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Botanical observations on Leeward Hawaiian Atolls

by

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I. Notes on the plants of Kure Atoll

Through the courtesy of the United States Coast Guard and Dr. H. J. Coolidge, the writer was able to visit Kure Atoll from September 12 to 14, 1961. The observations made at this time will serve as a supplement to Dr. Clay's (see ARB no. 78) report. I wish to thank Drs. George Butler, M. D. F. Udvardy, Robert Usinger, and Mr. David Woodside for calling my attention to certain plants.

Since Dr. H. F. Clay visited Kure in October, 1959, a U. S. Coast Guard Loran Station has been constructed there on Green Island. Among the facilities now present on the island are a landing strip paved with crushed coral over asphalt, a series of buildings and a 625 foot radio tower. As a result of the disturbances caused by activities involved in the construction of these facilities and the intentional and unintentional introduction of plants concomitant with such activities, there have been significant changes in the flora and vegetation of the island within the past two years.

All 13 species of vascular plants collected in 1923 by the Tanager Expedition (Christopherson and Caum, 1931) were still growing on Kure during the present visit in 1961. Of the six species first reported by Clay (ARB 78), all but Pluchea odorata were collected. In addition one presumed native species, Phyllostegia variabilis, and 22 species of newly introduced weeds and cultivated plants are here reported from Kure for the first time. Thus the flora now contains 41 species of vascular plants.

The Commanding officer of the Loran Station informed us that approximately 1500 plants for use in landscaping were flown in from Honolulu in March, 1961. Those which have survived are planted in the clearing around the buildings and the tennis court. In addition, Cynodon dactylon has been planted as a lawn grass and appears to be thriving. Another 200 pounds of seed of this species is being sown to create more lawn area. The introduction of more shade tree species is being considered. Some of the weed species were obviously introduced with the plants from Honolulu since they occur either in the cans with these plants or a short distance from the cans and not elsewhere on the island. Other weedy species are at present restricted to road margins or other disturbed areas and may have come in with some of the heavy construction equipment. One plant of Spergularia marina found growing in the middle of the airstrip may well have developed from a seed transported to Kure in the landing gear of some aircraft. This Spergularia is abundant on the margins of the airstrip at French Frigate Shoal, although it has not been reported from Midway.

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During the stay on Kure the larger of the two sand islands was visited. This island is about 400 meters long, 10 to 20 meters wide and reaches a maximum elevation of about one meter. The vegetation consisted of less than a dozen scattered plants of Boerhavia diffusa and one tiny clump of Eragrostis whitneyi var. caumii. Observation of the smaller sand island (50 m. by 10 m.) from a distance of approximately 50 meters revealed no sign of vascular plants. All other species are restricted to Green Island.

Specimens cited below were collected and identified by the author and have been deposited in the herbarium of the Bernice P. Bishop Museum, Honolulu 17, Hawaii. The initials "CHL" identify the author's collection numbers. No specimens of cultivated plants were made. New records are indicated by *.

PANDANACEAE

*Pandanus sp. Variegated variety planted near the living quarters.

GRAMINEAE

Cenchrus agrimonioides var. laysanensis F. Br. Half a dozen clumps in one small area of the central plain, intermixed with Boerhavia and Scaevola. CHL 1912.

*Cenchrus echinatus L. Two plants observed, one near the living quarters, the other near the east end of the landing strip. Both had set large quantities of seed so this plant will probably spread. CHL 1908.

*Chloris inflata Link. Disturbed areas near quarters and on roadsides. CHL 1907.

*Chloris virgata Swartz. Disturbed areas near quarters. CHL 1887.

Cynodon dactylon (L.) Pers. On dunes and beach near radar reflector tower, and used around quarters as lawn grass. CHL 1866, 1884, 1885.

*Digitaria sanguinalis (L.) Scop. Disturbed areas near quarters. CHL 1864.

*Eleusine indica (L.) Gaertn. Disturbed areas near quarters. CHL 1888.

*Eragrostis amabilis (L.) W. & A. Disturbed areas near quarters. CHL 1862.

Eragrostis variabilis (Gaud.) Steud. Fairly abundant in open areas of eastern-central plain. CHL 1868, 1869.

Eragrostis whitneyi var. caumii Fosb. Common in open sandy areas on lagoon side. One clump on the larger sand island. CHL 1861, 1867, 1870, 1893.

Lepturus repens var. subulatus Fosb. Several clumps near radar reflector tower and near east end of plain. CHL 1873.

*Setaria verticillata (L.) Beauv. One plant near the west end of the landing strip. CHL 1906.

CYPERACEAE

*Cyperus rotundus L. A few plants in disturbed areas near quarters. CHL 1905.

PALMAE

*Cocos nucifera L. Seedlings planted near quarters.

CASUARINACEAE

Casuarina equisetifolia L. In addition to the larger trees reported by Clay (ARB 78), several young plants are being grown around the quarters. CHL 1886.

AMARANTHACEAE

Achyranthes splendens var. reflexa Hbd. Here and there on the central plain. CHL 1875, 1894.

NYCTAGINACEAE

Boerhavia diffusa L. Abundant all over Green Island under and around Scaevola bushes and on the central plain. Boerhavia is growing rapidly in recently cleared areas and has covered the albatross runways which were cleared in October 1959. It is growing through the black-top at the east end of the landing strip. About a dozen plants are growing on the larger sand island. CHL 1860, 1876, 1877, 1881, 1882.

CARYOPHYLLACEAE

*Spergularia marina (L.) Griseb. One plant growing in the center of the landing strip, a few others noted along the road leading to the radio tower. CHL 1910.

CRUCIFERAE

Lepidium o-waihiense C. & S. Abundant on the central plain and invading areas recently cleared for installation of radio tower guy wires. CHL 1872.

ZYGOPHYLLACEAE

Tribulus cistoides L. Here and there in the central plain and on roadsides. CHL 1874.

EUPHORBIACEAE

*Codiaeum sp. Cultivated near quarters.

*Euphorbia glomerifera (Millsp.) Wheeler. Weed in cans with cultivated plants near quarters and spreading into open areas nearby. CHL 1863, 1904.

MALVACEAE

*Hibiscus sp. Cultivated near quarters.

*Thespesia populnea (L.) Sol. Cultivated near quarters.

COMBRETACEAE

*Terminalia catappa L. Cultivated near quarters.

APOCYNACEAE

*Nerium oleander L. Cultivated near quarters.

CONVOLVULACEAE

Ipomoea indica (Burm. f.) Merr. Common on central plain. CHL 1880.

BORAGINACEAE

Messerschmidia argentea (L.f.) Johnston. Several trees near eastern tip of island, one on south-central part. CHL 1895.

LABIATAE

*Phyllostegia variabilis Bitter. Two sterile plants were found on the central plain growing in a patch of Boerhavia diffusa and Solanum nelsoni about 100 meters from the tennis courts. The vegetative characters match those of Phyllostegia variabilis, a species previously recorded only from Laysan and Midway. Certain identification, however, awaits the collection of fertile material. CHL 1926.

SOLANACEAE

Solanum nelsoni Dunal. Common around edges of and occasionally in Scaevola thickets on central plain. CHL 1878, 1879, 1898.

Solanum nigrum L. Common on central plain, especially in disturbed areas. CHL 1897.

CUCURBITACEAE

Sicyos hispidus Hbd. Common on central plain. CHL 1899 - 1903.

GOODENIACEAE

Scaevola sericea Vahl. Abundant all over island forming dense thickets from one to three meters high. CHL 1871, 1890, 1891.

COMPOSITAE

*Conyza bonariensis (L.) Cronq. One clump noted near quarters. CHL 1909.

*Emilia javanica (Burm.) Rob. Weed in cans with cultivated plants near quarters and spreading into open areas nearby. CHL 1864.

*Gnaphalium sandwicensium Gaud. Abundant in recently cleared areas around quarters. CHL 1889, 1892.

*Helianthus annuw L. Cultivated near quarters.

Lipochaeta integrifolia (Nutt.) Gray. Common on central plain, moving into disturbed areas. CHL 1911.

*Sonchus oleraceus L. Disturbed areas near quarters. CHL 1883.

Verbesina encelioides (Cav.) B. & H. Several plants near radar reflector tower and spreading onto nearby lagoon beach, with seedlings also present in disturbed areas near quarters. CHL 1896.

The disturbed areas, which are the places where the greatest vegetational changes are to be expected, are of four general types:

a. Margins of roads and landing strip. Boerhavia diffusa has covered most of the margin of the landing strip, with Tribulus cistoides and some of the weedy grasses occurring as scattered individuals. Along the roadsides Boerhavia is somewhat less abundant with a larger proportion of weeds. In one place where a road is cut through a sand dune, Eragrostis whitneyi var. caumii is growing well.

b. Albatross runways. These were cleared in October, 1959. The parts which were not obliterated by the landing strip are now partially to completely covered with Boerhavia.

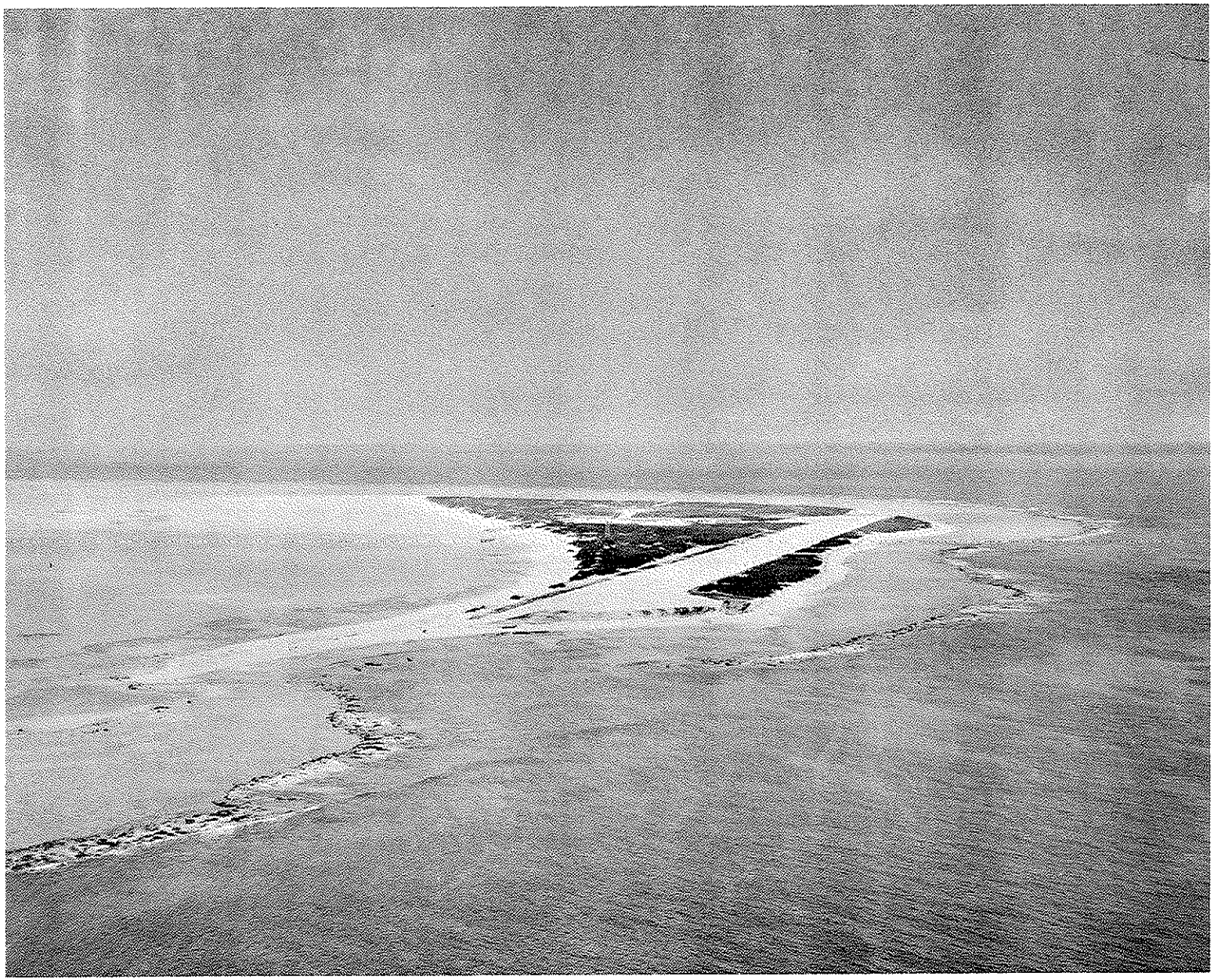
c. Clearings around living quarters. Gnaphalium sandwicensium is extremely abundant in areas where Cynodon dactylon has not been planted. Euphorbia glomerifera, Emilia javanica, Conyza bonariensis, and Eragrostis amabilis were found only here at the time the study was made.

d. Clearing around radio tower. A series of cleared strips a few meters in width radiate out from the base of the tower to the guy-wire anchors. These strips cut through most of the eastern part of the central plain. Boerhavia diffusa, Lepidium o-waihiense, Lipochaeta integrifolia, and Solanum nigrum are moving into these areas.

It is too early to predict the total impact of the recently introduced plants on the indigenous species. However, if no further major construction occurs, most of the indigenous plant species are present in numbers large enough that they do not appear to be in immediate danger. There are two exceptions to this statement, Cenchrus agrimonioides var. laysanensis and Phyllostegia variabilis (if our plant proves to be this species). Cenchrus is no longer to be found on Laysan and has not been collected on Midway since 1902. The few plants remaining on Kure should receive some measure of protection. Phyllostegia is also extinct on Laysan and has not been collected on Midway since 1923. The Kure plant should be watched to verify the determination and should also be protected.

Photo: Green Island, Kure Atoll, view from southwest 1961, showing airstrip and installations.

Photo courtesy of U. S. Coast Guard.



II. Vascular plants of Tern Island, French Frigate Shoal

Through the courtesy of the United States Coast Guard and Dr. Harold F. Coolidge, the author was able to visit Tern Island on September 2, 1961. Since only half an hour ashore was available, during which time a circuit of the island was made, the observations reported here should be considered as "preliminary". I wish to express my appreciation to H. Ivan Rainwater who supplied me with a list of his collections from French Frigate Shoal, and to Dr. V. J. Krajina and Miss Marie Neal who assisted in the identification of the material designated here as Atriplex muelleri.

French Frigate Shoal, about 480 miles northwest of Honolulu, is a crescent-shaped atoll on which are a number of sand islets. A few miles to the southwest are two rock islets, remnants of the original volcanic island. Tern Island, one of the sand islets (23° 54' N. Lat., 166° 19' W. Long.), is now the site of an airstrip and a United States Coast Guard loran station.

The botanical history of Tern Island is brief. The Tanager Expedition in 1923 (Christophersen and Caum, 1931) found five species of vascular plants growing there: Lepturus repens, Chenopodium sandwicheum, (now C. oahuense), Boerhavia diffusa, Portulaca lutea and Tribulus cistoides. During World War II the airstrip was constructed and some time later the loran station was built. H. Ivan Rainwater made plant collections on Tern and other islands in October, 1953. The second published observations were by Svihla (1957), who visited the island in 1956, and reported that the flora consisted of "various grasses", Ipomoea pes-caprae, Scaevola (probably S. sericea although no species was cited), and cultivated plants of Cocos nucifera and Casuarina sp.

Most of the surface of Tern Island is now occupied by the crushed coral airstrip which is 3100 feet long and drops off sharply into the water at the east and west ends. Along the south edge of the airstrip is an unpaved area 10 to 50 meters wide on which the living quarters are located. There is an extensive sandy beach along the south shore. On the north edge of the airstrip the unpaved area is up to 20 meters wide and there are only a few small sandy beach areas. The island is about two meters high. It is likely that little, if any, of the surface of the island was left untouched when the airstrip was constructed (see note p. 10).

The unpaved area south of the airstrip is rather densely covered with shrubs of Messerschmidia argentea and Pluchea odorata, and an herbaceous cover in which the predominant species are Ipomoea pes-caprae, Boerhavia diffusa, Cenchrus echinatus, Setaria verticillata, Sonchus oleraceus, and Conyza bonariensis. Of less frequent occurrence here are Eleusine indica, Lepturus repens, Portulaca lutea and P. oleracea. One large clump of Scaevola sericea is present southwest of the living quarters. Spergularia marina is abundant on the margins of the airstrip. The unpaved area on the north side of the island is less densely vegetated than that on the south. Pluchea odorata is present, but the shrubs are widely scattered. Very few plants of Messerschmidia argentea are present.

The herbaceous species are the same as those on the south except that Tribulus cistoides and Cynodon dactylon are also present on the north. Atriplex muelleri was found only in a single locality at the west end of the airstrip.

Cultivated plants around the Coast Guard quarters include Cocos nucifera, Casuarina equisetifolia, Ficus sp., Coccoloba uvifera, and Plumeria obtusa.

Of the five species noted by Christophersen and Caum (1931) for Tern Island all but Chenopodium oahuense were collected in 1961. The four species named by Svihla (1957) were still present. Fourteen additional species of weeds and cultivated plants are reported here for the first time. The flora now contains 22 species of vascular plants.

While it is impossible to determine the modes of introduction of the weedy species, it seems likely that the seeds of some of these came to the island in the soil which was reportedly brought there from Honolulu (Svihla, 1957). Honolulu was probably the place from which the cultivated plants were obtained. Other weedy species may have reached Tern Island accidentally via construction equipment, aircraft, or personnel. One cannot completely discount the possibility of "natural" dispersal by wind, birds, or ocean currents. However, most of the weedy species were present in the main Hawaiian Islands for many years before 1923, but the species were not found on French Frigate Shoal then. Thus, the weeds appeared there only after man began to make frequent visits.

The specimens cited below are deposited in the herbarium of the Bernice P. Bishop Museum, Honolulu 17, Hawaii. The initials "CHL" identify the author's collections made on September 2, 1961. The initials "HIR" indicate that the species was collected by H. Ivan Rainwater in October, 1953; "AS" indicates the species was collected by Arthur Svihla in February, 1956. The collections of Rainwater and Svihla were not numbered. New records are indicated by *.

GRAMINEAE

*Cenchrus echinatus L. CHL 1661.

*Cynodon dactylon (L.) Pers. CHL 1673.

*Eleusine indica (L.) Gaertn. CHL 1662, AS.

Lepturus repens (Forst.) R. Br. var repens. CHL 1668, 1674, HIR, AS.

*Setaria verticillata (L.) Beauv. CHL 1669, 1670, HIR, AS.

PALMAE

Cocos nucifera L. (Specimens not collected).

CASUARINACEAE

Casuarina equisetifolia L. CHL 1651.

MORACEAE

*Ficus sp. CHL 1659.

POLYGONACEAE

*Coccoloba uvifera (L.) Jacq. CHL 1660.

CHENOPODIACEAE

*Atriplex muelleri Benth. CHL 1654, HIR.

NYCTAGINACEAE

Boerhavia diffusa L. CHL 1671, 1675, HIR, AS.

PORTULACACEAE

Portulaca lutea Sol. CHL 1667, HIR.

*Portulaca oleracea L. CHL 1666.

CARYOPHYLLACEAE

*Spergularia marina (L.) Griseb. CHL 1663.

ZYGOPHYLLACEAE

Tribulus cistoides L. CHL 1652, HIR, AS.

CONVOLVULACEAE

Ipomoea pes-caprae (L.) Sw. CHL 1658, HIR.

APOCYNACEAE

*Plumeria obtusa L. CHL 1650.

BORAGINACEAE

*Messerschmidia argentea (L.f.) Johnston. CHL 1653, HIR.

GOODENIACEAE

Scaevola sericea Vahl. CHL 1656, HIR.

COMPOSITAE

*Conyza bonariensis (L.) Cronq. CHL 1655, 1665.

*Pluchea odorata (L.) Cass. CHL 1657, 1672, HIR, AS.

*Sonchus oleraceus L. CHL 1664, AS.

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Atoll Research Bulletin 51: 1-2, 1957.

Note -- The statement on p. 7, "It is likely that little, if any, of the surface of the island was left untouched when the airstrip was constructed," has recently been confirmed by Dr. Vernon E. Smith of Kaneohe, Hawaii. Dr. Smith tells me that he spent several days on Tern Island in 1948, at which time he did not observe any higher plants growing on the island.