly skilled hang gliding enthusiasts and are good dispersers. W.P. and M. Mull, R.P. Papp, and others have captured or seen wolf spiders near the summits of both Mauna Ke'a and Mauna Loa. We captured a male as it ran from beneath a rock within a few steps of the summit benchmark.

Mull and Mull (1980) first described the potential biological resources of the aeolian zone of Mauna Ke'a and discussed the conservation problems affecting the habitat. Perhaps the greatest concern among the man-caused perturbations to this environment is the widespread and increasing use of off-road vehicles. These disturb the substrate and turn over the boulders that play such an important role in maintaining populations

of these specialized animals during the dry summer months. We were unable to find the Wēkiu bug in what appeared to be suitable areas wherever the substrate had been markedly disturbed either during construction of the observatory facilities or by off-road vehicles.

Given the youth of Hawai'i Island and especially the youth of the high altitudes, it is surprising to discover specialized animals which are apparently found only in this habitat. These arthropods have made many distinctive adaptations in order to exploit the resources and live in this habitat. Important comparisons in ethology, physiology, and morphology are possible between Hawai'i's aeolian animals and their lowland relatives and also between the former and other aeolian animals living in similar habitats in other regions of the world.

What other discoveries await the biologist in this extreme environment? Have some other highly specialized animals which once lived in this unique ecosystem already become extinct as a result of the recent astronomical increase of Man's activities on the mountain top?

ACKNOWLEDGMENTS

We especially thank William and Mae Mull of Volcano, Hawai'i for their enthusiastic assistance in the field and for their helpful comments on the manuscript. Drs. W.C. Gagné of the Bishop Museum and P. Ashlock of the University of Kansas identified the bug. Drs. Gagné and A.C. Ziegler of the Bishop Museum kindly reviewed the manuscript.

LITERATURE CITED

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Swan, L.W. 1968. Alpine and aeolian regions of the world. pp. 29-54. In: Wright, H.E., Jr. & W.H. Osburn, eds., Arctic and alpine environments. Indiana Univeristy Press. 308 pp.

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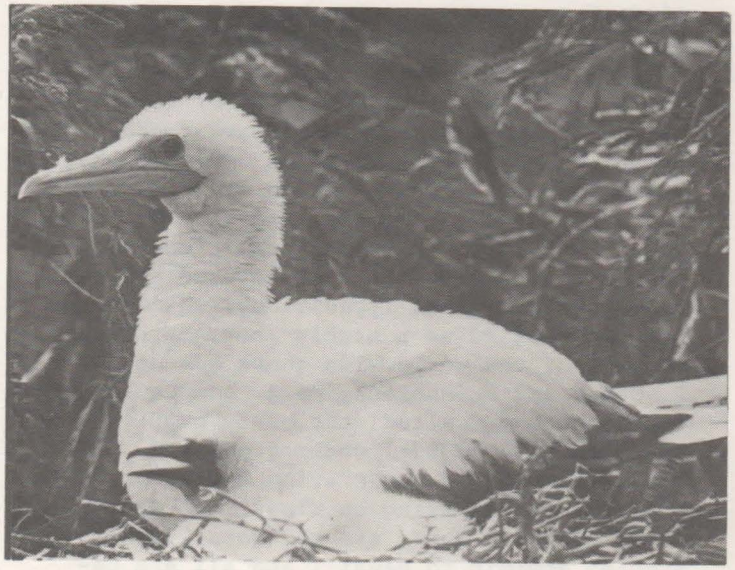
RIFLE RANGE IMPACTS ON RED FOOTED BOOBIES

Ted N. Pettit has sent the Society a copy of a letter dated August 23, 1979, addressed to Col. Peter Sterns, Army Corps of Engineers, at Ft. Shafter about Mr. Pettit's observations on the killing of nesting Red-footed Boobies at Kaneohe Marine Corps Air Station. Portions of the letter are reproduced below for our members:

"I am writing to you with information in regard to the rifle and machine gun range at the Kaneohe Marine Corps Air Station. I understand the Army Corps of Engineers is collecting data concerning the present impact zone and the effect upon the immediate area around Mokolea peninsula. My experiences are based upon a five-month study (April 1 to August 13, 1979) of breeding biology of the Red-footed Booby at the nesting colony located on Ulupau Head.". . .

"I would like to point out the large number of Boobies which have been shot and killed during this period of study. During the last week of April, 1979, I found approximately 40 dead birds in various stages of recent decomposition, resulting from bullet wounds to the chest and abdomen. During the third week of May, 1979, a similar mass killing occurred, this time totalling about 60 birds. I was unable to make an accurate body count due to the fact that the lower slope of Ulupau Head is an impact zone with a great deal of live ordnance lying about and it is unsafe to walk through this area.



Adult Red-footed Booby and chick.
Photo by R. J. Shallenberger

After the discovery of both slaughters, a report was made to the officer in charge of the range and the environmental affairs agent for the marine base, Mr. Tom Cajsky. Apparently the situation was not corrected at this time because subsequent trips to KMCAS resulted in finding 12 more dead adult Red-footed Boobies on June 23, 1979, 8-10 recently shot and killed Boobies on July 16, 1979, and 7 shot and killed Boobies on July 26, 1979. Many of these birds were among those studied in our investigations and the loss to the adult population also reflects the loss of eggs and chicks under their care. I would like to emphasize that these birds were found on the Kailua Bay side of the peninsula, opposite the rifle and machine gun range. Several birds were autopsied both in the field and in my lab and were found to be victims of gunshot wounds. I have taken many pictures of these dead Boobies which are available for your inspection. I have also recovered sixteen bird bands (U.S. Fish and Wildlife Service) from these decomposing bodies."

"I present this evidence of indiscriminate or intentional killing of Red-footed Boobies . . . for your consideration of changes or modifications in the present firing range system at Kaneohe Marine Corps Air Station."

"I would also like to point out that on many occasions from April-May, 1979, Humpback whales with calves were observed close to the Mokolea peninsula in Kailua Bay and the area adjacent to Mokumanu. These animals are protected by the Marine Mammal Act of 1972 and present another wildlife problem in the extent of the present impact zone."...

Ted N. Pettit

HOUSE EXCHANGE DIRECTORY

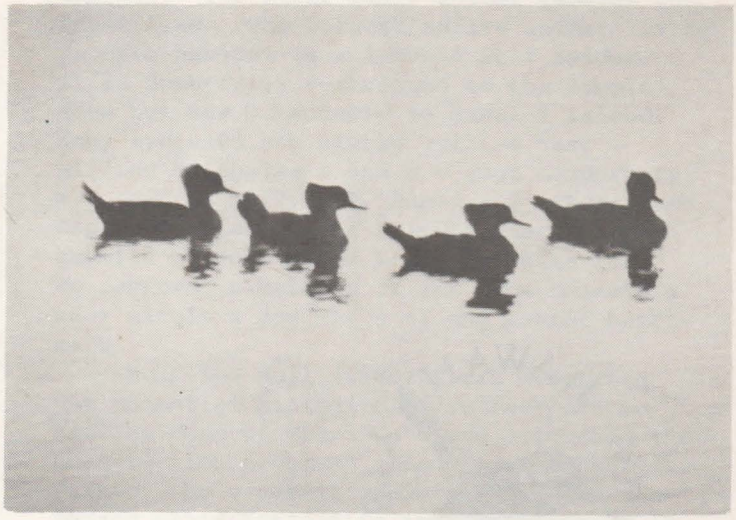
A directory is being planned for birdwatchers who would like to temporarily exchange their homes or apartments for vacations or hospitality purposes. For more information, birdwatchers are asked to send a self-addressed, stamped envelope to: Max Lazar, 55 Grand Avenue, Rockville Centre, N. Y. 11570.

WESTERN SAMOA IS TOPIC FOR SEPTEMBER MEETING

During August 1980 Dr. Mark Merlin spent two weeks in Western Samoa making observations of traditional agricultural practices and recent logging activities and their effects on native plants and birds. In addition he visited actual and proposed National Parks on two of the islands of Western Samoa, Savai'i and Upolu. He will discuss both exotic and native land birds, including effects of human predation on their distribution and abundance. Dr. Merlin is a geographer and Assistant Professor in the Department of General Science at the Universith of Hawaii. His talk will be illustrated with color slides.

FIELD TRIP TO PALEHUA-PALIKEA

On Sunday, September 7, the Society is planning a field trip to the Palehua-Palikea Trail in the southern Waianae Mountains. As the 'Elepaio goes to press, final permission is still pending, but if approval is not granted there will be an alternate forest bird hike. There is a good chance of seeing 'Amakihi, 'Apapane, and 'Elepaio, as well as native land snails and a variety of native plants on this mile-long trail. Weather date for the hike is September 21. Bring lunch, water, rain gear, and good hiking shoes. Meet on the Punchbowl St. side of the Library downtown at 7:30 a.m. Bring a car if possible or plan to share gas expenses.



HAWAII AUDUBON SCHEDULE OF EVENTS

(for details, see inside back page)

September 7 (Sunday) Field trip to Palehua-Palikea Trail. Leaders: George Campbell (941-1356) and Sheila Conant (948-8241). Meet at the Punchbowl St. side of the State Library downtown at 7:30 a.m. (Rain date is September 21.)

September 8 (Monday) Board meeting at the home of Sheila Conant, 3663 Alani Dr. (988-6522). All members welcome.

September 15 (Monday) General meeting at 7:30 p.m. Dr. Mark Merlin will talk on *Bird Life and Land Use in Western Samoa*. McCully-Moiliili Library, 2211 S. King St.

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