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## NA LAAU HAWAII

By George C. Munro

Very large areas of extremely interesting xerophytic or dry-land forests were evidently destroyed by man on all the islands of this group. Little more than remnants of these forests now remain. This class of land then became the kula (open land) of the Hawaiians. Part of the site of Honolulu and much of the cultivated lands of Oahu were at one time kula and no doubt they were forest-covered before that. The flora of the kula may have been the smaller plants of the more open spaces of the original forest. Some of them may have even preceded the forest. The kula is now mostly taken up with cultivation, grazing, buildings and introduced vegetation.

Mr. Charles N. Forbes, when Botanist for the Bishop Museum, made an interesting study (Bernice P. Bishop Mus., Occ. Pap., vol. 5, No. 1, 1921): "Preliminary observations concerning plant invasion on some of the lava flows of Maunaloa, Hawaii." It is interesting to see that some of the plants he enumerated are plants of the kula and two at least are still growing naturally on Diamond Head.

It was my privilege to spend thirty-four years roaming over large areas of kula country on Kauai, Molokai, and Lanai, noting their flora and the remnants of the old forests still existing in scattered groves and single trees. These lands are now to a great extent occupied by sugar cane and pineapple fields where no native plants are allowed to exist. I did some botanizing on all three of these islands and traversed dry lands of all the others. I also studied the rain forests and the intermediate zones between them and the dry lands. On our island, the intermediate zones and the dry lands, according to J. F. Rock, have a larger arborescent flora, more species of trees, than the rain forests. As my employment was in the grazing industry, plant life of the open country was ever under my scrutiny. I therefore became acquainted with and intensely interested in the native xerophytic plant life of these islands and have watched with apprehension the dangers to which it is exposed, dangers which at present do not face the plants of the rain forests to such a degree. It was part of my duty as manager of grazing concerns to see that the native plants were superseded by foreign species of greater value for grazing. It was then that I saw plantation plows make complete destruction of native vegetation on those lands.

Large areas of land cannot be kept idle, withdrawn from use in supplying human needs, in order to save a few rare plants. But some plant species could be saved if those using the land profitably would devote a little time for scientific



research apart from business, or even do it for sentiment alone. Surely it is worth while historically to save some of the original plants of Hawaii. Since 1918, I--with others--have been interested in some plan to save species of Hawaiian plants from destruction. That the various plans have not been fully successful is due principally to lack of interest where interest might be expected.

I saw Tetraplasandra racemosa of Kauai, one of our most remarkable trees, and the Lanai form of Euphorbia lorifolia, which filled an interesting role there, go down before the plow. Probably other, smaller plants went too. Haplostachys munroi and Abutilon eremitopetalum disappeared under the hoofs of cattle. No one knows if any representatives of the four exist today. The three last could easily have been saved. At present we see building operations creeping up the leeward side of the Koolau range and we do not know what dry-land plants may be disappearing in the operations.

However, the tide of interest is now turning. There seems to be a general awakening to the necessity of saving the dry-land plants of this favored land. I rejoice in it. Though age has circumscribed my field of activities, I am able to make an attempt, with considerable cooperation from others, to reproduce a forest representing that which no doubt covered much of the land now producing a great part of the wealth of these islands, also an effort to establish an example of the vegetation of the kula, some plants of which may belong to an era before forests existed in Hawaii, in a place easily accessible to the people of Honolulu.

This I call "Na Laau Hawaii" (na: belonging to; laau: vegetation, plants, trees or forest). Na Laau Hawaii is part of Leahy Native Garden, the subject of former papers in Elepaio. It is situated on the west side of Diamond Head, above the Army trail, made during the war in connection with defense, on the fourth ridge from Makalei. It is bordered along the bottom by about 500 feet of the Army trail, at about 100 feet elevation, between the two valleys bordering it on the north and south. It runs up to about 400 feet elevation, where the valleys on each side converge and almost meet. It consists of five different kinds of formation. A beautiful, gentle slope of algaroba-covered soil occupies the north side which I am calling "Ka Laau Nui" (the big forest); a small ridge of drier algaroba-covered soil on the south side, "Ka Laau Liilii" (the little forest); a wide, steep rocky, grassy space, "Ke Kula" (the open country), between the two forests; a rocky narrow ridge above the kula, covered with koa haole and some algaroba trees up to the knife edge ridge between the two valleys at the top, "Ke Kuaaina" (the upland or back country); and a narrow strip of soil-covered surface above the trail, "Ka Pahee" (the Hawaiian name for the smoother region below the tall ilima and before the seashore is reached). Na Laa Hawaii can be seen from the south end of the tennis court in Kapiolani Park. Counting from the south, the fourth ridge will be seen to be wide at the bottom, the scene of this experiment. Part of the larger and smaller forests can be seen, part of the kula and all of the kuaaina. The pahee below is not in sight. These names perhaps do not quite fit the areas described, but come very close to them. The two classes of vegetation, that of the xerophytic forest and the kula, can be grown there and very likely some of the shore plants as well. A graded trail cut across the face of the kula to its top will provide easy access to a beautiful view of the sea, Waianae Mountains, the Koolau range, and Honolulu to St. Louis Heights. Na Laau Hawaii now takes precedence in my work over Leahy Native Garden, which has served its purpose in demonstrating where native plants will and will not grow on the outer ridges of Diamond Head.



The present plan is to work this small area of about 3 acres into a representation, as faithful as possible, of what the original dry forests of these islands were before man altered them, and also that of the open or kula land which followed the destruction of the forests. It is planned to have Ka Laau Nui traversed by easy trails and specimens of each species labelled with scientific and native names and an account of the uses to which the ancient natives applied them. Therefore, if this project, dedicated to the native plants and trees of Hawaii, is as successful as expected, it will be an easy source of information and recreation to the people of Honolulu and some of our visitors.

The main object of the activity, however, is to assist materially in saving from extinction plants endemic to Hawaii. Most of the present vegetation of that area, except that of the kula, is foreign to Hawaii, but can eventually be eliminated from the reserve without great expense and with little danger of a fresh intrusion. The rocky kula is mostly occupied with pili and emolua, native bunch grasses with which many of the plants of the kula were originally associated.

It is not expected that all species of plants set out in Na Laau Hawaii will succeed but a sufficient number will survive to accomplish the object. At present there are twelve native species growing there spontaneously, and seed of eighty more have been planted.

Of the seed set out in Leahi Native Garden and elsewhere on Diamond Head in 1950, only that of the wiliwili (Erythrina sandwicensis) and alawao (Chenopodium sandwichium)--so far as known--have made good growth. A tree of the former was two feet eight inches high and an inch in diameter near the ground when it was deliberately cut down in August by some destructive person. An alawao plant flowered and has ripened its seed, and another is three feet, six inches high, withstanding the exceptionally dry season very well so far. There was rain all day on January 20th and a heavy shower on February 11th, but no rain of any consequence since then on this part of Diamond Head. Where, in 1950, there was a mass of old ilima four feet high, there is now almost open ground, with a great amount of the ilima dead. This has been favorable to the planting in Na Laau Hawaii. If followed by early and generous rains, germination of seed planted should be good. The early winter rains are best for seed germination on dry country.

Plants of other species started well but these, with many of the wiliwili, died during the dry season of 1951. This was expected, of course, and showed where plants were not likely to thrive. Most of the planting of 1950 was on unsuitable ground. The good ground was avoided for fear that later building operations would reach there. However, after nearly two years of experimental planting, it has been amply demonstrated that the open spaces of Diamond Head have not arrived at the condition necessary for tree growth even where there are good pockets of soil, the subsoil or rock-bottom being too impervious to tree roots. Again, where trees are now growing on deep soil, other foreign plants get such a hold that a great many of the Hawaiian slow-growing, dry-land plants would be smothered by the exotics before they could get established. It became evident that, to ensure success, it would be necessary to plant the larger trees on good ground where the foreign plants could be effectively dealt with. The position and condition of Na Laau Hawaii seemed to offer this. So, on December 28, 1951, I decided to take up the project, and risk the ground being later taken for building. However, it is hoped that some of the trees and smaller plants will become sufficiently spectacular to capture



public interest, so that public sentiment will demand that the locality be spared. The conservation object will thereby be attained. The plantings of 1950 and 1951 were over a wide area. Not a great deal of inspection of results could be made but enough to show the class of ground where plants were likely to succeed. All of the *Erythras* that grew on Na Laau Hawaii have survived. The wet season of 1951-52 on Diamond Head was an unfavorable one for germination of seed, so not much was learned from the plantings of 1951. In Na Laau Hawaii, close touch with the plantings can be kept. Experiments are being carried out in the thinning out of exotics by chemicals. This give great promise for the project.

I am getting wonderful cooperation in collection of seed and obtaining permits for various privileges in connection with this work. Doctors' reports on my physical condition are extremely encouraging and there seems no reason why I cannot keep up what I am doing at present for a considerable time to come. Eventually it is hoped that the project will have sufficiently demonstrated its value to warrant the employment of paid caretaker. If we are favored with early and fairly continuous rains this coming wet season I shall have a good report on Na Laau Hawaii early next year. I am hoping that the names I am using for the project and its parts will be officially retained, and no personal names attached to it if the project is a success.

Most plants to be set out are raised in nurseries and planted out when well grown. This of course brings quicker results. However, it has its drawbacks. Plants raised in cans cannot always quickly develop the root system suitable for survival in very dry localities. Seedlings of many of the dry-land trees grow slowly as to their above-ground portion, but the root system grows quickly and the tap-root penetrates deeply in the early stages of growth. This aids them to withstand the first dry season and gives greater stability for their future life. My system of almost always using seed only, and plenty of it, leaving it to nature to develop the plant, also has disadvantages. But in Na Laau Hawaii it is the only system that can be used at present. It will certainly work for many of the common native plants if they are protected from exotics. Keeping the aggressive plants in check, and gradually eliminating them, spells success. Water provision can be added later to help bring rare and valuable plants through extra dry seasons in their early stages. I have felt until now that my effort on Diamond Head was to a great extent a gamble. With the experience gained I am now satisfied it is no longer so, even to the danger of Na Laau Hawaii being later taken for business purposes. Its value will be appreciated before the danger of that arises. Even if we now have a series of extra dry seasons it would of course be thrown back but would not be wrecked.

Na Laau Hawaii does not duplicate or compete with any other project of its kind. If many cooperate, success will be assured in saving endemic plants. If the wildlife refuge in Kapiolani Park materializes it will make a good show of the shoreline plants; Na Laau Hawaii, at 200 feet elevation, will take care of those favoring extra dry localities; the Kamehameha Schools' Waonahale plantation, at about 700 feet, if extended as proposed, will favor plants of that elevation; the Baldwin-Fleming native plantation at Puu Mahoe, Ulupalakua, Maui, at 2500 feet, will preserve the trees and shrubs bordering dry lands and rain forest, and probably most of those of the rain forest. Each of them will likely extend their efforts to grow plants outside their particular zone, and thereby much will be learned and some good show places be developed. The Board of Agriculture and Forestry protected areas of rare native trees, and the planting of others, will assist greatly,



and the list of rare plants prepared by the Conservation Council will also be a help. In connection with my work for collection of seed I am compiling a rough list of native dry-land plants from publications of Hillebrand, Rock, Degener and other publications, enumerating the plants of Hawaii. Also I have opened an indexed book of scientific and native names of all trees, shrubs and herbs growing or tried in Na Laau Hawaii, with condensed data on their behavior under the conditions there, so that information gained will be readily available and not buried in a mass of notes. Mr. Colin Lennox, President of the Board of Agriculture and Forestry, is furnishing me with aluminum labels stamped with the scientific names of the plants. These are being placed on the plants naturally there and will be on the new ones as they become established.

## JOURNAL OF THE 1938 LINE ISLAND EXPEDITION

By Walter Donaggho  
(continued)

July 26: continued. Leaving the kou clumps, we proceeded out toward the east shore of the island. I found a dead rat on the ground, and, as it was quite fresh, collected it as a specimen. I saw two others race into holes in the ground. Mr. Munro called from a depression in which he was standing. Sooty terns were flying angrily overhead. I went over and found that they were sitting on eggs, and collected a couple as specimens.

Banding accomplished, Mr. Munro walked up the coastal ridge towards the north, while I started for the central lagoon. The clamor caused by angry sooty terns scared up by Mr. Munro drifted loudly over to me several hundred yards away, and I looked over in his direction. He had a small flock of fairy terns hovering over and following him as he walked along... Crossing a dusty flat, I noticed a Phoenix petrel wheeling about.

After lunch, Mr. Munro and Mr. Emory started out to the north to band sooty terns. I was to relieve Emory at two o'clock. I started out later in the same direction to visit some ruins of a former encampment of guano workers, in hopes of finding a certain beetle that had been noted there... but failed to get any. At one time, I parted some clumps of grass and found a grey, downy petrel chick, presumably the young of the Phoenix petrel. The ruins consisted of three four-sided huts of coral slabs and one square platform, on top of which was a rusty iron cannon of an early date. In fear of possible attack? The camp was now inhabited by bosun birds, fairy terns, and lizards and skink. The only grey noddy I saw on the island was here.

I set out to the north and passed more tern colonies which grew larger as I neared the forest of *Tournafortia*. Soon there were thousands, the air full of them, the ground near and under the trees black with them. Their eggs were everywhere. And the noise! We had to shout to make ourselves heard above the continuous clamor. I relieved Emory and set to work catching terns. Fifty were banded and we started on toward the north end of the island. Coming to a large pile of guano which dominated the landscape, we climbed up its sides and noticed petrel burrows in the ground. I stuck my hand into one, and pulled out a chick, then put it back. A search of several others brought no luck, and I finally looked into one and saw black tail feathers sticking out. Grabbing them, I pulled out their owner, a strange shearwater, later identified as a dusky shearwater. Another glance into its burrow disclosed its white egg, which I collected. We searched the other parts of the mound without success...



Mr. Munro left me here, returning to camp. I struck out again, toward some coconut palms. Crossing a rough, rocky stretch, I heard the shrill warble of the Phoenix petrel. I turned and saw two of them not far behind, under a clump of wild morning glory vine. I walked over and captured one of them for a specimen.

The coconut palms grew on the banks of a small, brackish pond, fairly deep. While I was resting there, two frigate birds flew over the pond to get a drink, which they obtained by dipping their beaks into the water. Gliding back and forth over the water, they would suddenly dip their bills down and quickly take a draught. They had to be quick about it as the air currents changed and carried them away.

I started up again, and, crossing the pond at a narrow point, climbed up the north bank to look around. The ground ahead showed much evidence of having been worked for guano. There were several large depressions and several pilings of guano dust scattered about. At one of them I scared up a flock of eight curlews, the first I had ever seen. I watched while they walked about with a troubled air, whistling their "kioa", and then standing on a promontory to watch me.

(to be continued)

#### INFANTICIDE IN FRIGATE BIRDS, by Robert W. Phillips

On June 23, 1952, at Midway Islands, north central Pacific, the author and his wife undertook a field trip to Eastern Island in the Midway Group. We had been advised that even though the number of birds on Sand Island (the inhabited island, and largest of the group) far exceeded the number to be found on Eastern, a larger variety was to be found on the latter.

In the course of our expedition we observed an unusual bit of behavior by two separate frigate birds, both females. During the time spent on Midway, there had been no opportunity for close-up photographs of the frigate, and we were understandably elated at the large number of them we found nesting on Eastern. A selection of still shots was made, and in an effort to get an action shot with the movie camera, I irritated a nesting female sufficiently to cause her to leave the nest. As I backed away from the immediate vicinity, the parent made an approach to the nest, almost touching, and then taking off again. At a point directly over the nest, she thrust her head down, as if looking at the egg, before proceeding on her way. She made a circle at an altitude of approximately fifty feet, and then started another approach. The same procedure followed. In all, a total of twelve circuits and passes was made. I decided that my presence prevented her from landing, so I started to move away. As I left, I looked back over my shoulder and saw the parent make one final dive at the nest and pick up the egg in her beak. After carrying it to an altitude of about fifty feet, the egg broke open, and was dropped.

This behavior seemed to be rather irregular, but it was thought that perhaps the bird was attempting to remove the egg to a safer location. I decided to observe another bird. With the exception of the fact that a baby frigate, instead of the egg, was the victim, the circumstances were substantially the same. Later talks with other observers indicated that this behavior was the rule, rather than the exception, and at the time of egg laying, unless prevented by the male, the female will invariably destroy the egg. This period of temporary insanity is apparently of only a few hours duration, after which the female reverts to her usual bad temper.

(Note: comment on this behavior by an interested ornithologist would be welcome.  
Editor



## RECORDINGS OF HAWAIIAN BIRD SONGS

Persons who have had the pleasure of hearing the tape recordings made by Mr. and Mrs. William V. Ward of the songs of birds found in Hawaii will be delighted to learn that they are being transcribed onto phonograph records at Cornell University and soon will be available in Hawaii.

The transcriptions have been made through the cooperation of Dr. Peter Paul Kellogg, and include the songs of ten birds, five on each face of the record. Sale of the records will be handled through E. H. Bryan, Jr., of Bernice P. Bishop Museum (Honolulu 17, T. H.), so that the records may be had at the lowest possible cost by those interested in them in Hawaii.

## SEA BIRDS, RECORD OBSERVATIONS

Robert C. Frohling (Condor, 54:316, 1952) makes a record of his observations at sea, 30 miles from Pearl Harbor, January 10, 1952, of two adult Pomarine jaegers, the pair augmented by nine others before observation ended. They stayed in the wake of his ship until about two miles from Pearl Harbor. The second observation was of a Bonaparte gull at a "sand spit near Kuapa Pond, Oahu", recorded only once before, "on Kauai Island, on March 14, 1891."

We are most grateful for such recording, and hope many will think of doing it.

## NOVEMBER FIELD TRIP

The trip to the booby colony at Ulupau Head is always popular, so it was not surprising to find eight cars--even after consolidation of car-loads--starting up the slope toward the colony, on November 9th.

An estimated three or four hundred boobies were resting in the koa haole as we approached, but they rose in clouds and flew off. A few remained close enough to permit us to examine them closely, and one immature booby circled about us, approaching within a few feet of our heads. Never before have we encountered such mass exodus. They did not return during the period that we remained there. Although there were neither eggs nor young visible, this conduct still seems unusual.

After watching through glasses the distant boobies, and also admiring the flight of both boobies and frigates, we returned to the ponds just inside the entrance of the area. There we observed the stilt and the plover along the way, and the noddy terns that dipped for food into the ponds. One immature gull, possibly a ring-billed, was observed among a flock of plover and turnstone.

By this time our original group had dwindled, but two cars went on to Kaelepulu Pond, being rewarded with the sight of hundreds of ducks, coots, plover, turnstones, and stilts. Most of the ducks were pintails, but among them were shovellers and four baldpate--the last named being the high point of the trip to this observer, a "first" for her.

The count for the day was: Marine Corps Air Station, 5 pintail ducks, uncounted boobies, 3 frigate birds, 5 stilts, 4 turnstones, 8 barred doves, 19 plovers, 1 sparrow, 1 lace-necked dove. Before station, 2 plovers, 4 turnstones, 2 barred doves, 3 rice birds. Field and Sea area, 50 plover and turnstones, Kaelepulu area, uncounted numbers.

Grenville Hatch



# SEMI-PALMATED PLOVER AND BALDPATE ON OAHU.

On September 21, 1952, I observed a semi-palmated plover (Charadrius semipalmatus) at Kaelepulu Pond, Oahu. The completely black bill indicated it was an immature bird. During a visit to the same area on September 28, I again saw a semi-palmated plover, in all likelihood the same bird I had seen the Sunday before.

The semi-palmated plover has never previously been reported from the Hawaiian Islands. (E. H. Bryan, Checklist of Hawaiian Birds, 1941-42; George C. Munro, Birds of Hawaii, 1944.)

Among the numerous pintails I observed 6 baldpates (Mareca Americana), 2 males and 4 females at the above pond on November 2, 1952. According to Munro, op. cit., this species has been reported three times previously from the Hawaiian Islands, the last previous record being January 1940.

Hans Meinhardt.

## DECEMBER FIELD TRIP.

To Aiea trail, December 14th. We hope to have the privilege of being under the expert guidance of Tom Maguire, and to learn more about both plants and birds than we have ever known before. Remember your pencil and note book! Meet at the Library of Hawaii at 8:00 a.m.

## DECEMBER MEETING:

In the staff work room of the Library of Hawaii, on the ewa side, downstairs, Monday, December 15th. This is our annual meeting with election of officers for 1953. We shall also formulate plans for the Christmas count and compare and combine our notes on the Aiea trip.

HAWAII AUDUBON SOCIETY OFFICERS: President, Miss Margaret Titcomb; Vice-President, Mr. Ray H. Greenfield; Secretary, Miss Grenville Hatch; Treasurer, Mrs. Blanche A. Pedley.

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