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5th Floor, Hunt Library
Carnegie Mellon University
4909 Frew Street
Pittsburgh, PA 15213-3890
Telephone: 412-268-2434
Email: huntinst@andrew.cmu.edu
Web site: www.huntbotanical.org

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The Hunt Institute for Botanical Documentation, a research division of Carnegie Mellon University, specializes in the history of botany and all aspects of plant science and serves the international scientific community through research and documentation. To this end, the Institute acquires and maintains authoritative collections of books, plant images, manuscripts, portraits and data files, and provides publications and other modes of information service. The Institute meets the reference needs of botanists, biologists, historians, conservationists, librarians, bibliographers and the public at large, especially those concerned with any aspect of the North American flora.

Hunt Institute was dedicated in 1961 as the Rachel McMasters Miller Hunt Botanical Library, an international center for bibliographical research and service in the interests of botany and horticulture, as well as a center for the study of all aspects of the history of the plant sciences. By 1971 the Library's activities had so diversified that the name was changed to Hunt Institute for Botanical Documentation. Growth in collections and research projects led to the establishment of four programmatic departments: Archives, Art, Bibliography and the Library.

cum group," is mainly coastal, and bears greenish yellow flowers and an inferior ovary. The latter is obviously represented by Santalum ellipticum Gaud., s.l. This inhabits all islands, rather typical plants growing below Diamond Head lighthouse in Honolulu and at Kaena Point, Island of Oahu. On the Island of Hawaii this widespread species is represented by forma annectens Degener and var. luteum (Rock) Degener. The more aberrant of this S. ellipticum group on this island are S. paniculatum Hook. & Arn., and S. pilgeri Rock. The latter is a commercially valuable timber tree of the rainforest once centering about Hualalai, but now on the verge of extinction.

Santalum paniculatum is a spreading, twiggy tree usually two to three meters tall, with yellowish coriaceous leaves. It grows most abundantly near Kilauea Military Camp. As this area is within the confines of Hawaii Volcanoes National Park, this interesting species is being spared from annihilation.

While concentrating on the distribution of Wikstroemia taxa, we came across a single, strange sandalwood growing in a scrubby forest punctuated here and there with Metrosideros trees, trees nonspecific with Australian ones. This area is northeast of Glenwood and, as the crow flies, about ten miles distant from the nearest typical S. paniculatum that we know. Though as tall as some trees of S. pilgeri, it is not closely related to this distant species. In spite of being much taller than any S. ellipticum s.l., and S. paniculatum ever observed, we judge it to be a variety of the latter and worth recording as follows:

SANTALUM PANICULATUM var. CHARTACEUM Deg. & Deg., var. nov. Arbor 10 m. alta, foliis chartaceis.

Differing from the species in attaining a height of 10 meters rather than 2-3, and bearing chartaceous rather than coriaceous leaves.

SANTALUM PANICULATUM var. CHARTACEUM Deg. & Deg.

Otto & Isa Degener

Two distantly related groups of Santalum are native but not endemic to the Hawaiian Archipelago. One, called the "freycinetianum group" by *Skottsberg, is more montane, and bears claret colored flowers and a half superior ovary; S. freycinetianum Gaud., and S. haleakalae Hillebr., are beautiful examples. The other, called the "ellipti-

Dorothy Powers photo

Santalum haleakalae Hillebr.

Do Not close up gap in Centerfold

Type Locality: Deg. & Deg. 32,769. Fern Forest Estates, east of Belt Road, Puna, Hawaii. Scrubby Metrosideros forest at 2,000 feet. June 5, 1972. Type at N.Y., 12 cotypes elsewhere.

As many owners of this subdivision are having their lots bulldozed clean of the endemic forest to replant them with Psidium guajava L., for an anticipated jam, jelly and juice industry, this interesting taxon may not survive many more years. We therefore show a photograph of its habit of growth. It is the largest tree above the front tire of the jeep.

*Skottsberg in Bull. B.P. Bishop Mus. 43:41. 1927.

MYRSINE, RAPANEA AND SUTTONIA
Degener & Degener

"Phytologia" is a technical magazine published at irregular intervals in an edition of 250 copies, which are mailed to about that many institutions. Frequently, however, reprints of articles are distributed privately by individual authors to select correspondents. Thus about 350 copies were scattered throughout the World of Degener, O., & I. "Numata & Asano, 'Biological Flora of Japan and Remarks about Paederia, Phryma, Rabdosia, Rapanea, Sigesbeckia & Vitex.' Phytologia 22(3):210-214. 1971." Because of the cryptic title few local workers realize that we Degeners have altered the scientific names of over a dozen Hawaiian koleas. We shall not repeat ourselves as copies of "Phytologia" are available for study at local museums and colleges. At least we wish to add a few pertinent remarks for Newsletter readers:

During the present Century various writers have relegated the Hawaiian koleas to either Myrsine, Rapanea or Suttonia. We have long championed the second, one of us giving some reasons in the Flora Hawaiiensis as early as April 21, 1939. In fact, Rapanea Aubl., (1775) we consider a genus synonymous with Suttonia A. Rich., (1832) and quite different from the predominently African Myrsine L. (1735, 1737). To quote Dr. A.C. Smith briefly (Journ. Arn. Arb. 54:278. 1973.): "Actually, in Myrsine (sens. str.) the filaments are connate into a tube that is only proximally adnate to the corolla-tube, being dorsally free from the corolla and distally produced into obvious filaments. In Rapanea the filament-tube has lost its identity by a complete fusion with the corolla-tube, there is no 'flange' (i.e. free filament-tube), and the anthers appear essentially sessile on the corolla-throat." Our koleas fit the latter description.

We have named a kolea endemic to Kauai Rapanea helleri Deg. & Deg. (Phytologia 22(3): 213. 1971.). In the introduction of his "List of Flowering Plants in Hawaii" (1973), Dr. St. John states that "The acceptance of the species in this summary has been based, either upon herbarium specimens, or upon acceptable published records. The botanical judgament on these has been that of the author." Thereupon the author on page 268 upholds Myrsine hosakai Wilbur, R.C. (Nomenclatural Notes on the Hawaiian Myrsinaceae. Pac. Sci. 19(4): 522. 1965.), and relegates Rapanea helleri Deg. & Deg., to synonymy. This must be an oversight as Dr. Wilbur's binomial for the Kauai plant has no standing whatsoever. This very same name was because of rules of priority

NECROLOGY

Felix J. Widder, retired Director of the Institute for Systematic Botany and of the Botanical Garden of the University of Graz, Austria, died by accident in his eighty second year September 5, 1974. Dr. Widder, among major interests, has grown and studied seeds of Xanthium from Fiji and Hawaii. He has accumulated by purchase and gift since 1945 thousands of herbarium specimens from these two archipelagoes for his institutions. His action thus helps prevent repeating the tragic mistake Hillebrand made when he placed "all his eggs in one basket," donating his entire collection to Berlin shortly before his death July 13, 1886. Thus, during World War II bombing of the Museum Building by U.S., 'planes Hillebrand's Phanerogams were destroyed in the holocaust. Only the Lobeliaceae, at that time on loan to F.E. Wimmer (1881-1961), in Vienna, His Pteridophytes escaped destruction, having been among the first plants to have been sent away from Berlin for a safe asylum. Had Hillebrand collected ample duplicate material for distribution to numerous scattered institutions, later workers would not be so often perplexed precisely which of his scientific names and descriptions in his magnificent Flora belong to which taxa we now collect. With types destroyed, This confusion would have been avoided by the study of Cotypes. Widder's accumulation of cotypes studied by more recent monographers is a distinct service to the Science of Botany.

FLOTSAM AND JETSAM OF CANTON ATOLL, SOUTH PACIFIC

Otto & Isa Degener

Canton, a Pacific Ocean atoll lying between latitude 2° 46' and 2° 52' S., and longitude 171° 37' and 171° 44' W., is the most northern of eight low coral islands comprising the Phoenix Group. Resembling a pork chop in shape, it is about eight miles long, and has its longer axis lying roughly from its narrower eastern end to its four miles wide western end (fig. 1). The atoll consists of a rim 150 to 1,800 feet wide enclosing a shallow lagoon of about 25 square miles. The greatest elevation of the island is twenty feet.

Evidently built around a volcanic core, the atoll consists mainly of the calcareous skeletons and shells of invertebrates, fragments of coralline algae, and a few vertebrate skeletons. All have been comminuted into sand and powder, andor cemented into vast stretches of calcite. These last rim the island and are worn smooth by the waves washing back and forth over them with scouring material. The dry atoll rim of calcite fragments, sand and powder is more or less glued together by felt-like or gelatinous films of numerous genera of blue-green algae (Degener & Degener 1959). Bird excrement, hardly guano, accumulates under the rookeries of booby and frigate birds nesting preferably on scaevola bushes (Murphy et al., 1954; fig. 2). Rare areas of humus may be found in patches of forest, the result not only of fallen twigs and leaves, but from accumulated excrement of the terrestrial hermitcrab Coenobita perlatus. Some of this earth, an estimated collection of 1,000 years, may be four inches deep.

The atoll was of little importance until Pan American World Airways began to use it as a refueling station in 1939 for aircraft on Honolulu-Auckland flights. As both Great Britain and the United States laid claim to this flat area, the controversy was amicably settled April 6, 1939 by agreement to administer the atoll jointly as a condominium for fifty years and "thereafter until such time as it may be modified or terminated by mutual consent." With outbreak of World War II, Canton became the hub of Pacific air movement by United States Military Forces. In 1942, with 1,143 Army personnel stationed there, it was used for antisubmarine search and photographic reconnaisance missions. A year later it was the main base for the conquest of the Gilbert Islands from the Japanese. By 1950 commercial activity was at its zenith, with four major airlines involved and a resident force of about 300 Americans and British.

With continuous improvement in airplanes, the importance of Canton as a refueling station waned. The last scheduled commercial stop was in 1959. That same year the National Aeronautics and Space Administration (NASA) selected Canton as Project Mercury Tracking

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by

Otto & Isa Degener, Charles R. Gunn & John V. Dennis

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With continuous improvement in airplanes, the importance of Canton as a refueling station waned. The last scheduled commercial stop was in 1959. That same year the National Aeronautics and Space Administration (NASA) selected Canton as Project Mercury Tracking Station Number 11, and for a few years until 1966 to support the astronauts in Project Gemini. During 1968 the Government of American Samoa was permitted to salvage whatever it wanted from deactivated installations. In 1970 the atoll became a Space and Missile Test Center, serviced by United States personnel, many being Samoans (Rickett 1971 for details and references).

As Botanical Consultant for Canton Atoll for the Civil Aeronautics Administration (CAA), Otto Degener explored and worked on the atoll for a week in July 1950 and for six weeks in April-May 1951. He and Isa Degener then continued study of the atoll for about three weeks in February-March 1958.

Canton has been under the scrutiny of many scientists practicing diverse disciplines. According to the entomologist van Zwaluwenburg (1942) on Canton "Between December 1940 and February 1941 there were some weeks of strong westerly winds which attained a velocity of 55 knots. The effect of these prolonged gales on the normal ocean currents, though temporary, must have been considerable. Drift-borne seeds were absent or at least inconspicuous on the Canton beaches the year before, but by August they were a striking feature of the shore line everywhere. It is assumed that their presence is a result of the gales of the previous winter." He forthwith mentions what he considers to be Myristica sp., Entada scandens, Inocarpus edulis, Mucuna spp. (4),

Caesalpina crista, Canarium sp., Barringtonia speciosa, Terminalia catappa, Cerbera odollam, unidentified spp. (3), Alenrites moluccana, Pandanus sp., and viable Cocos. "Seeds of many of the species listed had sprouted after stranding. Between 35 and 50 coconut sprouts were estimated to be still present in September along the entire 27-mile perimeter of the island, but these were only a fraction of the total number of coconuts cast up. Some of the hazards attending the survival of seedling plants from drift seeds are obvious (Opeophila olivieri Owen [C. perlatus]) shred the husk of coconuts and eat out the contents of the sprouted nuts; flood tides drench many seedlings with sea water; in at least one case high water buried a sprouted palm deep in sand. So the complete failure of any of the above named plant species to become established on Canton in the past - - - is not surprising when, to the hazards already mentioned, are added the inevitable recurrent shortages of rain."

When the ~~writers~~ we visited the island in the winter on 1957-58, ~~they~~ we similarly found on its beaches great accumulations of floated debris, mostly wood (fig. 3), fruits and seeds (fig. 4) reminiscent of the situation mentioned by van Zwalusenburg. Such objects, often with superficial scrutiny, can be identified to the genus; and, particularly fruits and seeds, to the species. For the specific determination of thousands of puzzling Canavalia seeds, however, considerable space in a garden is needed to raise them so that the plants can be identified by study of flowers, legumes and seeds. ~~The writers~~ We lacked such space. Nevertheless, one questionable Canton seed collected in 1958 and planted in ~~their~~ our garden at Mokuleia Beach, Oahu, Hawaii, is now a 50 foot tall Hernandia peltata Meissn. Though hundreds of seeds of Erythrina were collected on Canton, only a few were planted in the garden. One, allowed to flower and fruit, was E. variegata var. orientalis (L.) Merr. Becoming too large and beginning to buckle a house foundation, it was chopped down. Its larger limbs and its trunk segments, rolled to the beach for disposal,

soon struck root and sprouted. This species evidently can colonize isolated islands not only by seed but by trunk fragments. With facilities to plant a thousand Canton seeds of Erythrina and a thousand of the very variable seeds of Canavalia, many as yet undescribed taxa might have been discovered.

As many representative propagules were collected, chiefly along the north shore, as the expense of shipping them home permitted. Numbered voucher specimens have been deposited at the New York Botanical Garden (NY) with unicates and smaller collections at the University of Massachusetts (MASS), Berlin (B), Kew (K), Bishop Museum (BISH), Arnold Arboretum (A), Cornell (BH, CU) Geneva (G), Munich (M), Smithsonian (US), St. Louis (MO), United States Department of Agriculture (USFS), Vienna (W) and elsewhere. Many of these specimens have been so efficiently filed away taxonomically that it is impracticable to reassemble them to ascertain their herbarium numbers. The writers succeeded in identifying most of the dissominules themselves. Dr. R. Melville independently identified many of the numbers they had identified and, in addition, many were unknown to us; and so did likewise Dr. Charles R. Gunn, Mr. John V. Dennis and Miss M. H. Stone.

Intrigued by a 1968 article by Dr. Gunn about stranded seeds and fru along Florida's shore, we dusted off our old notes, photographs and the few specimens remaining to us. We then prepared the present paper, with editorial suggestions from Gunn and Dennis. Two companion papers should follow: one, under authorship of Degeners, Gunn and Dennis, should describe and illustrate the Canton Atoll material in some detail; while the other, under authorship of Gunn and Dennis, might concentrate on wind and ocean currents in the Pacific, and buoyancy.

The following list[illegible] what the writers believe we collected on Canton. As the identification of certain propagules - especially of Canavalia, Erythrina, Mucuna, Terminalia - is difficult or impossible unless

these can be grown to produce identifiable flowers, the list is a tentative one. Some of the specimens bear Degener & Degener collection numbers.

Cycadaceae: Cycas circinalis L., D. & D. 24,668.

Podocarpaceae: ?Podocarpus elongata L'Herit.

Pandanaceae: Pandanus spp.

Palmae: ?Borassus, D. & D. 24,625; Cocos nucifera L.; Nypa fruticosans Wurmb., D. & D. 24,692.

Taccaceae: Tacca leontopetaloides (L.) Kuntze.

Casuarinaceae: Casuarina equisetifolia Forst.

Fagaceae: Quercus bonnettii Mic., D. & D. 24,683.

Olacaceae: ?Ximenia americana L.

Cassythaceae: Cassytha filiformis L.

Hernandiaceae: Hernandia nymphaeifolia (Presl) Kubitzki; H. peltata Meissn., and/or some similar species, D. & D. 24,697, 24,702.

Chrysobalanaceae: Parinari glaberrima Hassk.

Leguminosae: Canavalia cathartica Thouars, D. & D. 24,675; C. micropiper (DC.) Piper; C. spp., many taxa, some probably new; Cynometra sp.; Dioclea reflexa Hook. f., D. & D. 24,684, 24,975; D. violacea Mart., D. & D. 24,671; D. spp.; Entada phaseoloides (L.) Merr., and/or related spp., D. & D. 24,628, 24,629; Erythrina variegata var. orientalis (L.) Merr., and/or other spp., D. & D. 24,669; Gallandina crista (L.) Small; Intsia (Afzelia) bijuga (Colebr.) Kuntze, D. & D. 24,687; Mucuna gigantea (Willd.) DC., D. & D. 24,670; M. cf. gigantea, D. & D. 24,682; M. ?raikei Warb., D. & D. 24,681, 24,974; M. spp. D. & D. 24,667; Pongamia pinnata (L.) Merr.; Sophora tomentosa L., D. & D. 24,706; Strongylodon lucidus (Forst. f.) Seem. (or perhaps S. pseudolucidus), D. & D. 24,691.

Guttiferae: Calophyllum cf. decumanum Gaertn., D. & D. 24,620; C. spp., D. & D. 24,620; C. spp., D. & D. 24,676, 24,694.

C. inophyllum Gaertn. D. & D. 24,626

Meliaceae: Xylocarpus (Carapa) moluccensis (Lam.) Roem., (Globular fruit

Euphorbiaceae: Aleurites moluccana Willd., D. & D. 24,686; Aleurites sp. nov.? with walnut-shaped seed, D. & D. 24,627; Hevea brasiliensis (HBK) Muell-Arg.; Hippomane mancinella L., D. & D. 24,699.

Anacardiaceae: Spondias cytherea Sonner., (or perhaps doubtfully distinct S. dulcis), D. & D. 24,672.

Rhamnaceae: Colubrina cf. asiatica Brongn. (Seeds rather small.)

Tiliaceae: Triumfetta procumbens Forst.

Malvaceae: Pariti tiliaceum (L.) Britt.; Thespesia populnea (L.) Soland.

Bombacaceae: ?Ochroma sp.

Sterculiaceae: Heritiera littoralis Dryand.; Melochia sp.

Guttiferae: Calophyllum inophyllum L., D. & D. 24,680.

Flacourtiaceae: Pangium edule Reinw., D. & D. 24,677.

Sonneratiaceae: Sonneratia sp.

Lecythidaceae: Barringtonia speciosa (L.) Kurz.

Combretaceae: ?Lumnitzera; Terminalia cf. catappa L., D. & D. 24,673; T. spp., D. & D. 24,668, 24,674, ?24,975?

Sapotaceae: Palaquium sp.; Sapotaceae ? D. & D. 24,693.

Apocynaceae: Cerbera manghas L.

Convolvulaceae: Ipomoea pes-caprae var. emarginata Hall. f., D. & D. 24,679.

Boraginaceae: Cordia subcordata Lam., D. & D. 24,578; Messerschmidia argentea (L.f.) Johnston.

Verbenaceae: Clerodendrum inerme (L.) Gaertn.

Rubiaceae: Guettarda speciosa L., D. & D. 24,678; Morinda citrifolia L.

Apocynaceae: Ochrosia cf. oppositifolia (Lam.) K. Schum., D. & D. 24,698.

Goodeniaceae: Scaevola sp.

Compositae: Wedelia biflora (L.) DC.

Because drift logs had housed shipworms of various genera (Banksia sp.; Martensia spp.; Teredo bensoni, T. clava, T. samoaensis) and some goose barnacles (Lepas anatifera), nearly a hundred wood samples were collected.

These were shipped to the late Dr. Charles H. Edmondson for his studies of wood-fouling organisms. Even logs of balsa, Ochroma Pyramidale (Cav.) Urb., an American species, were found. These were conspicuous from other dicotyledonous wood by being practically free of shipworms and entirely free of goose barnacles. This freedom of organisms on floating balsa is due more to the remarkable lightness of the wood than to any other factor. Balsa wood practically floats on the ocean surface and, with the slightest breeze, the wet surface is lifted out of the water and exposed to the drying air. Hence this wood, as a whole, is simply too dry to sustain marine organisms.

In chopping drift logs for the pallets and shells, so necessary for the identification of shipworms, the writers came across several colonies of termites, such as Coptotermes formosana hitherto unrecorded from Canton. These insects appeared to have drifted to the atoll. It seems reasonable that wood boring insects can survive ocean transportation within a tree trunk as time is not always sufficient for wood to get waterlogged through and through. Though not in a position to offer proof, it is possible for a knothole in a tree to seal over so that the enclosed cavity will house propagules of animals and plants: eggs, cysts, the aestivating or hibernating animals themselves, spores, seeds, fungus hyphae, etc. Such a drifted log, cast upon a sun scorched beach and there decaying, would eventually liberate such propagules into such an unfavorable environment that most would succumb. But another factor promoting survival and colonization not only for "knothole migrants" but for drift fruits and seeds enters the picture.

Living at the beach on the northern Oahu, Hawaiian Islands, and having had their home and garden devastated by the tsunami or "tidal waves" of April 1, 1946 and March 9, 1957, the writers were overwhelmed by one truth. Tsunami are frequent and of enormous effect, pushing drift of all kinds a few feet to hundreds of feet inland from the inhospitable beach to often

humus soil and loam. Such action of the tsunami is on a wholesale scale, entire coastlines usually totaling thousands of miles being affected.

For some years after a tsunami the writers eradicated seedlings of the wild, endemic naupaka kai (Scaevola sericea var. fauriei (Lévl.) Deg. & Deg.) and of the exotic seagrape (Coccoloba uvifera (L.) L.) that continued to sprout in their flower beds 200 to 300 feet inland from the stands along the beach. Similarly, on the south shore of Oahu, some years after the tsunami of 1946, Mr. Walter Mayer showed them healthy plants of the locally rare endemic taxon of Colubrina asiatica (L.) Brongn., that had sprouted from the elevated windrow of debris cast up in his garden.

Anyone who has seen the hard-shelled eggs of geckos glued in holes and crevices of coconut and other logs along the beach will have an explanation - perhaps the true one - for the wide distribution of such reptiles.

Islands surrounded by great deeps with icy cold water even in the tropics, are beyond reach of most nonswimming, aquatic organisms unless they have a pelagic stage of some duration in their life. If these do not reach the completely isolated island via floating logs or larger propagules, a rare but effective means of transportation may be available. In studying the beaches of Canton the Degeners have come across quantities of gray to almost black blocks of pumice, and occasionally the shells of the pearly nautilus and the cuttlebone of the octopus. A random glance at dark pumice and more careful inspection of pale nautilus and cuttlebone occasionally discloses the white of coral and the calcareous housing of marine worms. Such types, and many others, may well have reached Canton waters mature enough to reproduce their kind before being washed upon the beach to die. We wish to emphasize that electric light bulbs, garbage and other waste matter of Caucasian and Oriental civilizations, so common to many beaches, are conspicuously absent on Canton. Outstanding artifacts were several outrigger canoes and a ~~fffffff~~ primitive paddle. Residents claim that one canoe, definitely hollowed out with a stone adz, is of African

origin. Study of a wood fragment, never collected, would have decided such claim.

They are just bugs (Hemiptera, Family Veliidae); but to us, pathetic ones all the same. Just beyond where the strongest waves lap the beach, among foam, sand and coral blocks of various sizes, clumsily and weakly hop exhausted marine waterstriders (Halobates micans). They are black above, perhaps for desired warmth; pale bluish below to be camouflaged against attack by hungry fish fry looking upward from below. They are only a few millimeters long. Agile skaters on the surface film of ocean water, like their relatives on fresh water of American brooks and ponds, they are helpless when thoroughly wetted during a storm or when blown unsuspectingly by the trade winds and swept by the breakers onto shore. They are out of their element and here they die. Though living on the vast expanse of the ocean, they are no more water creatures than are the frigate birds flying overhead. This insect, to survive from generation to generation, must find a chance piece of driftwood, seed, pumice or even floating feather upon which to lay its eggs; while the bird and the sea turtle must find an island like Canton to lay theirs. These waterstriders, we believe, had been swept along the surface of the ocean like the fruits and seeds by gale force winds rather than washed by ocean currents to pile up on the beach.

Due to a spell of rainy weather germination of more or less salt freed seeds was so successful that the beach showed a narrow, faint line of green extending for many miles, a condition unknown to any resident of the time. In this line of drift not a single Canton species was noticed except Cassytha filiformis, Triumfetta procumbens and Cordia subcordata. As these propagules were wave worn, we believe them not of local origin.

The sea hearts (Entada phaseoloides s.l.), with large expanded cotyledons, a few leaves and a slender stem elongating vainly for a support to climb, were already beginning to suffer in February from the strong drying salt breeze. Not one became established. Thousands upon thousands of seedlings

of the beach morning-glory (Ipomoea pes-caprae var. emarginata) with stiff, thick, green, deeply notched cotyledons horizontally akimbo, were being daily eaten by the hermitcrab (C. perlatus), known in the vernacular as "Bernard." Various Mucuna species, probably rich in the poison L-dopa, were germinating merely to fall prey to these hungry hermitcrabs. Of the myriad viable seeds that braved the ocean for unknown weeks and months without succumbing before landing on Canton shores, we failed to see a single successful introduction. This atoll simply does not offer conditions fit for survival of phanerogams excepting for the trees Cordia subcordata and Messerschmidia argentea (fig. 5), the vines moonflower (Calonyction tuba) and lovevine (Cassytha filiformis), and thirteen other shrubs and herbs (fig. 6). These natives are described in Degener & Gillaspy (1955) and Degener & Degener (1958). Should certain kinds of seeds be washed farther inland by a tsunami where shelter and favorable soil conditions would permit such adventives to establish themselves, they would be soon destroyed by the hermitcrabs. These congregate under bushes and trees during the heat of the day, while at other times they roam over the atoll greedily scavenging in search of food (figs. 7, 8).

Of individuals who have been on Canton, we wish to acknowledge the help of Island Manager Edwin Gillaspy and Mrs. Gillaspy; Mr. & Mrs. Albert Lincoln, well-informed residents and malacologists; and Dr. L.H. MacDaniels, who analysed the soil and water of Canton many years ago. For additional information touching diverse aspects of the atoll, the reader is advised to consult Murphy, Niedrach & Bailey (1954), and their bibliography compiled by E.H. Bryan, Jr., of about seventy items published between 1862 and 1954; and the following bibliography of additional pertinent items:

BIBLIOGRAPHY

Van Zwaluwenburg, R.H. 1942. Notes on the Temporary Establishment of Insect and Plant Species on Canton Island. Haw. Planters' Record 46:49-52.

Degener, O., & W.H. Hatheway. 1952. Die Flora des Cantonatolls im Stillen Ozean. Rev. S. Amer. (Montevideo) 10:33-37.

Degener, O., & F.R. Fosberg. 1952. A Central Pacific Scsuvium. Occas. Pap. Bish. Mus. 21:45-47.

Hansen, I. [Mrs. O. Degener], & E. Potztal. 1954. Beiträge zur Anatomie und Systematik der Lepturoae. Bot. Jahrb. 76:250-270.

Murphy, R.C., R.J. Niedrach & A.M. Bailey. 1954. Canton Island. (Denver) Mus. Pict. 10:1-78.

Fosberg, F.R. 1955. Pacific Forms of Lepturus R. Br. (Graminoae). Occas. Pap. ~~B.P.~~ Bish. Mus. 21:285-294.

Degener, O., & E. Gillaspy. 1955. Canton Island, South Pacific. Atoll Res. Bull. 41:1-51.

Bryan, E.H., Jr. (Oct. 5) 1955. Marine Shells Collected by Otto Degener on Canton Island. Haw. Shell News 3(12):1-4.

Van Zwaluwenburg, R.H. 1955. The Insects and Certain other Arthropods of Canton Island. Atoll Res. Bull. 42:1-11.

Hatheway, W.H. 1955. The Natural Vegetation of Canton Island, an Equatorial Pacific Atoll. Atoll Res. Bull. 43:1-9.

Degener, O., & I. ~~Degener~~. 1958. The Hawaiian Beach Scaevola (Goodeniaceae). Phytologia 6:321.

Degener, O., & I. ~~Degener~~. 1959. Canton Island, South Pacific (Resurvey of 1958). Atoll Res. Bu ll. 64:1-24.

Dawson, E.Y. 1959. Some Marine Algae from Canton Atoll. Atoll Res. Bull. 65:1-6.

Bickett, R.D. (Jan. 11) 1971. Two Flags Over Canton. 1-11. Space & Missile Test Center. Vandenberg Air Force Base, Calif. (Includes bibliography of 22 items, chiefly military and political.)

Degener, O., & I. ~~Degener~~. Nos Despojos del Mar del Atolon de Canton Pacifico. Bol. Soc. Haw. Hist. Nat. y pro Nat. 4(8):15-18. (1973.)

The above references apply to Canton Atoll in the Pacific; the following applies to Florida, off the Atlantic:

Gunn, C.R. (March-April) 1968. Stranded Seeds and Fruits from the Southeastern Shore of Florida. N.Y. Bot. Gard. Journ. 43-54.

Degener O., & I. Lepturus Pilgerianus versus L. Repens. Newsl. Haw. Bot. Soc. 12(5): 31. (1973.)

DEGENERS' LEGENDS FOR FLOTSAM

Figure 1. Canton Atoll (After Hatheway 1955)

Figure 2. Frigate bird rookery amid scaevola bushes

Figure 3. Driftwood and Barringtonia fruits, etc.

Figure 4. Fruits, seeds and seedlings

Figure 5. Messerschmidia argentea, a favorite shade tree for the terrestrial hermitcrab (C. perlatus) to rest during heat of day. (Degener & Rasche photo)

Figure 6. Native phanerogamic vegetation consists of seventeen species only: Digitaria, Eragrostis, two of Lepturus, Boerhavia, Sesuvium, Portulaca, Cassytha, Tribulus, Suriana, Triumfetta, Sida, Pemphis, Calonyction, Cordia, Messerschmidia and Scaevola

Figure 7. Hermitcrabs enjoying their siesta (Degener & Rasche photo)

Figure 8. Hermitcrabs roaming over atoll in search of food

(5 pages mailed Lynn 1/3/72)

FLOTSAM AND JETSAM

With a little poetic license we consider the above title appropriate for material floating helterskelter on the surface of the ocean, and for the same material after it has been cast upon the shore.

Measured in geological time it happens continually; measured in ephemeral man's sense of time, "During last winter the beaches of Canton Island in the Phoenix Group experienced completely unprecedented masses of floating debris."

Most of this debris consisted of logs, fruits and seeds. Of such material we took unfortunately only as many samples as the expense of shipping it home or to the museum permitted. Hundred times as much should have been salvaged as the identification of such plant material is possible, indeed at some cost and time, and if of great practical as well as academic importance. These thousands of Canton logs, fruits and seeds are as definite in wood structure as the finger prints of individual men. Thus they are just like so many drift bottles set afloat by the hydrographic office to assemble data on ocean currents in the Pacific.

Because the logs had housed shipworms of various genera (see page), with a few deft strokes of a hatchet, we collected nearly a hundred wood samples. These we shipped posthaste to Dr. Edmondson for his studies of wood-fouling organisms, begun years ago under Navy auspices. Even logs of balsa, an American plant, were found. These were practically free of shipworms and entire free of goose barnacles (Lepas ?), the former so common on other kinds of dicotyledonous woods. We ascribe this freedom from organisms of floating balsa more to the remarkable lightness of the wood rather than to any other factor. Balsa wood practically floats on the ocean surface and, with the slightest breeze, the wetted surface is lifted out of the water for exposure to the drying air. Hence the wood as a whole is simply too dry to sustain marine organisms.

They are just bugs, but to us pathetic ones all the same. Just beyond where the strongest waves lap the beach, among foam, sand and coral blocks of various sizes, clumsily and weakly hop exhausted marine water-striders (Halobates micans). They are black above, perhaps for desired warmth; pale bluish below to be camouflaged against attack by hungry fish fry looking upward from below. They are only long. Agile skaters on the surface film of the ocean, like their relatives on that of fresh-water brooks on the Mainland, they are helpless when once thoroughly wetted or blown unsuspecting by the trades and swept by the breakers onto land. They are out of their element and here they die. Though living on the vast open spaces of the ocean, they are no more water creatures than are the frigate birds flying overhead. The insect, to survive as a race, must find a chance piece of driftwood, pumice or even floating feather upon which to lay its eggs; the bird, an atoll like Canton.

Some zoologists, finding for example the same kind of land snail on a continent as well as on an oceanic island, postulate the former existence of a land bridge connecting the two. The snail's ancestors, they maintain, generation after generation peu à peu thus reached the future island. This may be true in certain cases, as with the tortoises of the Galapagos. But if we were to explain the countless instances of disjuncted distribution of animals by land bridges, the ocean would show subaquatic mountain ranges like a network of rail and air transportation in a populous country. Submarine mapping does not show this to be true. For most cases, therefore, we must find another explanation for dispersal.

In our chopping of about a hundred drift logs for the pallets and , so necessary for the identification of shipworms, we came across several colonies of termites, such as Coptotermes formosana hitherto unrecorded from Canton. These insects may not have drifted to Canton, but we see no reason why they could not have done so. Nor does it seem unreasonable that woodboring insects can survive ocean transporta-

tion within a tree trunk as time is not always sufficient for it to get waterlogged through and through. Though we are not in the position to prove it ever happened, we believe it quite possible for a knothole in a tree to seal over containing, in the cavity beneath, propagules of animals and plants: eggs, the aestivating or hybernating animals themselves, spores, seeds, fungus hypae, etc. Eventually the tree would decay, liberating the prisoners on virgin territory. One such successful immigration of a species may not happen in 1,000 - 5,000 years, but what is that in duration of time to an island many hundred thousand, or even several million years old?

If we are to choose between land bridges or knotholes for the otherwise unexplained distribution of land organisms on isolated islands, we choose knotholes.

A drifted log, cast upon a sunscorched beach and there decaying, will liberate any living propagules it may contain into such an unfavorable environment that very likely most of them will succumb. But another factor favoring survival not only for "knothole migrants" but for drift fruits and seeds enters the picture.

Living at the beach on northern Oahu, Hawaiian Islands, and having home and garden devastated by the tsunami or "tidal wave" of April 1, 1946 and March 9, 1957, one is overwhelmed by one truth. Tsunami are frequent and of enormous effect, pushing drift of all kinds a few feet to hundreds of feet island from the inhospitable beach to often fertile humus soil and loam. Such action of tsunami is on a wholesale scale, entire coast lines being affected, usually totaling thousands of miles.

To this day, 200 - 300 feet inland from our stands along the beach of the wild, endemic naupaka and the exotic seagrape, we must eradicate seedlings of these two plants that continue to sprout from our flower beds. Similarly, on the south shore of Oahu, some years after the tsunami of 1946, Mr. Walter Bayer showed me healthy plants of Colubrina asiatica that had sprouted from the elevated "windrow" of debris cast up in his garden.

Anyone who has seen the hard-shelled eggs of geckos firmly glued in holes and crevices of coconut and other logs along the beach will have an explanation - perhaps the true one - for the wide distribution of such reptiles.

Islands surrounded by great deeps, of which the water is usually icy cold even in the tropics, are beyond reach of most non-swimming aquatic organisms unless they have a pelagic stage of some duration in their life. If these do not reach the completely isolated island via floating logs, a rarer but just as effective means of transportation may be available. In studying the beaches of Canton we have come across quantities of gray to almost black blocks of pumice, and occasionally the shells of the pearly nautilus and the cuttle-bone of the octopus. A random glance at dark pumice and more careful inspection of pale nautilus and cuttle-bone occasionally discloses the white of coral and the calcareous housing of marine worms. Such types, and many others, may well have reached Canton waters mature enough to reproduce their kind before being washed upon the beach to die.

Before dealing with fruits and seeds in detail, we wish to emphasize that electric light bulbs, garbage and other waste matter of Caucasian and Oriental civilizations, so common to many beaches, are conspicuous by their absence. Outstanding artifacts were several outrigger canoes and a paddle of primitive manufacture. Residents claim that one canoe, definitely hollowed out with a stone adz, is of African origin. Study of a wood fragment would decide such claim.

Fruits and seeds along the north shore were everywhere, arranged, however, in a line usually a foot or less wide. This width represents the area to which the stronger waves at high tide have been able to reach landward the water borne fruits and seeds of various sizes, shapes, textures and weights. Such qualities induced a certain rough assorting. A coarse-textured seed, other factors being equal, anchors in the sand before a smooth one.

Due to a spell of rainy weather - seed coats of certain species are impervious to salt water yet not to fresh - germination of seeds was so successful that the beach showed a narrow, faint line of green extending for many miles, a condition never known before! Strangely in this line of drift we found not a single local species excepting Triumfetta procumbens. As the fruit was wave worn, we believe it not of local origin.

The giant bean (Entada), with large expanded cotyledons, a few leaves and a slender stem stretching out vainly for a support to climb, were already beginning to suffer in February from the strong drying salt breeze. Not one became established. Thousands upon thousands of seedlings of the beach morning-glory, with stiff, thick, green, deeply notched cotyledons horizontally akimbo, were daily being eaten away by "Bernard," the hermitcrab. Not one became established. Various Mucuna species were germinating, merely to fall pray to hungry crabs. Of the myriad viable seeds that braved the ocean for unknown weeks and months without succumbing before landing on Canton shores, we failed to see a single successful introduction. Our atoll simply does not offer conditions fit for survival excepting for the moonflower, love-vine and the other few natives described in Bull. 41. Probably Canton would not even furnish conditions for survival farther inland to which a tsunami might push this living drift. Another island, blasted free of life by volcanic action like Krakatao, and boasting an abundant drift like Canton's, would burst into luxuriant greenery within a short time.

The collection listed below represents material collected in February 1958 and more or less identified. Puzzling specimens are being sent to specialists for comment. Still others are being planted with the hope of raising the resulting plants to flowering. Precise determination is then almost assured. Such additional information takes time to amass and hence must follow in a supplementary article. Specimens of Canton material, of whatever kind, are being deposted in appropriate scientific institutions as gifts from our sponsors, the Civil Aeronautics Administration.

Intergradations between the different categories are frequent.

The photographs of the Pacific Ocean disseminules were taken by Gunn to match those of the Atlatic Ocean appearing in the 1968 New York Botanical Garden Journal.

ARGYROXIPHIUM KAUENSE, THE KAU SILVERSWORD

*Degeners & Sunadas

The Hawaiian Islands are peculiar in having four endemic genera of Compositae belonging to the preponderately American Subtribe Madinae. These are Hailliardia and Dubautia, two groups like Bidens and Cosmos kept separate for convenience even though they intergrade imperceptibly; Wilkesia; and Argyroxiphium, to which the famed silverswords belong. Of the latter genus, several species grow on the Islands of Maui and Hawaii. Here we wish to describe more fully one of the lesser known. It grows on the southern slope of Mauna Loa in the Forest Reserve at about 6,000 feet elevation in the fog belt in wet humus among aa lava. It was collected as early as 1911 by C.N. Forbes, and incorrectly identified. Forester L.W. Bryan's collection of July 1956 was studied by J.F. Rock and Marie C. Neal, and too briefly described as Argyroxiphium sandwicense var. kauense in Occas. Pap. B.P. Bish. Mus. 22(4):31-33. 1957. It was renamed A. kauense (Hock & Neal) Deg. & Deg., in Flora Haw. Dec. 27, 1957.

The colony of Argyroxiphium kauense in the fog belt

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*The four authors are Mr. & Mrs. Otto Degener, botanists; Mr. & Mrs. Kaoru Sumada, wholesale florists.

Mailed Modesto 12/13/75

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The Degeners had found and studied a few isolated, live specimens in 1968. But under the guidance of Kuoru Sunada, Chairman of the Silversword Protection Committee, and Mrs. Sunada, on August 7, 1974 they were led to a magnificent colony of the species. With seedlings, the colony may number several thousand plants. About 250 were in full bloom at the time, but not a single one in seed. For the present description, therefore, a few achenes were used that had been stuck by spider or caterpillar threads to a dead, decayed head. Evidently the plants grow perhaps for five to ten years, burst into flower during a short season and give off a faint fragrance, mature their seed a few months later, and then die completely!

As the Kau silversword is such a beautiful plant, very localized in distribution and exposed to extinction in case a flow of lava should overwhelm the area from the summit of actively volcanic Mauna Loa, or from introduced insects and

browsing animals or exotic weeds, Chairman Sunda, nisei citizen of the Stat the State of Hawaii, is prepared to send his photographs and fresh seeds t seeds to botanical gardens and institutions in Japan on condition that the recipients will conscientiously try to cultivate this magnificent plant. We hope Hawaii shall add beauty to Japanese gardens with the Kau silversword. Its botanical description, based on living material, is as follows:

ARGYROXIPHIUM KAUENSE (Rock & Neal) Deg. & Deg., the KAU SILVERSWORD

Basally woody perennial with taproot bearing few side root, short-creeping and sparingly rooting from stem, very rarely few-branched near base, ending several dm. above ground before flowering in de-pressed-globose commonly 3 dm. wide and 2 dm tall sphere of loosely arranged arcuate-ascending living leaves above marcescent-retrorse ones; after several years' development quickly producing an erect ra-ceme to become commonly 15 dm. tall; a few may be as short as 7 dm. or a or as tall as 20 dm.; entire unbranched plant dying after seeding (or in the few conspicuously branched specimens observed only the seeded branch dying). Leaves linear, firmly fleshy, up to 30 cm. long, in cross section narrow diamond-shaped and 5-6 mm. wide and 2.5 mm. thick, from glutinous glabrous 12 mm. wide base, with acute apex appearin appearing mucronate because of projecting appressed hair, with 5-8 impressed longitudinal ribs on upper surface but smooth on lower sur surface, pale green and densely pubescent with appressed dark gray-ish silvery silky hair; dying leaves grayish purplish as are also i injured parts of stem. Raceme narrow-elliptic in ourline, yellow-green, the main hollow longitudinally ridged stem about 2 cm. thick with 100-150 single nodding heads, those toward base and top of raceme smaller and on shorter pedicels (with exception mention-ed below); bracts only of lower part of raceme often 9 cm. long with 8 mm. wide base, with lower half glabrate to clammy-pubescent but upper half silvery-pubescent like leaves and linear-lanceolate to acuminate apex, with midrib prominent; bracts upward in raceme as lon as long as pedicel and head or shorter, becoming greenish yellow, entirely clammy-pubescent and never silvery, mostly 25 mm. long and 2 mm. wide, narrowly elliptic but upward of raceme becoming finally linear; pedicels near base of raceme about 14 cm. long but toward apex of raceme gradually reduced to about 3 c., pithy, stiff, erect-spreading, pale yellow with green tinge, densely clammy-pubescent throughout with spreading glandular hair, flattened, tened, bearing along margin of narrow sides several bractlets often suboppositely arranged and mostly similarly glandular; bractlets linear-lanceolate, chiefly on upper half or third of pedicel, pale greenish with thick pale yellowish midrib, 2 or 3 but toward top of raceme fewer and smaller and finally none. Involucre campanulate, pale greenish, with erect-spreading short glandular hair, 10-20 mm. wide, 15-22 mm. high; involucral bracts about 30, more or less connate, 1.2-2 mm. wide, linear-lanceolate, in single row but some slightly overlapping lengthwise, acute to acuminate; receptacle slightly convex, 7 mm. wide, glabrous with-in; terminal head of raceme larger than all others and blooming precociously early with as much as 10 cm. of inflorescence im-mediately below still remaining in bud. Ray florets pistillate,

8 or usually less per head; ovaries blackish, shiny; corolla tube somewhat curved outward; ligule 5-6 mm. long, recurved, wrinkled lengthwise, usually 3-parted often with central lobe narrowest, rarely 2- or 4-parted, mostly yellowish but in some plants all white, in others white toward top of raceme but pale claret elsewhere, insstill others pale to bright claret throughout; style branches glabrous, dark purplish. Disk florets 75-150, tubular, 4 - 6 mm. long, green below but from about middle of corolla tube becoming increasingly more pink-claret; style branches pale yellow, with short papillose stigmas; anthers dark yellow; connective deltoid at apex. Disk achenes brownish black, shiny, 7-10 mm. long and 1.5 mm. wide, smooth but strongly 5-angled, straight (near center of head) to curved (near periphery), linear-clavate, with narrow truncate base having central mucro, with wider rounding top surmounted by firm pale-straminecus crown of three 0.5 mm. long and two 1.5 mm. long fimbriate pappus awns.

Type Locality: "Kahuku, above Kau Forest Reserve at Charlie Stone, altitude 6,700 feet, flowering and fruiting, July 1956, type L. William Bryan 25670 in Bishop Museum."

We must not confuse the Kau silversword with other silverswords growing on the Island of Hawaii. A.kauense grows on Mauna Loa at about 6,000 feet elevation in the fog belt. When ready to produce its inflorescence, the plant consists of a sphere of loose and somewhat flaccid, dark grayish, silvery leaves on an erect stem one decimeter or more above the ground. A. sandwicense DC., with probably several good varieties and forms, is peculiar to elevations of 8,000 to 10,000 feet on the same island. It grows in volcanic cinders exposed to intense sunlight alternating with some fog and occasionally snow. Before producing its magnificent inflorescence it consists of a sphere of compact, stiff, silvery leaves not borne on a long stem, but flat on the ground. ground. A. macrocephalum A. Gray, with a similar appearance to A. sandwicense, is endemic to Haleakala, a mountain forming the eastern part of the Island of Maui. In 1936 government officials planted fifted fifty of these Maui plants on the Island of Hawaii. As the first of these flowered and seeded in 1947, we today are not sure whether A. sandwicense and A. macrocephalum have hybridized. Are some unusual specimens of A. sandwicense true, natural varieties and forms or merely hybrids with A. macrocephalum due to this unfortunate 1936 introduction? At least all the specimens examined of A. kauense show no evidence of hybridization with other species.

The recently published statement that "Collectors and grazing have endangered the silversword, Argyroxiphium kauense, in Hawaii" is misleading. The colony grows at an elevation accessible only with some difficulty by jeep. The collectors during the last decade, so far as we know, have been the Degeners, the Sunadas and a National Park Ranger or two. The Degeners have taken a single flowering plant for shipment in preservative to Cornell for the making of a scientifically exact drawing. They have carefully removed two leaves and one flowering head only from each of fifty individual plants for distribution to fifty leading botanical institutions of the World, and taken a dozen seedlings for planting at 4,000 feet elevation. The Sunadas and the Rangers have collected seed for successfully propagating the silversword in Hilo and near the National Park Administration Building next to other species for comparative studies. The efficient method of inducing germination is to place the achenes between moist paper towels and to

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WIKSTROEMIA PULCHERRIMA var. PETERSONII Deg. & Deg.,
From Hawaii

Otto & Isa Degener

"The genus Wikstroemia in the Hawaiian Islands," released by the printer April 25, 1972 and published posthumously by Dr. Bo Peterson for the late Dr. Carl Skottsberg in Acta Soc. Sci. et Litt. Gothob., is a most meticulous monograph. It stimulated the kane and wahine writers to renewed field observations.

The kane writer's first glimpse of Dr. Skottsberg was many years ago. Studying for an advanced degree, the former was engrossed working up his earliest collections of Wikstroemia and other Hawaiian plants in the herbarium room of the New York Botanical Garden. Artist Mary E. Eaton had a high stool and high slanting drawing table facing the old Lorilard Snuff Mill, Dr. Per Axel Rydberg (1860-1931) had a large table at right angles to it and facing the window, and the kane student had a similar table next to that of Dr. Rydberg, one of his instructors. Dr. Rydberg stuttered a bit when dictating letters to Miss Nash, daughter of the agrostologist, recently deceased. When excited, his stuttering was severe and loud.

Carl Skottsberg of Sweden, with ruddy face, came to the Garden at that time with a formal letter of introduction to Director Britton (1859-1934). He was lifted upstairs by the elevator operator, and then ushered into the herbarium room where Dr. Britton was wont to work. Before Skottsberg spied Britton, he came face to face with Rydberg. We are not sure what happens when Greek meets Greek; but when Swede met Swede an excited, loud stuttering conversation in the native tongue reverberated throughout the hallowed herbarium. All botanical research ended on the top floor as all but one of the workers were fascinated by the conversation so replete with umlauts and other sounds not pronounceable in English. Finally exasperated, Dr. Britton stuck his head from behind a herbarium cabinet and shouted "Shut up or get out." Funereal silence followed.

More auspicious New York visits followed, in which the kane writer became well acquainted with Skottsberg. Such friendship was renewed and firmly cemented on Skottsberg's collecting trips in the Hawaiian Islands. He visited the ka-

ne's home on the north shore of Oahu. Although the latter already had had an assistant draw a Pupukea novelty for describing in his Flora Hawaiiensis, he abandoned all further work on the genus, resolving henceforth to siphon all representatives to Göteborg. Many years later, with Dr. Olof Selling, he visited Skottsberg's laboratory in Göteborg where Hawaiian Wikstromiae were growing out in the open!

Wikstroemia pulcherrima Skottsb., at the time unnamed, had been observed by the kane writer as early as 1922, on the tawny volcanic ash plain at about 2,500 feet elevation. It grew almost gregariously on both sides of the "Belt Road," now officially named Mamalahoa Highway, on the southeastern flanks of Mauna Kea and Hualalai, Island of Hawaii. It is a xerophytic, single-stemmed "shrub" more or less prostrate or to about 7 dm., tall. It is strikingly ornamental when the wahine plant bears its abundant orange-red fruit. Having occasion to visit the general area November 27, 1971, the kane and wahine writers were distressed to note how these Wikstroemia plains had been devastated. It was not by the browsing of herds of Hereford cattle, which avoid eating the plant - the genus is rich in a poison that can be crystalized - but by their trampling. Luckily the road now has unusually ample shoulders. With the cattle fenced away, the Wikstroemia can be most conveniently studied here. Anticipating the extinction of this splendid species, the only one thus far studied with a chromosome count of N = 18, the writers resolved to collect material for herbaria of the World.

During our collecting we noted two taxa, one with small leaves and the other with larger ones. We found also a few transitional plants. Not able to distinguish from the monograph to what taxon Dr. Skottsberg's type specimen belongs, we wrote for information to Dr. Peterson, Botaniska Museet, Carl Skottsbergs Gata 22, Göteborg, Sweden. Receiving a bri brief analysis of the salient features of the type, we are convinced W. pulcherrima s.s., - more properly but awkwardly called W. pulcherrima var. pulcherrima - is the large leaved taxon. Armed with this knowledge, we herewith name th the other:

WIKSTROEMIA PULCHERRIMA var. PETERSONII Deg. & Deg., var. nov. A specie foliis circa 2 cm. longis et 1 cm. latis.

Leaves elliptic to broadly elliptic, varying from 12-25

mm. long and 4-13 mm. wide but mostly 20 mm. X 10 mm. Flowers, as in the species itself, are abundant and greenish yellow. Whether the chromosome count applies to it, to the new variety or to both is presently unknown. All types, as we have mentioned before, are deposited in the New York Botanical Garden herbarium unless distinctly stated otherwise.

Type Locality: Degener & Degener 32,754. Along Mamalahoa Highway at Saddle Road Junction, Hawaii. On yellow Pahala ash plain at 2,600 feet; being exterminated by trampling cattle except between roadside fences. Nov. 27, 1971.

HIBISCADELPHUS NUMBER KK-HX-1

AN INTERNATIONAL TREASURE IN HAWAII

Otto & Isa Degener
New York Botanical Garden

Until higher education larned us more better, we considered mallow flowers to be flat and open; lobelia flowers to be tubular and curved; and bird beaks, except those of hawks and owls, to be straight and pecky.

The genus Hibiscadelphus (Malvaceae), established by Rock in 1911, is a remarkable group of endemic species restricted to limited areas of the Hawaiian Islands. How many existed in the drier forests before man's coming thousands of years ago is guesswork. The normally increasing population from the original introduction probably, like the "brother" genus Hibiscus, "walked" more or less "dryshod" through the ancient archipelago as islands repeatedly rose from the depths, melted together with lava flows andor falling sea level, separated with erosion andor rising sea level, and drifted slowly westward on the Earth's crust. Today botanists recognize a species from Kauai, represented by about half a dozen trees in Waimea Canyon; one from East Maui, now extinct; one from northern Hawaii, now extinct; and two others from Hawaii. These last are H. hualalaiensis Rock (plate 1), now centering in greatly reduced numbers in a remnant forest about Puu Waawaa; and H. giffardianus Rock (plate 2), consisting so far as we know of a venerable tree officially labeled KK-HX-1, with its numerous semidomesticated offspring growing in Hawaii Volcanoes National Park in Kipuka Ki and Puaulu, and in a few State parks and gardens.

For readers unacquainted with the Islands, we wish to explain that the vernacular word "kipuka," certainly worth anglicising, refers to "the hole" according to the Hawaiians, formed by newer lava flows surrounding older ones. It is truly an oasis of richer terrain, such as are common on Maui and Hawaii where volcanoes are quiescent or active. These kipukas are famed for often harboring the Islands' rarest plants and the endemic animals depending on them for food and shelter.

The avian fauna of the Hawaiian Archipelago is famous for the endemic, nectar feeding "honeycreepers" [sic], belonging to the Drepanididae (the proper orthographic ending for a Family in Zoology). Amadon in 1950 recognized nine genera consisting of 22 species and 24 subspecies. The State of Hawaii is truly infamous that about 40% of these remarkable taxa have been encouraged to become extinct. Modern ornithologists do not agree whether their ancient origin was Central American, Malaysian, or perhaps both disjunct regions. Being botanists and hence not prejudiced by ornithology, our snap judgment favors Malaysia as so many of Hawai'i's plant genera which produce indigestible seeds enclosed in fruits palatable to birds have their closest relatives there. We

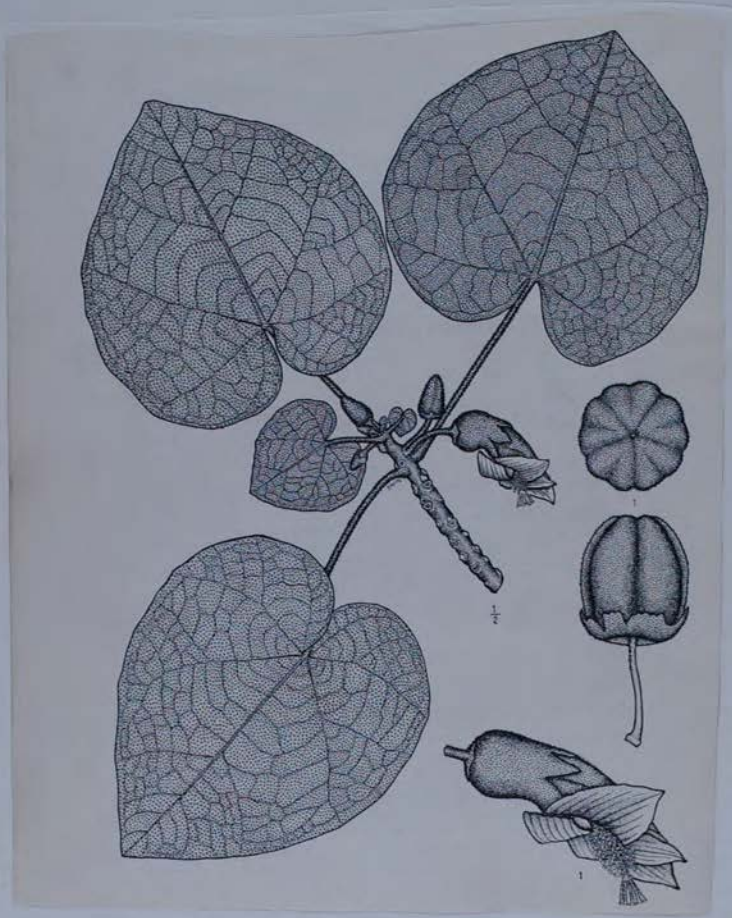

Plate 1. Hibiscadelphus hualalaiensis J.F. Rock
(After Degener)

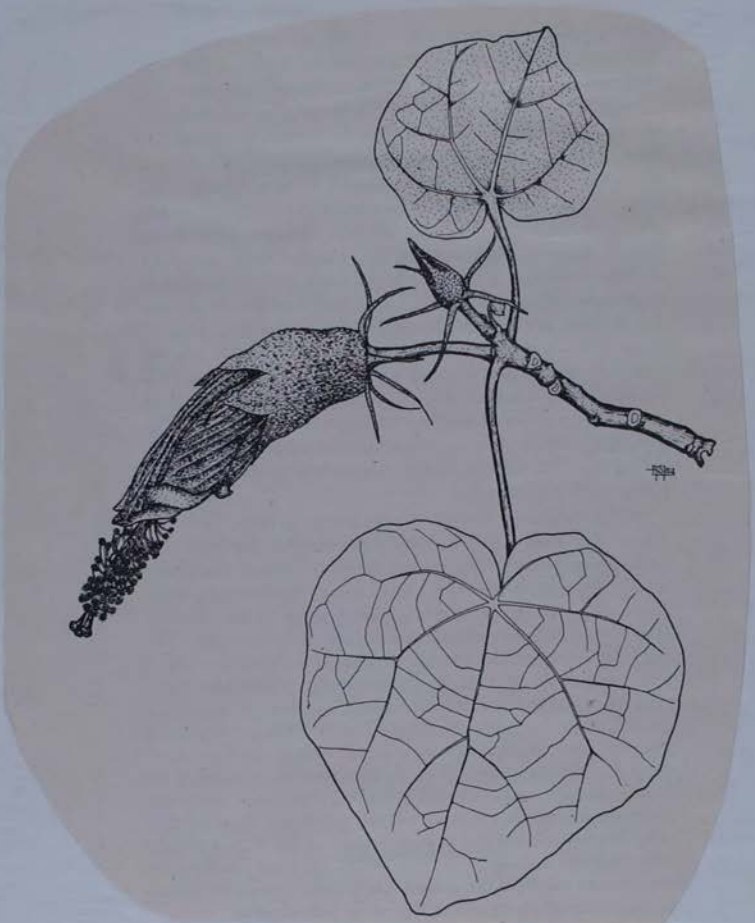

Plate 2. Hibiscadelphus giffardianus J.F. Rock
Twig of type tree, 1929. (After Degener)

Plate 3. Cyanea baldwinii Forbes & Munro
(After Degener)

believe that if frugivorous birds were able, undoubtedly aided by numerous stepping-stone islands existing between the two land masses, to settle in the Hawaiian Islands, that the ancestors of the Drepanididae did also. Their nectar based droppings left us no visible legacy as evidence.

Drepanididae over millions of years intermeshed in an evolutionary way in development with Lobeliaceae, of which all but two small genera of the native nine, bear curved, tubular flowers. The lobelioids (the genus Lobelia is not native to the Islands), from sea level to all but the highest mountains on the Islands of Hawaii and Maui, in taxa and sheer numbers of individuals must have been enormous before man's unwitting extermination of the endemic biota began a few thousand years ago! Since 1778 when Captain Cook rediscovered the Islands, Gaudichaud, Hillebrand, Rock, Wimmer and a few others were able to describe about 275 surviving taxa scattered among Clermontia, Cyanea (plate 3), Delissea, Galeatella, Neowimmeria, Rollandia and Trematolobelia.

Into this environment crowded with curved, tubular Lobeliaceae flowers which the curious, slightly rubbery beaks of the drepanids entered like a hand into a glove, some mallow with spreading, actinomorphic flower similar to that of the hibiscus, arrived. This immigration was probably by floating seed or sealed capsule driven by some unusual southwesterly gale. With a curved corolla excreting nectar and secreting minute insects, and an efficient shape for pollination by birds with a bill similarly curved (plate 4); this ancient hibiscoid finally had evolved the peculiar corolla shape for which the genus Hibiscadelphus is famous. This may very well have taken eons; perhaps while such island as Midway arose from the deep where Hawaii now exists, grew to a considerable height and, as volcanism there died as it slowly floated westward, gradually eroded away to become the "low" atoll we know today. Believing in these developments in the fields of Botany, Zoology and Geology, both of us kane and wahine dreamers consider the genus a Sacred Creation of Nature, a true International Treasure.

While working on his Master's thesis about the gametophyte of Lycopodium cernuum in Kilauea's fumeroles in 1922 under the direction of Dr. James B. Pollock, Exchange Professor from the University of Michigan at the University of Hawaii, the kane writer first saw Rock's type plant of Hibiscadelphus giffardianus. It was growing beyond the boundary at 3,900 feet elevation of Hawaii National Park in Kipuka Puaulu, then considered part of Brown's Ranch. This last surviving tree was perched on the outer, southeastern rim of a collapsed lava tube in such a position that cattle were reluctant to risk browsing on it.

Become Naturalist of the Park in 1929, the kane frequently walked, motored and rode horseback to the tree, then ailing because of injury to its trunk, to gather fallen flowers and dried leaves. With a little soaking, he was able to furnish leading botanical institutions In America and elsewhere with authentic

Plate 4. The mamo, a nectar feeder.
(After Wilson & Evans)

specimens. He likewise broke off one twig so that his student artist, the late Hung Sun Lau, could draw it for the projected "Plants Hawaii National Park," published in 1930. There, plate 59, please note, is an illustration of part of the actual type tree. A popular description accompanies it; while a scientific one appears in Flora Haw., 9/10/32.

Though the type tree or at least its aerial part appeared to have died in 1930, the kane was delighted that two trees were growing on each side of the road leading into Walter M. Giffard's vacation home at Kilauea and Kalanikoa Streets, Volcano. Leaving the Island of Hawaii to botanize mainly on the other islands, thoughts of Hibiscadelphus waned until the Degeners purchased a home in 1966 catercornered from the one formerly owned by Giffard. Inspection of the premises showed the trees gone. Their sadness concerning the apparent extinction of this rare species turned to joy when Geologist Howard Powers, who had been employed at the Park at the same time as the kane in 1929, not only led them to a magnificent tree of the species forty feet tall and with a six and a half inch trunk along the Mauna Loa Strip Road in Kipuka Ki of the renamed

Hawaii Volcanoes National Park; but gave them a potted plant he had raised from a seedling to set out in their new garden. With this gift, in addition to gifts through Ranger Donald Reeser, and roadside seedlings growing near the tree as well as plants raised by them from seed, their garden may become a refuge for about a score of plants should a lava flow from Mauna Loa ever destroy the kipuka.

Complicating matters, specimens of H. hualalaiensis Rock, known from the Puu Waawaa area of the mountain Hualalai and not from the National Park, had been planted near Kipuka Ki in the 1950s or early '60s and at length began to flower. Purists, perhaps rightly so were the species common, maintain such trees should be destroyed as alien to the Park. We Degeners reason that so long as *exot-

*Gold and silver Pityrogramma ferns among dry lava and cinders particularly about the summit area of Kilauea; grasses, presumably introduced during World War II as grain in straw for Army mules and now posing a fire hazard in all but wet jungles - difficult to control biologically because of the potential danger of the parasite transferring to sugarcane; Bulbostylis capillaris in stramineous tufts in cinders about the Kau Desert; Hedychium coronarium, H. flavescens and H. gardnerianum spreading rapidly from Park and concessioner buildings to smother endemic herbs; Arundo bambusifolia in grassy and dry areas; Myrica faya, purposely introduced by foresters, remaining in small numbers in 1977 after heroic eradication work in forests and burned areas; Polygonum chinense along roadsides a distinct danger with its red leaves and pink flowers when it spreads into the Kau Desert to brighten the black lava unnaturally; Anemone hupehensis replacing silvery Astelia colonies as soon as these are destroyed by feral pigs; the white-fruited strawberry Fragaria chiloensis var. ananassa, abundant about Kipuka Puaulu and Kipuka Ki, usually misidentified for the endemic red-fruited F. c. var. sandwicensis; Rubus penetrans, R. rosifolius and the truly vicious R. ellipticus, being partially controlled biologically with some resulting injury to the endemic species; Abrus precatorius with its deadly bean about Wahaula; Fuchsia magellanica, beautifully festooning trees where the endemic Stenogyne calaminthoides used to thrive, about Thurston Lava Tube, and creating thickets strangling endemics; Nasturtium majus s. l., in Kipuka Puaulu; Raimannia along roads especially about Kilauea Crater and the Mauna Loa Strip; Eucalyptus where the endemic koa should tower; Heterocentron subtriplinervium near Kilauea-Iki; Linociera introduced into the old Ainahou Ranch area by the late Herbert Shipman who saved the endemic goose from extinction; Buddleja asiatica s. l., a pioneer on lava flows and persistent elsewhere so numerous that it requires biological control in spite of potential injury to some cultigens of the genus; Conyza along roads and drier localities requiring biological control as does its relative Pluchea odorata of somewhat more favorable areas; as well as others. Such weeds need eradication before time, effort and funds are expended in trying to justify the eradication of questionable taxa of the endemic genus Hibiscadelphus. The present administration, well aware of priorities, is engaging the services beginning March 1977 of the Plant Ecologist and Pathologist Dr. Donald Gardner. Had plants developed a nervous system, these noxious weeds would be trembling at their roots.

ics are overrunning the National Park and feral pigs are causing havoc because of insufficient personnel, H. hualalaiensis should be the lowest taxon on the totem pole to be removed from National Park lands. The gene pool should be preserved for later and probably wiser generations. What the decision will be, no one now knows.

The stately H. giffardianus in Kipuka Ki flowers and fruits profusely, the abundant seed, we noted one early morning being avidly gathered by a feral pheasant. The seeds germinate readily under the tree in the leaf mold along and actually on the road. This one plant, from which the Degener trees and the nursery stock grown at the Park originated, bears the metal tag No. KK-HX-1. In spite of our widely expressed conviction to colleagues and others regarding the tree in question being H. giffardianus, some individuals consider it a hybrid between this species and H. hualalaiensis. Believing it a hybrid, they proposed it be felled as not worthy of existence in the Park. A lecture about the problem presented at the Hawaii Field Research Center at the Park in August 1976 did not change our views. Not only that; but letters, we have learned, have been sent to World Arboreta and Herbaria stating that the Degener identifications are faulty and their distributed specimens, being hybrids, should be destroyed.

Worried about the future of this remarkable genus, we casually wrote Dr. Powers, now retired and residing on Oahu, about the possible fate of the tree we so admired. Not realizing that he had remained at the National Park long after the kane's departure, we were dumbfounded by his answering letter postmarked December 6, 1976. It reads, in part:

"The seedling I gave you of the Hibiscadelphus Giffardianus was dug up from under the tree that Don Reeser is talking about. - - - I recently heard first hand from Jim Tobin, retired Park Service, that he had been a buck ranger assigned to Hawaii National Park in his early days [1942 onward]. The tree that you describe on page 211 - - - was still alive in Herbert Shipman's pasture just over the fence from the Park land. Young Jim had apparently learned about the fact that the tree was the only representative in the world, so he and a sympathetic companion would make forays across the fence to collect seeds (and I think he said take cuttings also) and propagated the Giffardianus. The two trees in Kipuka Ki are from Tobin's activities. They must be pure. There is also a planting of two or three H. Hualalaiensis in Kipuka Ki, below the road makai [oceanward] of the two H. Giffardianus - more than a hundred meters down slope as I remember - - -. They certainly weren't there when the pedigree of the H. Giffardianus specimens in Ki was determined." Dr. Powers then questions how fertilization in the genus takes place: "- - - what kind of bird or insect or wind power would move pollen from the H. Hualalai up to the H. Giffardianus? I don't know, so I can't say whether your H. Giffardianus is a hybrid or a 'pure' specimen." We Degeners likewise do not know if this maturing seedling is pure until it flowers, as we do not know the parentage of the pollen.

According to retired Forester Lester W. Bryan's records of April

1977 Degener & Degener, Hibiscadelphus 393

Pg. 393 contained picture of
J. F. Rock. Given to Portrait Dept.

Plate 5. J. F. Rock planting
H. giffardianus (L. H. Bryan photo Sept. 1, 1940)

1946 "The tree found by Rock in 1911 was then in poor condition, and within a few years, it finally succumbed. - - - Sometime after the discovery of the original tree, Mr. Giffard collected seeds and grew them at his mountain home near the Volcano Road at 29 Miles - - -. From this tree, cuttings were taken; one of which rooted and grew. After it became well established, it was taken up and in September 1940, transplanted inside a fenced area in the Shipman 'Keauhou Ranch.' where it is still growing today.

"Of interest is the fact that in September of 1940 when this tree was ready for transplanting, Prof. Joseph F. Rock, who originally discovered and named this tree was visiting here in Hawaii and had the pleasure of preparing the hole and transplanting the descendant of the parent tree which he had discovered nearly 30 tears before." (Plate 5.)

Retired Entomologist Cliften J. Davis, a Park Ranger in his youth, independently gave us essentially the same general information as did Powers and Bryan; in addition to explaining how he and others about 1940 propagated the species by seed and cuttings. These were planted out in various places in the Islands and on the Mainland. How many of these trees or their offspring survive today, we do not know.

Because of the statute of limitations regarding the fortunate act by two "buck rangers" of trespassing about twenty five years ago to air layer a remarkable species on the verge of extinction, we here add a few paragraphs from a letter dated February 11, 1977:

"Dear Dr. Degener:

Your letter of February 2 is most welcome. - - - As to my recollections of the Hibiscadelphus giffardianus, they are very clear as to how but not as to when we made the air layerings. The operation was carried out by Vernon R. 'Ross' Bender and myself sometime during the 1951-52 era. We slipped over to Keauhu Ranch under cover of darkness, made slanted cuts about two-thirds through a stem, inserted a toothpick or similarly sized sliver of wood in the cut and then wrapped the whole thing in a plastic bandage that contained wetted sphagnum moss. Ever so often thereafter we would return, check the 'bandage' for moisture, wet it a little if needed, and check for roots. When the layering showed roots of an inch or so we cut the rooted stem free, took it to the National Park Service greenhouse, potted it, and gave it regular care. There were several such cuttings (2 to 3 to perhaps 6) taken in a span of about one year. I am not certain they all lived.

"Ross Bender is now retired and lives at 43390 Alta Acres Drive, Three Rivers, California 93271. He may have notes from that time as he supervised the nursery and kept some records on the various plants we were trying to propagate.

"Later, perhaps during 1952-53, Elroy Bohlin took over the nursery project and I think he too worked with Hibiscadelphus giffardianus. By then relations between the NPS and ranch management had improved and surreptitious snitching of cuttings became unneces-

Hibiscadelphus giffardianus, Shipman Keauhou Ranch, June 1960. (L.W. Bryan photo)

sary. Bohlin lives at 7822 N.E. Point No Point Road, Hansville, Washington 98340.

"I certainly hope these clues are helpful. At the time Ross and I made the cuttings I understood the Keahou specimen was the last known. Incidentally I remember setting out rooted cuttings in Kipuka Puaulu and on the Mauna Loa Strip road. These were enclosed with hog wire and I regularly carried water to them in 5 gallon back pump tanks during dry spells.

[Signed] Daniel J. Tobin, Jr.
Superintendent
[Mount Rainier National Park]"

We are convinced tree No. KK-HX-1 originated from a self-fertilized seed of the type tree. The tree certainly resembles the type plant as the kane remembers it in Kipuka Puaulu; its flowering twigs resemble it in Kipuka Puaulu; its flowering twigs match Plate 58; and all seedlings, none of which have yet flowered as it takes the tree years to mature, are uniform in the vegetative state and resemble the species. None, as expected in a hybrid, show a dual ancestry. Furthermore, this venerable tree was growing in Kipuka Ki over a decade before the introduction of H. hualalaiensis to the Park from the latter's home at Puu Waawaa about fifty miles distant as the crow flies. It would be fantastic had it arisen by cross-fertilization from pollen coming from such a distance.

In summary, whether hybrids exist in the Park, whether some will be developed by artificial pollination or whether the two species of Hibiscadelphus are a bit confusing because of the occurrence of annectent forms (as in Santalum paniculatum H. & A., and S. pilgeri Rock

likewise growing about Kipuka Puaulu and Puu Waawaa respectively), we consider this old tree to be pure H. giffardianus.

The chronology of events begins with Rock's discovery of the type tree of Hibiscadelphus giffardianus in 1911 in Kipuka Puaulu. As no other tree of the species existed in the World nor even a plant of H. hualalaiensis Rock grew nearer than about fifty miles, seeds produced must have been the result of self-pollination and hence self-fertilization. A tree grown from such seed, and hence F_1 generation, was planted in Giffard's garden. A cutting from the resulting tree, and thus still F_1, was planted by Rock at Keauhou Ranch. Two rangers, making air layers of it, planted one of these along the Mauna Loa Strip Road in Kipuka Ki. This resulting tree, now forty feet tall, is F_1 or, more simply stated, a seedling and direct descendant of the type tree.

The binomial "HIBISCADELPHUS X PUAKUAHIWI K. Baker and S. Allen, Hybrid novum," in Phytologia 33(4):276. 1976 and represented by tree No. KK-HX-1 must be rejected. The name is a synonym of Hibiscadelphus giffardianus Rock in Haw. Bd. Agric. & Forestry Bull. 1:10, pl. 4. 1911.

We are convinced the forty foot tree marked Number KK-HX-1 must not be felled. Arn't you?

Waialua, Oahu, Hi. 96791
July 11, 1976

Dear Sir:

With Tahiti presently in the news due to the voyages of the raft Hokule'a, we thought readers may be interested ragarding our study of the pineapple, a study not yet polished for publication in book form.

The pineapple, known as Ananas (modied from an Indian word) comosus, is native to tropical America and no other place on Earth. For about 250 years, pushed by the trade winds, Spanish galleons circled the Hawaiian Islands while sailing back and forth between Acapulco, Mexico and Manila, Philippines. The Spaniards were the first European discoverers of many islands in the Pacific, discoveries which they often considered of little importance because of the absence of gold. We can well assume that the Spaniards carried the relatively "unimproved, wild" pineapple as a source of food aboard their vessels. Such pineapples, unlike the pampered cultigens of commerce, bore abundant seed. Whether these seeds or pineapple crowns reached some Pacific Islands and grew, we do not know. Be that as it may, the pineapple was in the South Pacific previous to Capt. James Cook's rediscovery of the Hawaiian Islands.

(Please do not correct Cook's archaic spelling)

Our belief in the above is based chiefly on references in Cook's "Journals III, No. 1. On page 158 he states that while in Tonga "I planted a pine apple and sowed the seeds of Millon &c[a] in the Cheifs Plantation, and had a dish of Turnips to dinner, being the produce of the seeds I left last Voyage." In Huahine, an island near Tahiti, we find his crew planted shaddocks, rescued grape vines from Tahiti, pineapples, melons and other desirable vegetables.

Cook is famous, not only for his exploratory work, but for his ability to reduce the incidence of scurvy, a deadly disease caused by faulty nutrition. It certainly would be strange if Cook, with pineapple available in the Society Islands, did not take a supply aboard when he left there and reached the Hawaiian Islands. He did carry along watermelon, causing the Hawaiians to believe his sailors were cannibals because of the red "flesh" they saw them eating.

The collective fruit of the pineapple resembles superficially the collective fruit of the pandanus or screwpine, known in the vernacular as hala. Why did the Hawaiians, a highly intelligent people, call the pineapple hala-kahiki or the"Tahitian hala" if they were not aware it had come to them from Tahiti? If readers do not believe as we do, that is their problem and not ours.

Aloha,
Drs. Otto & Isa Degener

 100± xeroxes of Notes Waimea Arb. 3(2): 1976.

The Hala-Kahiki or Pineapple

Otto & Isa Degener

The pineapple is native to tropical America and no other place on Earth. How did it first reach the Hawaiian Islands? Was it by a Polynesian double canoe, by a Spanish galleon, or by a roomy English vessel designed for the coal trade and captained by James Cook?

Hawaiian mele, or epics, so frequently mentioning food plants, do not mention the tasty pineapple or hala-kahiki so far as we know. Until some native scholar turns up evidence to the contrary, we doubt the Polynesian ancestors of the Hawaiians brought the plant to the Hawaiian Archipelago as they did the coconut, sugarcane, taro and many other useful cultigens.

For about 250 years several Spanish galeones or galleons, pushed by the trade winds, circled the Hawaiian Islands annually while sailing between Acapulco, Mexico and Manila, the Philippines. Moreover, the Spaniards were the first European discoverers of many islands in the Pacific, discoveries they considered often of little importance because such islands lacked gold. From Hawaiian mele, from geneologies of present-day Hawaiians, from early Spanish maps depicting roughly where the Hawaiian ones are located and from a lava stone sculpture (figs. 1,2) unearthed on the Island of Oahu resembling a grandee with a ruff, we are certain such galleons reached the Hawaiian Islands long before the coming of Captain James Pace Cook in 1778. Even without such evidence, it is reasonable to assume that some galleons, driven off course by storms would have reached these islands.

Undoubtedly one of the provisions carried on board were fruit of the pineapple plant. These on their top bore a "crown" viable for months; and, unlike the highly improved cultigens now sold in the markets, bore seeds viable for years. The early occurrence of the pineapple in the Philippines is undoubtedly from crowns and or seeds transported by galleon. As the pineapple was introduced by the Spaniards to Manila, it may very well have been introduced to some of the South Sea Islands as well; yes, perhaps even to the Hawaiian Islands! Has some scholar come across pertinent references to the pineapple or ananas in the archives of Acapulco, Manila or Seville? We wish to know.

The Only American port of call where Capt. Cook might have procured the pineapple was in Rio de Janeiro during his first expedition. Did he get a supply there, or more likely from plants introduced into the Pacific by the Spaniards? On page 158 of his "Journals III, No. 1" Cook states that while in Tonga "I planted a pine apple and sowed the seeds of Millon &c^{a} in the Cheifs Plantation, and had a dish of Turnips to dinner, being the produce of the seeds I left last Voyage." In Huahine, an island near Tahiti, we find his crew planted shaddocks, rescued grape vines from Tahiti, pineapples, melons and other desirable vegetables.

Cook is famous, not only for his seamanship and explorations, but for his ability to prevent scurvy, a deadly disease of sailors caused by faulty nutrition. It certainly would be strange if Cook, with pineapples available in the Society Islands, did not take a supply aboard when he left there and reached the Hawaiian Islands. He did carry watermelons, causing the Hawaiians to believe his sailors were cannibals because of the red "flesh" they saw them eating. If perishable watermelons were aboard, why not pineapples?

The first written reference we have to some kind of pineapple in the Hawaiian Islands is that of Don Francisco de Paula Marin, known as "Manini" to the Hawaiians. He was born in Jerez, Andalusia, November 28, 1774. He early joined the Spanish Navy and thus came to Nootka on the northwest coast of America. He deserted, according to one version, to become a crew member of the "Lady Washington," captained by John Kendrick. As the vessel made three voyages between Nootka and China, we believe Marin became a resident of the primitive island kingdom in 1793 or 1794. He was an extremely capable retainer in the service of Royalty for many years, acting as interpreter, pilot, physician, business counselor and keeper of accounts. He acquired a plurality of wives and much land. He was not so much an introducer of plants to the Hawaiian Islands as an expert horticulturist who raised them to perfection and made efficient use of them. He kept a journal, mostly in Spanish, that has been lost. Yet, before this disaster, Robert C. Wyllie, Minister of Foreign Relation for the Government, made excerpts from it in English. Hence we know from one of these that Marin January 21, 1813 planted pineapples. We explain

Fig.2. Pesumably a Spanish grandee with ruff, sculptured in Hawaiian lava: rear view. (Courtesy, Museum für Völkerkunde, Berlin).

Note: An article by Rudy Mitchell on the subject of "hala-kahiki" will appear in the next issue.

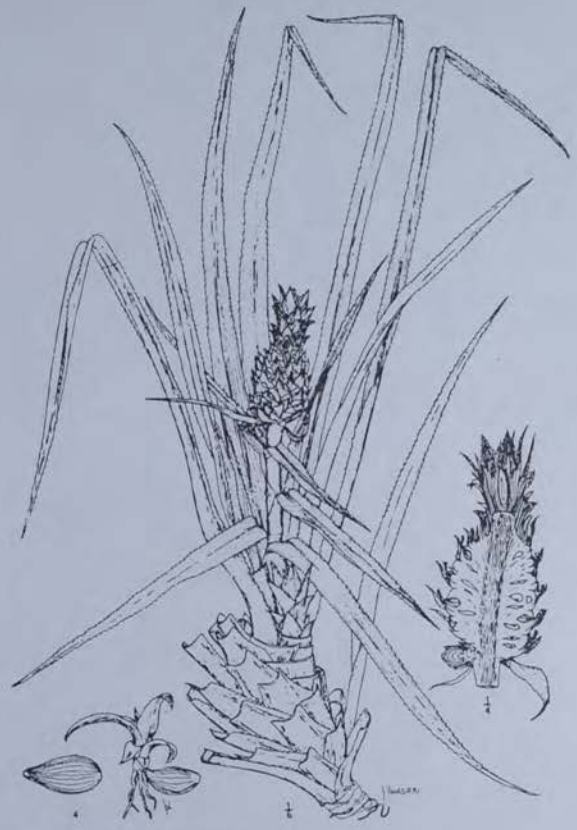

PLATE 20.—Pineapple or Hala Kahiki. (Original).
Habit, showing adventitious roots at base of cut stem; seed and seedling; longitudinal section of young collective fruit, showing rudimentary seeds in ovarial cavity.

Fig.3

(extracted from: Degener: Plants of Hawaii National Parks)

WEEDS (?) OF JAPAN
Otto & Isa Degener

A mysterious package arrived by certified mail recently from the Kumiai Chemical Industry Co., Ltd. It contained a brochure and a heavy 2.5 cm., thick book measuring 19 X 26 cm. The imposing brochure shows this Tokyo concern to have a paid-up capitalization of 1,260,000,000 yen, and to have branch factories in Sao Paulo, Brazil and Bangkok, Thailand. The company concentrates in the manufacture of pesticides, industrial chemicals, veterinary medicines and feed additives. Colored photographs show some of these activities. The preoccupation with herbicides and other chemicals of agricultural importance, we assume, ca's financing the writing and publication of the accompanying Japan Illustrated by Colour, "edited by: Makoto ca's larger industrial firms emulated those of Japan by advertising their products through works of permanent, scientific value.

This Flora of 515 pages, published last August on filled stock, sells for $40. Though printed mostly in Japanese, the vernacular and scientific names of plants, their distribution in Japan and elsewhere, and the phenology are likewise printed in English. Moreover, pictures can be "read" in any language; and here the work is of outstanding help for the foreigner. In the taxonomic part of the volume there are 826 colored photographs measuring 5 X 7 cm., some consisting of two separate prints showing a plant in two separate stages of growth. Besides these, there are 557 accompanying figures in black and white carefully drawn to show not only a habit sketch; but also details of roots, rhizomes, ocreae, ligules, flowers, fruits, seeds and spores. Of 556 taxa listed in the index, practically all are described and figured. They belong to 331 genera, and of these genera more than two thirds are described and figured in Britton & Brown's "Flora." How many of the species are identical with those in the area covered by the latter work, the reader can check for himself.

A few trivial imperfections were noted, such as not using the orthography "Sigesbeckia" on page 229, showing a photograph upside down on page 290, and listing a few plant names on pages 412 and 413 of the index in alphabetical disorder. The great fault we find is that the authors and the sponsoring chemical company are far too modest in their claims. Numata & Yoshizawa's volume is not a "Weed Flora of Japan" at all! Too many of the plants are lovely and interesting ones gracing fields, marshes and roadsides. To us a more appropriate title would have been "Herbaceous Flora of Japan, Illustrated in Colour." Were we to tour Japan again, we would include this book in our 'plane luggage in spite of its weight.

WIKSTROEMIA PERDITA DEG. & DEG., AN EXTINCT (?) ENDEMIC
OF A PARADISE LOST BY EXOTIC PRIMATES
Otto & Isa Degener

The genus Wikstroemia of the Thymelaeaceae, as occurring in the Hawaiian Archipelago, was studied by Dr. Carl Johan Fredrik Skottsberg (12/1/80-6/14/63) of Göteborg, Sweden, in the field ~~1917/17/1922, 1926, 1938 and 48~~ in 1922, 1926, 1938 and 1948. His early studies were continued in great detail with the loan from about thirty institutions of over 600 historical numbers of which many have become exterminated in this Bulldozer Age of Biotic Destruction. He recognized 38 named taxa before his death. ~~Publication~~ edited by Skottsberg's handwritten manuscript was ~~posthumously~~ completed during the summer of 1962. It was by Bo Peterson of the "Botaniska Museet, Göteborgs Universitete" who, according to his letter dated March 17, 1973, plans "to be able to publish some additions - - - and to make up a key for the species." We corrected the almost perfect English text, paying particular attention to the confused spelling of Hawaiian names before publication of the monograph as "The Genus Wikstroemia Endl. in the Hawaiian Islands." Acta Regiae Societatis Scientiarum et Litterarum Gothoburgensis. Bot. 1:1-166. 1972.

(Plate 1)

Driving in our jeep last January along the ~~Chain-of-Craters~~ coastal Road, Hawaii Volcanoes National Park, ~~between~~ Wahaula heiau (temple) ~~and the end of the road where cut by the 197~~ lava flow in search of ephemeral, halophytic Panicum species, we were amazed to see mauka (mountainward) fresh gashes in an endemic jungle never penetrated by botanists before. Reaching there late in the afternoon, we discovered the gashes to represent a cleanly bulldozed grid evidently for paved roads in preparation for the sale of house lots. With all workmen gone for the day, we ~~scooped about~~ for possible botanical prizes. Among the bruised tangle of rare and even unknown taxa, such as a form of maile, Alyxia oliviformis, newly described under an archaic specific name in Phytologia 32:377-385. 1975, we unearthed a single graceful akia lying uprooted on the ground. Even though the butting of the bulldozer had knocked off most of its nocturnal flowers, we saved many of the twigs for museums of the world. We can only wonder what intricate chemicals this plant could synthesize - a plant of a genus cherished for its unique qualities in heathen days for catching fish and eliminating hated enemies. Even though we failed to find a pistillate specimen, we here name and describe this single akia tree thus far known to us as:

WIKSTROEMIA PERDITA Deg. & Deg., sp. nov. Planta mascula solum cognita: Arbor usque 9 m. alta, glabrata; ramulis gracilibus; internodis usque 5 cm. longis. Petiolus 5-10 mm. longus; lamina lanceolata, 40-100 mm. longa, 13-25 mm. lata, basi obtusata, apice acuminata. Rhachis 3-5 mm. longa. Flores strigosi; tubus 4 mm. longus; lobi externi 1.5 mm., interni 1 mm. Pistillodium 1 mm. longum; ovario ½ base nudo, ½ apice densiusculo setoso.

Staminate plant (pistillate presently unknown) a slender glabrate trict openly twiggy tree 5 meters tall, with 4 cm. thick trunk and smooth reddish brown bark. Leaves distant, in bud antrorsely yellow-puberulent but soon glabrous or nearly so; petiole thin, 5-10 mm. long; blade chartaceous, lanceolate, 4-10 cm. long, 13-25 mm. wide, entire, green and with narrow impressed midrib above, pale green with somewhat salient midrib and prominent veins beneath, acute to acuminate at apex, broadly obtuse at base. Inflorescence longmarcescent; peduncle barely 1 mm. thick, antrorsely yellowish puberulent as is rachis, straight but in age retrorsely curved, 2-4 to very rarely 10 mm. long; rachis 1.5 mm. thick, 3-5 to rarely 7 mm. long, unbranched, straight or nearly so, with 25-75 thick minute pedicels from which all nocturnal flowers have been shed except a terminal cluster of 2-5 open ones and up to 20 in various stages of immaturity. Flowers greenish yellow, densely puberulent with antrorse yellowish hair without but glabrous within; tube 4 mm. long; lobes spreading, suborbicular, irregularly crenulate, the outer two 1.5 mm. long and almost as wide but the inner two 1 mm. long and as wide. Stamens with outer pair of oblong anthers extending to apex of tube, inner pair separated by half an anther length below. Aborted pistil 1 mm. long, clavate, lower half glabrous, upper half densely beset with stiff antrorse hair. Hypogynous scales 2, one third length of pistil, ligulate, at apex somewhat acute and entire or somewhat truncate and emarginate.

Type Locality: Known only from "Deg. & Deg. 33,680. (Single staminate 5 meter tree.) Kalaka mauka just beyond Nat. Park Boundary NE of Wahaula, Puna, Hawaii. Bulldozed Metrosideros forest at 1,300 feet. Jan. 23, 1976." Holotype at New York; isotypes widely distributed.

The present paper may be considered an addendum to Dr. Skottsberg's monograph.

Before the Polynesians came several thousand years ago to the Hawaiian Archipelago (Phytologia 29:242-246. 1974.), we estimated the endemic Angiosperm flora to have numbered about 50,000 well-recognizable taxa; by the time Capt. Cook had rediscovered them in 1778, the endemics had declined to about half that number. With the advent of the bulldozer and the unwitting introduction of exotics, animals as well as plants, the extermination of our endemic plants and the endemic animad dependent upon them for food and shelter is progressing at frightful speed. Though we are here primarily concerned with Wikstroemia perdita as an example of of extermination before our very eyes, we might mention that of the 47 species and 38 subspecies or varieties of endemic birds that enlivened our islands, 22 have become extinct within the last 200 years. The reduction in number of the plants producing their food, such as the red, one-seeded berry of the akia, is one of the main reasons.

The important factor for the ever-increasing disappearance of the local biota is the poor record up to now of our public schools (1/28-29/76), particularly in the teaching of biology and its appreciation. It is disastrous that our Nation nted the Territory of Hawaii Statehood before most of our izens had been properly educated. As a result the e is threatened by biologically dull and tourist-ignoring idents who advocate "the conversion of 5,000 rural acres h year into plantings for commercial timber operations

(2/4/76)." That means the destruction of our fascinating, biologically [redacted] explored jungles for replacement with Australian eucalyptus and Mainland evergreens!. These residents maintain that "Hawaii's forests could support after 50 years, a timber industry generating 1,900 jobs and providing an annual net return of nearly $10 million, according to a State report released yesterday (3/24/76). The report noted that almost half of Hawaii's land is in forests and it consluded that half of that - one million acres - is capable of producing a usable timber crop."

Those materialists who are impressed by the questionable promise "of an annual net return of nearly $10" from timber should ponder H.N. Moldenke's statement (4/16/76) that "The Hawaiian Islands rank with such other islands as Mauritius and Madagascar in the high percentage of endemism among their flora and fauna. In Mauritius and Madagascar thoughtless men have just about completely decimated their natural heritage (which explains in part why so few scientists, and tourists/ in general, visit them anymore)."

We appeal to the botanists of the world to come to this Mecca threatened by lumbering advocates. They should hunt for the unknown pistillate tree of Wikstroemia perdita and collect, preserve, and record as much of the Hawaiian flora as is still extant so that future, better educated generations shall understand what a splendid Paradise the Islands had been before we idiotic Primapes destroyed it for evermore.

Too often part Hawaiians themselves, not thoroughly versed in Biology and Hawaiiana, and tourist hotel ground landscape architects, will destroy native plants bulldoze extensive areas of native plants for replacement with Brazilian bougainvillea and exotic erythrina. We are gratified Dr. Skottsberg did not [redacted] the more recent vandalism as acres of the endemic, nightblooming Cereus sandwicheanus D.C. and the brilliant Wikstroemia pulcherrima Skottsb. and its var. petersonii Deg. Deg. (Phyt. 24; 151, 1972.)

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Otto & Isa Degener

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Skottsberg's handwritten manuscript was completed and posthumously published by Bo Peterson of the "Botaniska Museet, Göteborgs Universitet" who, according to his letter dated March 17, 1973, plans "to be able to publish some additions - - - and to make up a key for the species." We corrected the almost perfect English text, paying particular attention to the confused spelling of Hawaiian names before publication of the monograph as "The Genus Wikstroemia Endl. in the Hawaiian Islands." Acta Regiae Societatis Scientiarum et Litterarum Gothoburgensis. Bot. 1:1-166. 1972.

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Fårö, Sweden, July 30, 1962

My dear Degener,

Thanks very much for the clippeng and for the new Flora leaves. The hunting program is a scandal and I cannot understand that it didn't meet with crushing resistance from the conservation people in U.S.A. Mind you, Hawaii is a state now and nothing like this brutality would pass in any other state.

Among the additions to the Flora were two new Canavalias. I see that you have distributed material to a number of herbaria, all perhaps not very important and I am sorry that you came not to think of Stockholm, where I have tried to build up a representative Hawaiian collection! Lots of paramount things are still missing.

Yesterday I finished the analysis of the last Wikstroemia you sent me. As I told you I cannot handle any more now, as I have to get it MS ready.

Best wishes

Sincerely

Skottsberg

nodis usque 5 cm. longis. Petiolus 5-10 mm. longus; lamina lanceolata, 40-100 mm. longa, 15-25 mm. lata; basi obtusata; apice acuminata. Rhachis 3-5 mm. longa. Flores strigosi; tubus 44 mm. longus; lobi externi 1.5 mm, interni 1 mm. Pistillodium 1 mm. longum; ovario ½ base nudo, ½ apice densiusculo-setoso.

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*The orthography was corrected to "Pulama" on all labels before distribution.

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McBride's "Practical Folk Medicine of Hawaii,"
and opinions about
Tacca hawaiiensis versus Tacca leontopetaloides
and other taxa

Otto & Isa Degener

The occasion for printing a review of a botanical or other work gives us the opportunity not only to express our opinions regarding it, but to discuss the identifications of any plants involved. Some discrepancy in the use of names arises from our tendency to be "splitters," emphasizing the differences in plants; while the author may tend to be a "lumper," emphasizing the likenesses in plants.

L. Richard McBride, former Ranger of Hawaii Volcanoes National Park and presently Lecturer at Kilauea Military Camp, has authored his sixth book: "Practical Folk Medicine of Hawaii." This book of 104 pages is illustrated with 84 figures, over half of plants used by the ancient kahunalapa'au, or medicine man. McBride, under one of his nine headings, warns the reader that his "doctor be consulted" before using a home remedy. Hence the book is not a danger to health and even life of the gullible reader as is the disaster authored by Kaalakamana and Akina in 1922 and unfortunately recently reprinted. Pages 22 through 75 deal primarily with the plants, or simples, and the parts used; and their descriptions and habitats. McBride gives the plants used their vernacular and, according to his judgement, their scientific names. As mentioned above, we as "splitters" prefer such changes be made as Allium, on page 23; Pariti, p. 34; citrifolia, p. 55; gaudichaudii, p. 58; and quinquefolia, p. 62. The illustration for page 39 appears to be just a printer's error. A discussion of "Ailments commonly Treated in Hawaii Folk Medicine" follows the botanical part of the book.

Three scientific names used by the author intrique us:

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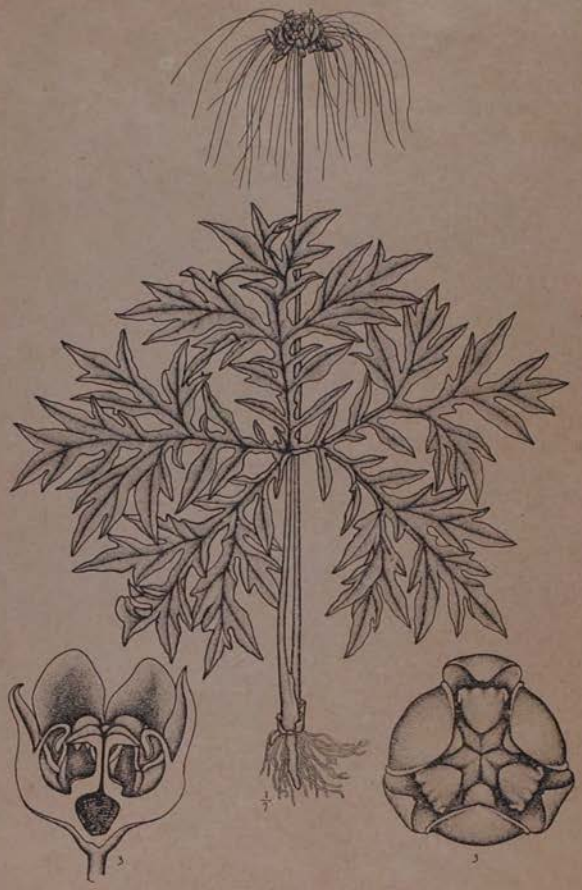
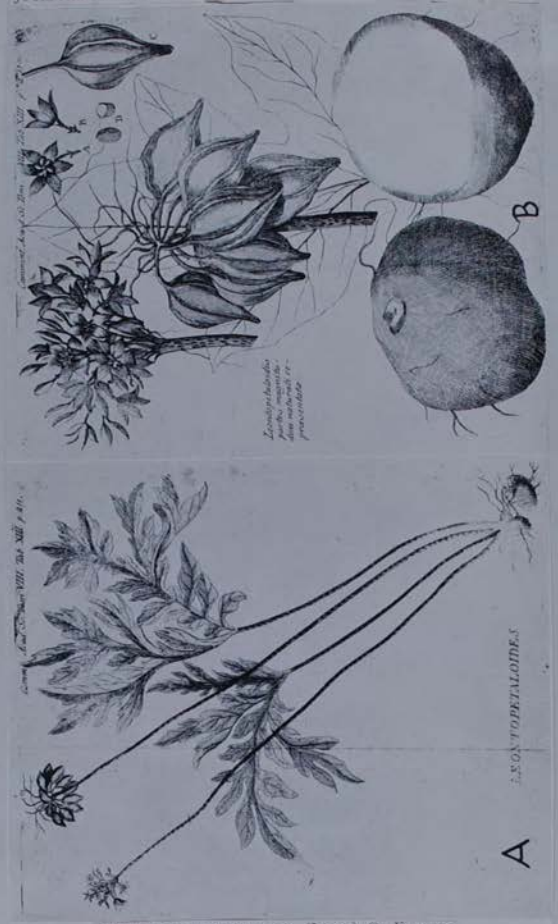
TACCACEAE
TACCA FAMILY



TACCA HAWAIIENSIS Limpricht f.
(Original)
(Described on preceding page)
(Otto Degener, 11/3/'32) (Kapoho, Hawaii)



Tacca Leontopetaloides (Linn.) O. Kuntze

Amman(n), P. Comment. Acad. Sci. Petrop. 8: Pl. 13. 1741, after Merrill

it. That the seeds are wind-disseminated is not sufficiently convincing for us to change our opinion. We are eagerly awaiting a monograph of the genus based, not on casual observation of herbarium sheets, but on facts gleaned with the use of the most recent tools of Science.

"Solanum nigrum" (p. 67), a binomial we have followed for years, is evidently a misidentification. Our popolo is Solanum nodiflorum subsp. nutans R.J. Henderson (1974).

In the Flora Hawaiiensis for November 3, 1932 one of us printed an illustrated description of the local pia he had collected at Kapoho, Island of Hawaii, as Tacca hawaiiensis Limprecht f. Today most workers equate this species with T. leontopetaloides (L.) Ktze., based on a specimen, according to Linaeus (Sp. Pl. 313. 1753), with its "Habitat in India." In fact, Linnaeus refers his binomial to the description and illustrations published by Amman(n) in 1741. As this work is generally unavailable, E.D. Merrill reprinted the Amman(n) plates in the Journ. Arn. Arb. 26: Plate II. 1945. To us, who have had the Hawaiian pia growing in our Mokuleia garden for about forty years and have collected Tacca species in the Hawaiian and Fiji Islands since, T. hawaiiensis and T. leontopetaloides are not conspecific at all but distinct. As pictures can be read in any language, we here dispense with repeating long, technical descriptions in foreign languages. After comparing the plates presently show, doubters can compare original published descriptions for themselves.

"Practical Folk Medicine of Hawaii," selling for $4.50 per copy, caters to the resident and tourist interested in Hawaiiana and local plants in general; not so much to the professional botanist. It is of value to workers in pharmacology of the world as it gives them a clue as to which Hawaiian plants deserve assay. Who knows what medicinal discoveries the kahunalapa'au has made, and how modern chemists may improve on them to enhance their efficacy?

submitted to McClenbecs 6/7/76

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Lauit Molokai
3/17/77

SOME TAXA OF RED-FLOWERED HIBISCUS ENDEMIC TO THE HAWAIIAN ISLANDS

Otto & Isa Degener

After receiving a specimen of a red hibiscus from Mr. Rene *Sylva from the Island of Maui last October, we dusted off our manu=* script concerning the genus Hibiscus and here publish our opinions regarding some of its red-flowered taxa. Unlike more conservative workers we, like Sister Margaret James Roe, exclude the genus Pariti Adans., from Hibiscus L., for reasons explained **elsewhere. With this in mind, we recognize four cohorts of Hibiscus as endemic to the Hawaiian Archipelago. Besides other more important features, these groups can be distinguished from afar by flower color. The yellow is represented by such a species as the mčō-hau-hele or H. brackenwidgei Gray, mostly of arid lowlands; the pink by the hualele or H. youngianus Gaud., mostly of swampy lowlands exposed to salt ocean breezes; the white by such a species as the fragrant pamakani kani or H. arnottianus Gray; and the red, the most difficult and most numerously represented on Kauai, by such a species as the enigmatic kokio-ula or H. kokio Hillebr. These two last groups thrive thrive at low and middle elevations often in rainforests and ledges or streambanks exposed alternately to sun and mist. The suspicion expressed that H. kokio might actually represent a white-flowered taxon we dismiss as absurd as the specific name kokio and the vernacular name kokio-ula clearly refers to its flower color.

A "red" published as a new endemic for the Islands is ***H. fauriei Lévl. This unhappy binomial as ****Rock indicated, can be ignored as a Hawaiian plant. Bought from Abbé Faurie with other specimens for the College of Hawaii herbarium and soon deposited on permanent loan at the Bishop Museum by Legislative fiat, this specimen proved to be the African native coral hibiscus H. schizopetalus (Mast.) Hook. f., grown in gardens in most tropical countries!

H. clayi Deg. & Deg., of Kauai, with its diminutive leaves, is a strong species easily recognized even when sterile. Hence we felt no qualms in publishing an *****illustrated description of it in 1959.

Another "red" is ****** H. kahilii Forbes, known only from the mountains of southern Kauai. It was last collected by St. John in 1947. This species is distinct as **Roe has indicated on page 21.

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**Deg., & Greenw. Fl. Haw. 2/15/57; Roe, M.G., in Pac. Sci. 15(1): 4. 1963.

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*An employee of the State, and an expert in Hawaiiana, especially regarding the native plants of his island.

Besides the differences noted by Roe between H. newhousei Roe of northeast Kauai and H. saintjohnianus Roe of northwest Kauai, we wish to emphasize the difference in leaf shape and venation. The former bears leaves with a distinctly acuminate apex and, on the under side, more delicate ribs abd venation; while the latter has them acuminate and, on the under side , a prominent midrib flanked on each side by a single prominent rib. Contrary to some locally expressed opinion of wishing to unite the taxa, we follow Sister Margaret James Roe's findings. We know both species from living specimens as well as herbarium one: 1.) Degeners' & D. Plucknett No. 28,210. Hibiscus newhousei Roe (2 trees 12 feet high, slender-twiggy; calyx swollen, pale green; stamens red; anther & pollen pale yellow; style branches pink; stigma brownish.) Moloaa, Anahola, Kauai. Open weedy ledges near water intake. March 12, 1961. 2) H. saintjohnianus Roe is represented by Degeners & H.F. Clay No. 34,106. Cultivated in Lyon Arboretum, Honolulu, Oahu. A species endemic to Kauai. July 12, 1963. Degeners' No. 34,105 collected by H. F. Clay. Cultivated in Foster Botanical Garden, Honolulu, Oahu. Originally collected by B.C. Stone along Napali Coast, Kauai, Dec. 28, 1964.

Dismissing as good species with moderately well known ranges H. schizopetalus (syn. H. fauriéé), H. clayi, H. kahilii, H. newhousei and H. saintjohnianus, our opinion regarding the two binomials H. kokio Hillebr., ex Wawra nom. nud., (in Flora oder algemeine botanische Zeitung, p. 174. 1873.) versus H. saintjohnianus Roe (in Pac. Sci. 15(1):18. 1961.) deserves explaining:

What is precisely the true H. kokio, designated the official flower of the Islands in 1923? How many varieties and forms occur? We have worked out some of the answers. The remainder may be gained by the possible finding of herbarium specimens lurking neglected in some foreign museum, living specimens in botanic gardens, further field work, and growing seeds or cuttings from wild plants native to various island regions under controlled conditions.

Hooker & Arnott in Bot. Beech. p. 79. 1832, mentioned the occurrence of Hibiscus Boryanus, native to the Island of Réunion and described by DeCandolle, as occurring at Byron Bay, an obsolete name for Hilo Bay, Island of Hawaii. The present city of Hilo is about ten miles south of the village of *Hakalau.

*Though we have no proof, we suspect that Hooker & Arnott's "Byron Bay" taxon is the "Hakalau Red" of E.V. Wilcox and V.S. Holt described in their "Ornamental Hibiscus in Hawaii. Haw. Agr. Exper. Stat. Bull. 29:58. 12/1/13 as a "Large tree, dark brown bark, green on twigs. Leaves ovate or lanceolate, serrate, smooth, dark green, 3/4-2¼ in. wide, 1½-4½ in long, petiole 1/8-1½ in. Flower 2½ in., wide, uniform scarlet throughout, filaments short, column 2 in., peduncle 1½ in., bracts 6, very narrow, green. Not self seeding; used as male parent." Knowing the area, practically a single sugarcane field stretching along the lowlands for about forty miles, we doubt this has persisted in the wild state unless, very probably, along one of the few narrow, weed strangled gulches traversing it. The "Hakalau Red" is the only red hibiscus the authors mention

As deCandolle's species bears a red flower, the red-flowered Hilo plant was evidently in error identified as the Réunion species. In 1854 Gray (Bot. U.S. Expl. Exped. 1:176.) described the novelty H. Arnottianus, basing his description on two distinct spe species: the red-flowered Hawaii plant and a white-flowered Oahu on one. According to the 1961 Int. Code Bot. Nomencl. Art 64, "When the same new name is simultaneously published for more than one taxon, the first author who adopts it in one sense, rejecting the other, or provides another name for one of these taxa must be followed." Ignoring for a moment Wawra's reference to "Hibiscus Kokio Hillebrand mss.", we find that Hillebrand (Flora Haw. Islands, p. 48. 1888.) selected the name "H. Arnottianus, Gray" for the species with white petals and "H. Kokio, Hillebr.", for a species with red. Now that we have established that some red-flowered hibiscus is H. kokio, precisely which plant is it? Wawra in Flora, oder allgemaine botanische Zeitung, page 174 not 173, please note , 1875, published "Hibiscus Kokio Hillebrand mss.", as a nom. nud., with the remark, "Aus Hillebrands Herbar; 2403. Kokio der Eingebornen sic ; der etwas breitere Kelch und Kronröhre unterscheidet sie von H. Arnottianno, mit dem er sonst über einstimmt (?). Baumartige schöne Sträucher, sollen nach Hillebrand aus den Pali-bildenden Felsmauern von Waiawa (Kauai) vorkommen; auch kultivirt in seinem Garten." On page 48 of his Flora, Hillebrand under the heading "H. Kokio, Hillebr. in Flora 1873, p. 173.", in error for p. 174 gives an adequate but garbled description to establish the name and, on page 49 adds the range: "Oahu, Nuuanu (Remy); Molokai! Halawa (Hbd.); Kauai Haena and Waimea? (Mrs. Sinclair). Very rare, and probably is the Hibiscus with red flowers from 'Byron's bay' referred to by Hook. & Arn. under H. Boryanus, l.s. - Nat. names: 'Pualoalo' and 'Kokio'. Wawra's specimens came from the writer's garden, where it has been in cultivation for many years." The description includes numerous taxa, not just one. According to Hillebrand's Flora, page VIII, "The conventional sign ! placed after a name denoting habitat signified that a specimen or specimens of the species described are to be found in the author's herbarium, which, according to a verbal wish expressed a few hours before his death, has been presented to the Royal Botanical Museum of Berlin*." This fact is worded a bit differently on page XCI. Though Wawra's artiele cle mentions the species as occurring in Waiawa, Kauai, Hillebrand does not repeat this region in his Flora but mentions "Haena and Waimea? (Mrs. Sinclair)" instead. An enigma is Mrs. Sinclair's plate 9 (Indig. Fl. Haw. Isl. 1885)? which Hillebrand cites under his H. kokio. . T is is a painting of a red-flowered hibiscus, identified by J.D. Hooker as "Hibiscus Arnottianus A. Gray forma" and coming from Kauai or perhaps Niihau. This painting is certainly not of our Molokai type plant though identified as H. kokio by St. John (Pac. Sci. 8:143. 1954.). Judging from our own reactions when dealing with novelties, we believe a botanist would describe a novelelty he had not only discovered himself but was cultivating in his garden. Following this reasoning, we place the type locality for the true H. kokio s.s., as Halawa, Molokai. Remember, this is the only red native in Hillebrand's herbarium (as noted by his exclamation mark "!") and evidently the only kind cultivated in his Vineyard

Street, Honolulu, garden. Caum (Occasional Pap. B.P. Bish. Mus. 9. (5):7. 1930.) apparently never saw Wawra's article but simply copied Hillebrand's reference precisely, even to the wrong page number. Miss Roe on page 14, incidentally, gave another wrong Hillebrand-Wawra reference. Caum describes as new Hibiscus kokio var. pukoonis from "Molokai, bottom of Pukoo Valley, just inside the native forest - - -" and considers, with some misgiving, the Oahu plant the species itself. He is wrong. His var. pukoonis fits precisely a fragment of Hillebrand's plant as being in his herbarium by an exclamation mark and now deposited under an "Ex Museo botanico Berlinensi" label in the Bishop Museum as a gift from Berlin to J.F. Rock. It is annotated in Rock's handwriting to be "Hibiscus Kokio Hbd. Cultivated in Hbd's garden." We have seen the sheet. That is why we consider var. pukoonis a synonym of the species itself; and we have drawn heavily upon Caum's careful description. The Oahu plant, surprisingly, has never been properly named botanically.

Furthermore, we omit Mrs. Sinclair's Kauai plant as the possible type for Hillebrand's H. kokio as Hillebrand himself in his Flora indicates his doubt about his species identification by printing a question mark.

To make doubly sure regarding our suspicions about the two binomials H. kokio and H. saintjohnianus, we wrote Kew for help. Through the kindness of Director Sir George Taylor, C.E. Hubbard wrote us under date of the 27th June, 1963: "Dear Dr. Degener, Following your letter of the 18th June, we have looked up the specimen of Hibiscus kokio Hillebrand that was originally sent by Mrs. Sinclair in 1885. A photograph of the specimen is being prepared and a copy will be sent to you when it is ready. On the sheet is a label bearing Hooker's original determination 'Hibiscus aff. arnottianus'. There is also the collectors brown paper label bearing the vernacular name Kokio-ula. The later determination of Hibiscus kokio Hillebr. br. is on a separate slip. This sheet has been compared with Mrs. Sinclair's illustration and there can be no doubt that the two are the same plant. The illustration is, in fact, a very good representation of the species. We shall be very pleased to have duplicates tatia of this species in due course when you are able to send them to us. Yours sincerely, C.E. Hubbard for Sir George Taylor, Director." July 16M 16 Mr. Hubbard wrote: "I enclose the photograph of the type sheet of Hibiscus kokio Hillebr. which was promised to you in my recent letter. The descriptions on the labels do not show clearly, but they have been transcribed on the back of the print." Our accompanying plate I is a reproduction of the copyrighted Kew photograph. On the reverse is the following note, mentioned above, written in pencil:

"Hibiscus kokio Hillebr.
Hibiscus aff. Arnottiana
Hawaii; Mrs. Sinclair
Comm 1/1885
Kokia-ula"

Though Mr. Hubbard considers Mrs. Sinclair's sheet at Kew the type of H. kokio Hillebr., the photograph shows it to be H. saintjohnianus Roe. Even though collected almost a Century earlier, we follow Roe in considering St. John No. 25,989 the lectotype. Put in other words, it is as follows:

HIBISCUS SAINTJOHNIANUS Roe

Hibiscus arnottianus A. Gray forma sensu Sinclair, Indig. Fl. Haw. Isl. Pl. 9. 1885. (Represented by Sinclair plant and Kew photograph.)
Hibiscus kokio Hillebrand Fl. Haw. Isl. 48. 1888. (In part.)
Hibiscus saintjohnianus Roe in Pac. Sci. 15(1):18. 1961.

Type Locality: "Headland west of Hanakapiai, Napali Coast, Kauai. Altitude- 700 feet; on partly precipitous slope. December 22, 1956. H. St. John 25,989." Almost needless to say, we do not consider the Kew plant the type, even though collected about a Century earlier. Degeners, H.W. Hansen & G. Cliff No. 24,008 was collected Sept. 23, 1955 along "Nualolo Trail, Kokee region, Kauai. Sunny shrubby talus above cliffs. (4 ft. bush; fl. slightly yellower than true Chinese red.)" This specimen has leaves somewhat acuminate and the margins more serrate than the type plant.

The above witches' brew, though retaining H. saintjohnianus, boils down to our considering Caum's trinomial H. kokio var. pukoonis unpermissible as it is predated by H. kokio Hillebr., s.s. (see also Articles 69 & 70 of the Code). The Molokai plant, needing a trinomial shall be:

HIBISCUS KOKIO Hillebr. var. KOKIO

Hibiscus kokio Hillebr. Fl. Haw. Isl. 48. 1888. (As to Molokai plant only.)
Not Hibiscus kokio of most authors.
Hibiscus kokio var. pukoonis Caum in B.P. Bish. Mus. Occas. Pap. 9(5):[illegible]. 1930. (His plate 5, however, has flower legends reversed in error.)

Type Locality: "Molokai: Halawa (Hbd.)"; deposited in the Marie C. Neal Herbarium, Bishop Museum, Honolulu.)

A recently discovered novelty is:

HIBISCUS KOKIO var. PEKELOI Deg. & Deg., var. nov. A specie foliis minimis differt. Plate II.

The blades are 50-80 mm. long (not 100-120 mm. as in Caum's taxon), 22-45 mm. wide (not 55-65 mm.), acute to rarely acuminate (not more uniformly acuminate), sinuately crenate to very rarely serrulate (never serrulate); petioles 3-20 mm. long (not 30-40 mm.).

Type Locality: Otto Degener No. 182222. Wailau Valley, Molokai. Rainy, shrubby, coastal ledges. Aug. 3, 1928. Deposited in NY. Lest readers err, we wish to emphasize that this is a trivial taxon of the true H. kokio of Molokai and not of any "red" thus named in error on Kauai or elsewhere. The name commemorates Mr. Noah Pekelo, Jr., who collected the same variety about May 18, 1963. The original Pekelo (or "Peter" in English), according to our friend, bore a longer Hawaiian name before the advent of the Missionaries. (Distributed to NY, Bishop, Berlin, Kew, Leiden, Vienna, Smithsonian). His material came from a "Little gully at an elevation of 2,250 ft. at Kainalu, Molokai, back of 'puu Mano'." "Qbout a dozen or so plants plants remaining - very long branches crawling about over ulehe and other plants similar to Ieie but not entwining."

Having equated the above names with plants to our satisfaction, we know of numerous native "red" taxa having existed or still existing in the Hawaiian Archipelago. We know this from publications, from herbarium specimens collected by ourselves and others, and from plants formerly and presently in cultivation. The two acre "Hibis-Garden," established by the Government in 1955 at the corner of Monsarrat and Paki Avenues, Waikiki, Honolulu, was a potential source of tremendous help. Due to the contributions of horticulturists and botanists like ourselves, a large collection of native, exotic, and hybrid taxa between the two, were growing under controlled conditions. In fact, by 1957 the collection consisted of hundreds of hybrids donated by "The Hawaiian Hibiscus Society," and "about 20 endemic Hawaiian species (Haw. Holiday, 12/1/57)." These plantings of scientific value were, while botanists were concentrating on other genera, suddenly bulldozed without much prior warning and changed into a "Rose Garden," a garden pretty to be sure but quite useless scientifically and out of place in the subtropics. The loss of this garden is largely responsible for the following sketchy surmises regarding some scientifically nameless "reds" not mentioned above. Many of these appeared closely related to one another perhaps because of lack of plasticity; because of ready transport from one island to another by floating seed or capsule to mix emerging gene pools; or, more likely, because of having been transported dry-shod between areas that later became distinct islands due to fluctuations in sea level or due to land movements. Ve that as it may, keen gardeners or horticulturists, and less often botanists, have early recognized among the "reds" many different taxa. In fact, Wilcox & Holt mention, beside the Hakalau red, the Haena red, Kawaihapai red, Kipu red, Molokai red, and Oahu red. Caum (ibid., p. 8) in addition mentions an Ahuimanu red and a Mokuleia red.

HIBISCUS ULA Deg. & Deg., sp. nov. Frutex. Lamina 4-11 cm. longa, 2-7 cm. lata, obovata vel ovata, margine sinuato-dentate; petiolo 2-50 mm.; stpulis 0-5 mm. Pedunculo 1-3 cm.; bracteis 6-7, subulatis; 4-8 mm. Calyce 15 mm. longo, furcato 4-5; lobis acutis. Corolla (rubris?), 75 mm. longis. Columna staminarum 55 mm.; filamentium 8 mm. Ramuli stylorum 8 mm. I. III.

Scandent shrub. Leaves with thin glabrous, broadly obovate to ovate blades 4-11 cm. long, 2-7 cm. wide, sinuately dentate, acumin-

ate to acute or rarely obtuse at apex, rounded at base, on ferruginous scurfy 2-50 mm. long petioles; stipules obscure to (on vigorous shoots) 5 mm. long, setaceous, pubescent. Peduncles near end of branches, 1-3 cm. long, articulate 1/4 from top, glabrate. Involucral bracts 6-7, subulate, 4-8 mm. long, glabrate. Calyx tubular, 15 mm. long, silky puberulent, cleft for 1/3 to 1/4 into acute triplinerved lobes of which lateral nerves in same flower may be fused at cleft or some mm. below it. Corolla red: tube about as long as calyx; lobes 4- to 6-nerved, narrow-obovate, 6 cm. long, toward top 3 cm. wide, glabrous except for faintly ciliolate margin. Staminal column 55 mm. long, glabrous, red, ending in five 1.5 mm. long teeth; filaments crowded toward distal fifth of column, about 8 mm. long, glabrous, antrorsely spreading; pollen yellow. Ovary 7 mm. long, 4 mm. wide, glabrous; style as long as staminal column, its red s spreading glutinous hair (mostly with adhering pollen). Stigma and seed unknown.

Type Locality: "'The plant is vine like and grows on a narrow ridge about an hour's walk from the Iao Valley State Park', West Maui." Collected by Rene Sylva (Degeners No. 34,145). Type: NY; isotypes: Amherst, Berlin, Edinburgh, Geneva, Ithaca, Kew, Leiden, Leningrad, St. L., Wien.

Degeners & Fleming No. 25,125, "(15 ft. high, red flowered, twiggy shrub.) Honokowai ditch trail, W. Maui. Dark gulch-bottom near Strem. March 27, 1959.", collected without flowers was a confusing plant until examination of Mr. Sylva's recent find. His No. 34,145 bears a few apparently depauperate leaves which are smaller, oval and with an ontuse apex, thus resembling those of No. 25,125. This latter plant is not thriving as its densely crowded nodes indicate. Conversely, a few of its watersprouts and a flowering specimen (Degeners No 27,807) "Cultivated by Colin Potter in Foster Botanical Garden, Honolulu from cutting No. 25,125 (which see) from West Maui. Nov. 3, 1961.", matches the normal growth of No. 34,145. We conclude both Nos. 25,125, 27,807 and 34,145 to be H. ula.

HIBISCUS OAHUENSIS Deg. & Deg., sp. nov. Frutex foliis saepe glabratis. Petiolus 6-18 mm. longis; lamina chartacea, 5-13 cm. longa, 2-6 cm. lata, ovata; basi obtusa vel truncata; apice acuta rare acuminata; margine crenata vel raro subintegra. Pedunculus 25-30 mm. longus, bracteolae circa 7, puberulentae; 5-10 mm. longae. Calyx 25 mm. longus, 12 mm. latus, lobis acuminatis. Corolla 6-7 mm. longa, rubra. Columna staminarum 55 mm. longa.

Hibiscus kokio Roe in Pac. Sci. 15(1):14, 17 as to Oahu plant only;; Not Hibiscus kokio Hillebr. Fl. Haw. Isl. 48. 1888. (Unless it is the plant collected by Remy in "Nuuanu," Island of Oahu, sometime between 1851-55 and unknown to us.)

Straggling shrub with virgate branches up to 6 meters long, yellow-pubescent when young. Leaves: Petioles 6-18 mm. long, yellowish pubescent; blades ovate, 5-13 cm. long, 2-6 cm. wide, chartaceous, above glabrous to especially glabrate when young on ribs below, broadly obtuse to subtruncate at base, acute to rarely acuminate above, crenate except for lower fourth which is entire or nearly so or blade rarely subentire throughout; stipules linear, 2-6 mm. long, often caducous. Peduncle 25-30 mm. long, yellowish-pubescent; involucral bracts about 7, subulate, 5-10 mm. long, puberulent. Calyx glabrous, 12 mm. wide, 25 mm. long and split 2/5 its length into acuminate lobes. Corolla 6-7 cm. long, red, with spreading-reflexed 3 cm. wide petals. Staminal column pinkish, 55 mm. long, with flattened linear acuminate 4-5 mm. long reflexed teeth at top, with its 11 mm. long glabrous branches spreading from upper fifth of column. Style slightly longer than staminal column, with red spreading branches coarsely pubescent; stigma subcapitate, dark red.

Type Locality: "Kawaiiki Ditch Trail, Kawailoa, Koolau Range, altitude 1080 feet, November 23, 1956, Roe 204."

Local Range: Reliably known only from the type locality at about 400 meters elevation where a small colony existed. A venerable shrub with straggling branches up to 6 meters long has attracted the attention of several generations of hikers, hibiscus hybridizers and botanists. The kane writer, with Bush & Topping, collected material over thirty years ago from this individual shrub. A visit to this same plant in 1963 to gather Deg. & Deg. No. 28,245 for distribution to a few larger museums showed practically no change in appearance. The label reads: "On perpendicular, rocky bank at Kawaiiki Ditch intake, Kawailoa, Oahu, June 30, 1963." How this taxon relates to other plants on this and remaining islands, we do not presently know. Though it resembles H. kokio Hillebr., of Molokai, it differs in too many features like leaf shape and size of floral parts to be conspecific with it.

~~HIBISCUS ROSATA St. John in Pac. Sci. 26(3):286. 1972.~~

HIBISCUS ROSATA St. John in Pac. Sci. 26(3):286. 1972.

This taxon was discovered on "Kauai Island, Waimea Dist., bottom of short Nualolo Trail, 2,250 ft alt, 30 September 1969, Robert W. Hobdy 158 (Bish)." According to Dr. St. John's description the flower is "(apparently red)." Furthermore, according to a letter from Forester Hobdy dated Dec. 15, 1971 "The Hibiscus (#158) you asked about are quite variable. - - - The flowers show much variety ranging from pale yellow-orange to red. The leaves also show variation in shape and pubescence. I suspect that there is hybridization occurring between the H. St.-johnianus and a maroon Hibiscus described to me by Hans Hansen. I could not find the maroon plants in three trips into the area, but there does seem to be hibridization. What do you make of it?"

The present prodromus should alert our young colleagues to continuous field work, hunting botanical and cottage gardens for native species that may have escaped the vandalized "Hibiscus Garden," and delving through libraries and herbaria throughout the World for neglected references and sheets of historical importance. Much remains to be done to gain a better knowledge of the red-flowered hibiscus endemic to the Hawaiian Islands.

This study is an example of the fuzzy state of knowledge pertaining to our native genera. In fact, most of them, every bit as interesting but nothwith conspicuous flowers universally admired, are still still less known. So modern man is exterminating such fascinating creations faster than a botanist can list them in a Red Book as being rare and endangered. How can botanists stay the bulldozer from crushing an endemic jungle with unique plants and the animals that depend on them for food and shelter when no biologist has had the time to collect and study its unique biota (Phtologia (34(1):28-32. 1976.). Unfortunately by the Red Book method, the rarest plants have no protection at all as, being unknown, they miss the list! For most isolated and little known island systems, like the Hawaiian, all native species should be considered rare and endangered except a few. These last, like some treeferns, acacia and ohia-lehua, should be listed in a Blue Book of species available for harvesting, for replacement with a sterile golf course, or for judiceous population control.

"Man is endowed with intellect and creative powers so that he may multiply what is given him, but up to now he has not created, he has destroyed. Forests are fewer and fewer, rivers dry up, game becomes extinct, the climate is ruined, and every day the earth gets poorer and uglier." From Chekhov's "Uncle Vanya, 1899.

SOME TAXA OF RED-FLOWERED HIBISCUS ENDEMIC TO THE HAWAIIAN ISLANDS

Otto & Isa Degener

After receiving a specimen of a red hibiscus from Mr. Rene *Sylva from the Island of Maui last October, we dusted off our manuscript concerning the genus Hibiscus and here publish our opinions regarding some of its red-flowered taxa. Unlike more conservative workers we, like Sister Margaret James Roe, exclude the genus Pariti Adans., from Hibiscus L., for reasons explained **elsewhere. With this in mind, we recognize four cohorts of Hibiscus as endemic to the Hawaiian Archipelago. Besides other more important features, these groups can be distinguished from afar by flower color. The yellow is represented by such a species as the māo-hau-hele or H. brackenridgei Gray, mostly of arid lowlands; the pink by the hualele or H. youngianus Gaud., mostly of swampy lowlands exposed to salt ocean breezes; the white by such a species as the fragrant pā-makani or H. arnottianus Gray; and the red, the most difficult and most numerously represented on Kauai, by such a species as the enigmatic kokio-ula or H. kokio Hillebr. These two last groups thrive at low and middle elevations often in rainforests and ledges or streambanks exposed alternately to sun and mist. The suspicion expressed that H. kokio might actually represent a white-flowered taxon we dismiss as absurd as the specific name kokio and the vernacular name kokio-ula clearly refer to its flower color.

A "red" published as a new endemic for the Islands is ***H. fauriei Lévl. This unhappy binomial as ****Rock indicated, can be ignored as a Hawaiian plant. Bought from Abbé Faurie with other specimens for the College of Hawaii herbarium and soon deposited on permanent loan at the Bishop Museum by Legislative fiat, this specimen proved to be the African native coral hibiscus H. schizopetalus (Mast.) Hook. f., grown in gardens in most tropical countries!

H. clayi Deg. & Deg., of Kauai, with its diminutive leaves, is a strong species easily recognized even when sterile. Hence we felt no qualms in publishing an *****illustrated description of it in 1959.

Another "red" is ****** H. kahilii Forbes, known only from the mountains of southern Kauai. It was last collected by St. John in 1947. This species is distinct as **Roe has indicated on page 21.

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Besides the differences noted by Roe between H. newhousei Roe of northeast Kauai and H. saintjohnianus Roe of northwest Kauai, we wish to emphasize the difference in leaf shape and venation. The former bears leaves with a distinctly acuminate apex and, on the under side, more delicate ribs and venation; while the latter has them acuminate and, on the under side , a prominent midrib flanked on each side by a single prominent rib. Contrary to some locally expressed opinion of wishing to unite the taxa, we follow Sister Margaret James Roe's findings. We know both species from living specimens as well as herbarium ones: 1.) Degeners & D. Plucknett No. 28,210. Hibiscus newhousei Roe (2 trees 12 feet high, slender-twiggy; calyx swollen, pale green; stamens red; anther & pollen pale yellow; style branches pink; stigma brownish.) Moloaa, Anahola, Kauai. Open weedy ledges near water intake. March 12, 1961. 2.) H. saintjohnianus Roe is represented by Degeners & H.F. Clay No. 34,106. Cultivated in Lyon Arboretum, Honolulu, Oahu. A species endemic to Kauai. July 12, 1963. Degeners' No. 34,105 collected by H. F. Clay. Cultivated in Foster Botanical Garden, Honolulu, Oahu. Originally collected by B.C. Stone along Napali Coast, Kauai, Dec. 28, 1964.

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Hooker & Arnott in Bot. Beech. p. 79. 1832, mentioned the occurrence of Hibiscus Boryanus, native to the Island of Réunion and described by deCandolle, as occurring at Byron Bay, an obsolete name for Hilo Bay, Island of Hawaii. The present city of Hilo is about ten miles south of the village of *Hakalau.

*Though we have no proof, we suspect that Hooker & Arnott's "Byron Bay" taxon is the "Hakalau Red" of E.V. Wilcox and V.S. Holt described in their "Ornamental Hibiscus in Hawaii. Haw. Agr. Exper. Stat. Bull. 29:58. 12/1/13 as a "Large tree, dark brown bark, green on twigs. Leaves ovate or lanceolate, serrate, smooth, dark green, 3/4-2¼ in. wide, 1½-4½ in long, petiole 1/8-1½ in. Flower 2½ in., wide, uniform scarlet throughout, filaments short, column 2 in., peduncle 1½ in., bracts 6, very narrow, green. Not self seeding; used as male parent." Knowing the area, practically a single sugarcane field stretching along the lowlands for about forty miles, we doubt this has persisted in the wild state unless, very improbably, along one of the few narrow, weed strangled gulches traversing it. The "Hakalau Red" is the only red hibiscus the authors mention for the island.

As deCandolle's species bears a red flower, the red-flowered Hilo plant was evidently in error identified as the Réunion species. In 1854 Gray (Bot. U.S. Expl. Exped. 1:176.) described the novelty H. Arnottianus, basing his description on two distinct species: the red-flowered Hawaii plant and a white-flowered Oahu one. According to the 1961 Int. Code Bot. Nomencl. Art 64, "When the same new name is simultaneously published for more than one taxon, the first author who adopts it in one sense, rejecting the other, or provides another name for one of these taxa must be followed." Ignoring for a moment Wawra's reference to "Hibiscus Kokio Hillebrand mss.", we find that Hillebrand (Flora Haw. Islands, p. 48. 1888.) selected the name "H. Arnottianus, Gray" for the species with white petals and "H. Kokio, Hillebr.", for a species with red. Now that we have established that some red-flowered hibiscus is H. kokio, precisely which plant is it? Wawra in Flora, oder allgemeine botanische Zeitung, page 174 [not 173, please note], 1875, published "Hibiscus Kokio Hillebrand mss.", as a nom. nud., with the remark, "Aus Hillebrands Herbar; 2403. Kokio der Eingebornen [sic] ; der etwas breitere Kelch und Kronröhre unterscheidet sie von H. Arnottianno, mit dem er sonst über einstimmt (?). Baumartige schöne Sträucher, sollen nach Hillebrand aus den Pali-bildenden Felsmauern von Waiawa (Kauai) vorkommen; auch kultivirt in seinem Garten." On page 48 of his Flora, Hillebrand under the heading "H. Kokio, Hillebr. in Flora 1873, p. 173.", in error for p. 174 gives an adequate but garbled description to establish the name and, on page 49 adds the range: "Oahu, Nuuanu (Remy); Molokai! Halawa (Hbd.); Kauai Haena and Waimea? (Mrs. Sinclair). Very rare, and probably is the Hibiscus with red flowers from 'Byron's bay' referred to by Hook. & Arn. under H. Boryanus, l.s. - Nat. names: 'Pualoalo' and 'Kokio'. Wawra's specimens came from the writer's garden, where it has been in cultivation for many years." The description includes numerous taxa, not just one. According to Hillebrand's Flora, page VIII, "The conventional sign ! placed after a name denoting habitat signified that a specimen or specimens of the species described are to be found in the author's herbarium, which, according to a verbal wish expressed a few hours before his death, has been presented to the Royal Botanical Museum of Berlin*." This fact is worded a bit differently on page XCI. Though Wawra's article mentions the species as occurring in Waiawa, Kauai, Hillebrand does not repeat this region in his Flora but mentions "Haena and Waimea? (Mrs. Sinclair)" instead. An enigma is Mrs. Sinclair's plate 9 (Indig. Fl. Haw. Isl. 1885.) which Hillebrand cites under his H. kokio. This is a painting of a red-flowered hibiscus, identified by J.D. Hooker as "Hibiscus Arnottianus A. Gray forma" and coming from Kauai or perhaps Niihau. This painting is certainly not of our Molokai type plant though identified as H. kokio by St. John (Pac. Sci. 8:143. 1954.). Judging from our own reactions when dealing with novelties, we believe a botanist would describe a novelty he had not only discovered himself but was cultivating in his garden. Following this reasoning, we place the type locality for the true H. kokio s.s., as Halawa, Molokai. Remember, this is the only red native in Hillebrand's herbarium (as noted by his exclamation mark "!") and evidently the only kind cultivated in his Vineyard.

Street, Honolulu, garden. Caum (Occasional Pap. B.P. Bish. Mus. 9. (5):7. 1930.) apparently never saw Wawra's article but simply copied Hillebrand's reference precisely, even to the wrong page number. Miss Roe on page 14, incidentally, gave another wrong Hillebrand-Wawra reference. Caum describes as new Hibiscus kokio var. pukoonis from "Molokai, bottom of Pukoo Valley, just inside the native forest - - -" and considers, with some misgiving, the Oahu plant the species itself. He is wrong. His var. pukoonis fits precisely a fragment of Hillebrand's plant as being in his herbarium by an exclamation mark and now deposited under an "Ex Museo botanico Berlinensi" label in the Bishop Museum as a gift from Berlin to J.F. Rock. It is annotated in Rock's handwriting to be "Hibiscus Kokio Hbd. Cultivated in Hbd's garden." We have seen the sheet. That is why we consider var. pukoonis a synonym of the species itself; and we have drawn heavily upon Caum's careful description. The Oahu plant, surprisingly, has never been properly named botanically.

Furthermore, we omit Mrs. Sinclair's Kauai plant as the possible type for Hillebrand's H. kokio as Hillebrand himself in his Flora indicates his doubt about his species identification by printing a question mark.

To make doubly sure regarding our suspicions about the two binomials H. kokio and H. saintjohnianus, we wrote Kew for help. Through the kindness of Director Sir George Taylor, C.E. Hubbard wrote us under date of the 27th June, 1963: "Dear Dr. Degener, Following your letter of the 18th June, we have looked up the specimen of Hibiscus kokio Hillebrand that was originally sent by Mrs. Sinclair in 1885. A photograph of the specimen is being prepared and a copy will be sent to you when it is ready. On the sheet is a label bearing Hooker's original determination 'Hibiscus aff. arnottianus'. There is also the collectors brown paper label bearing the vernacular name Kokio-ula. The later determination of Hibiscus kokio Hillebr. is on a separate slip. This sheet has been compared with Mrs. Sinclair's illustration and there can be no doubt that the two are the same plant. The illustration is, in fact, a very good representation of the species. We shall be very pleased to have duplicates of this species in due course when you are able to send them to us. Yours sincerely, C.E. Hubbard for Sir George Taylor, Director." July 16 Mr. Hubbard wrote: "I enclose the photograph of the type sheet of Hibiscus kokio Hillebr. which was promised to you in my recent letter. The descriptions on the labels do not show clearly, but they have been transcribed on the back of the print." Our accompanying plate I is a reproduction of the copyrighted Kew photograph. On the reverse is the following note, mentioned above, written in pencil:

"Hibiscus kokio Hillebr.
Hibiscus aff. Arnottiana
Hawaii; Mrs. Sinclair
Comm 1/1885
Kokia-ula"

Though Mr. Hubbard considers Mrs. Sinclair's sheet at Kew the type of H. kokio Hillebr., the photograph shows it to be H. saintjohnianus Roe. Even though collected almost a Century earlier, we follow Roe in considering St. John No. 25,989 the lectotype. Put in other words, it is as follows:

HIBISCUS SAINTJOHNIANUS Roe

Hibiscus arnottianus A. Gray forma sensu Sinclair, Indig. Fl. Haw. Isl. Pl. 9. 1885. (Represented by Sinclair plant and Kew photograph.)
Hibiscus kokio Hillebr. Fl. Haw. Isl. 48. 1888. (In part.)
Hibiscus saintjohnianus Roe in Pac. Sci. 15(1):18. 1961.

Type Locality: "Headland west of Hanakapiai, Napali Coast, Kauai. Altitude- 700 feet; on partly precipitous slope. December 22, 1956. H. St. John 25,989." Degeners, H.W. Hansen & G. Cliff No. 24,008 was collected Sept. 23, 1955 along "Nualolo Trail, Kokee region, Kauai. Sonny shrubby talus above cliffs. (4 ft. bush; fl. slightly yellower than true Chinese red.)" This specimen has leaves somewhat acuminate and the margins more serrate than the type plant.

The above witches' brew, though retaining H. saintjohnianus, boils down to our considering Caum's trinomial H. kokio var. pukoonis superfluous as it is predated by H. kokio Hillebr., s.s. (see also Articles 69 & 70 of the Code). The Molokai plant, needing a trinomial shall be:

HIBISCUS KOKIO Hillebr. var. KOKIO

Hibiscus kokio Hillebr. Fl. Haw. Isl. 48. 1888. (As to Molokai plant only.)
Not Hibiscus kokio of most authors.
Hibiscus kokio var. pukoonis Caum in Occas. Pap. B.P. Bish. Mus. 9(5):7. 1930. (His plate 5, however, has flower legends reversed in error.)

Type Locality: "Molokai: Halawa (Hbd.)"; deposited in the Marie C. Neal Herbarium, Bishop Museum, Honolulu.)

A recently discovered novelty is:

HIBISCUS KOKIO var. PEKELOI Deg. & Deg., var. nov. A specie foliis minimis differt. Plate II.

The blades are 50-80 mm. long (not 100-120 mm. as in Caum's taxon), 22-45 mm. wide (not 55-65 mm.), acute to rarely acuminate (not more uniformly acuminate), sinuately crenate to very rarely serrulate (never serrulate); petioles 3-20 mm. long (not 30-40 mm.).

Type Locality: Otto Degener No. 18,222. Wailau Valley, Molokai. Rainy, shrubby, coastal ledges. Aug. 3, 1928. Deposited in NY. Lest readers err, we wish to emphasize that this is a trivial taxon of the true H. kokio of Molokai and not of any "red" thus named in error on Kauai or elsewhere. The name commemorates Mr. Noah Pekelo, Jr., who collected the same variety about May 18, 1963. The original Pekelo (or "Peter" in English), according to our friend, bore a longer Hawaiian name before the advent of the Missionaries. (Distributed to NY, Bishop, Berlin, Kew, Leiden, Vienna, Smithsonian). His material came from a "Little gully at an elevation of 2,250 ft. at Kainalu, Molokai, back of 'puu Mano'." "About a dozen or so plants remaining - very long branches crawling about over ulehe and other plants similar to Ieie but not entwining."

Having equated the above names with plants to our satisfaction, we know of numerous native "red" taxa having existed or still existing in the Hawaiian Archipelago. We know this from publications, from herbarium specimens collected by ourselves and others, and from plants formerly and presently in cultivation. The two acre "Hibiscus Garden," established by the Government in 1955 at the corner of Monsarrat and Paki Avenues, Waikiki, Honolulu, was a potential source of tremendous help. Due to the contributions of horticulturists and botanists like ourselves, a large collection of native, exotic, and hybrid taxa between the two, were growing under controlled conditions. In fact, by 1957 the collection consisted of hundreds of hybrids donated by "The Hawaiian Hibiscus Society," and "about 20 endemic Hawaiian species (Haw. Holiday, 12/1/57)." These plantings of scientific value were, while botanists were concentrating on other genera, suddenly bulldozed without much prior warning and changed into a "Rose Garden," a garden pretty to be sure but quite useless scientifically and out of place in the subtropics. The loss of this garden is largely responsible for the following sketchy surmises regarding some scientifically nameless "reds" not mentioned above. Many of these appeared closely related to one another perhaps because of lack of plasticity; because of ready transport from one island to another by floating seed or capsule to mix emerging gene pools; or, more likely, because of having been transported dry-shod between areas that later became distinct islands due to fluctuations in sea level or due to land movements. Be that as it may, keen gardeners or horticulturists, and less often botanists, have early recognized among the "reds" many different taxa. In fact, Wilcox & Holt mention, beside the Hakalau red, the Haena red, Kawaihapai red, Kipu red, Molokai red, and Oahu red. Caum (ibid., p. 8) in addition mentions an Ahuimanu red and a Mokuleia red.

HIBISCUS ULA Deg. & Deg., sp. nov. Frutex. Lamina 4-11 cm. longa, 2-7 cm. lata, obovata vel ovata, margine sinuato-dentate; petiolo 2-50 mm.; stpulis 0-5 mm. Pedunculo 1-3 cm.; bracteis 6-7, subulatis; 4-8 mm. Calyce 15 mm. longo, furcato 4-5; lobis acutis. Corolla (rubris?), 75 mm. longis. Columna staminarum 55 mm.; filamentium 8 mm. Ramuli stylorum 8 mm. T. III.

Slender shrub. Leaves thin, scabrous, broadly obovate to ovate blades 4-11 cm. long, 2-7 cm. wide, sinuately dentate, acumin-

ate to acute or rarely obtuse at apex, rounded at base, on ferruginous scurfy 2-50 mm. long petioles; stipules obscure to (on vigorous shoots) 5 mm. long, setaceous, pubescent. Peduncles near end of branches, 1-3 cm. long, articulate 1/4 from top, glabrate. Involucral bracts 6-7, subulate, 4-8 mm. long, glabrate. Calyx tubular, 15 mm. long, silky puberulent, cleft for 1/3 to 1/4 into acute triplinerved lobes of which lateral nerves in same flower may be fused at cleft or some mm. below it. Corolla red: tube about as long as calyx; lobes 4- to 6-nerved, narrow-obovate, 6 cm. long, toward top 3 cm. wide, glabrous except for faintly ciliolate margin. Staminal column 55 mm. long, glabrous, red, ending in five 1.5 mm. long teeth; filaments crowded toward distal fifth of column, about 8 mm. long, glabrous, antrorsely spreading; pollen yellow. Ovary 7 mm. long, 4 mm. wide, glabrous; style as long as staminal column, its red spreading glutinous hair (mostly with adhering pollen). Stigma and seed unknown.

Type Locality: "'The plant is vine like and grows on a narrow ridge about an hour's walk from the Iao Valley State Park', West Maui." Collected by Rene Sylva (Degeners' No. 34,145). Type: NY; isotypes: Amherst, Berlin, Edinburgh, Geneva, Ithaca, Kew, Leiden, Leningrad, St. L., Wien.

Degeners & Fleming No. 25,125, "(15 ft. high, red flowered, twiggy shrub.) Honokowai ditch trail, W. Maui. Dark gulch-bottom near stream. March 27, 1959.", collected without flowers was a confusing plant until examination of Mr. Sylva's recent find. His No. 34,145 bears a few apparently depauperate leaves which are smaller, oval and with an obtuse apex, thus resembling those of No. 25,125. This latter plant is not thriving as its densely crowded nodes indicate. Conversely, a few of its watersprouts and a flowering specimen (Degeners No. 27,807) "Cultivated [by Colin Potter] in Foster Botanical Garden, Honolulu from cutting No. 25,125 (which see) from West Maui. Nov. 3, 1961.", matches the normal growth of No. 34,145. We conclude Nos. 25,125, 27,807 and 34,145 to be H. ula.

HIBISCUS OAHUENSIS Deg. & Deg., sp. nov. Frutex foliis saepe glabratis. Petiolus 6-18 mm. longis; lamina chartacea, 5-13 cm. longa, 2-6 cm. lata, ovata; basi obtusa vel truncata; apice acuta rare acuminata; margine crenata vel raro subintegra. Pedunculus 25-30 mm. longus, bracteolae circa 7, puberulentae, 5-10 mm. longae. Calyx 25 mm. longus, 12 mm. latus, lobis acuminatis. Corolla 6-7 mm. longa, rubra. Columna staminarum 55 mm. longa.

Hibiscus kokio Roe in Pac. Sci. 15(1):14, 17 as to Oahu plant only; Figs. 9, 10. 1961.

Not Hibiscus kokio Hillebr. Fl. Haw. Isl. 48. 1888. (Unless it is the plant collected by Remy in "Nunanu," Island of Oahu, sometime between 1851-55 and unknown to us.)

Straggling shrub with virgate branches up to 6 meters long, yellow-pubescent when young. Leaves: Petioles 6-18 mm. long, yellowish pubescent; blades ovate, 5-13 cm. long, 2-6 cm. wide, chartaceous, above glabrous to especially glabrate when young on ribs below, broadly obtuse to subtruncate at base, acute to rarely acuminate above, crenate except for lower fourth which is entire or nearly so or blade rarely subentire throughout; stipules linear, 2-6 mm. long, often caducous. Peduncle 25-30 mm. long, yellowish-pubescent; involucral bracts about 7, subulate, 5-10 mm. long, puberulent. Calyx glabrous, 12 mm. wide, 25 mm. long and split 2/5 its length into acuminate lobes. Corolla 6-7 cm. long, red, with spreading-reflexed 3 cm. wide petals. Staminal column pinkish, 55 mm. long, with flattened linear acuminate 4-5 mm. long reflexed teeth at top, with its 11 mm. long glabrous branches spreading from upper fifth of column. Style slightly longer than staminal column, with red spreading branches coarsely pubescent; stigma subcapitate, dark red.

Type Locality: "Kawaiiki Ditch Trail, Kawailoa, Koolau Range, altitude 1080 feet, November 23, 1956, Roe 204."

Local Range: Reliably known only from the type locality at about 400 meters elevation where a small colony existed. A venerable shrub with straggling branches up to 6 meters long has attracted the attention of several generations of hikers, hibiscus hybridizers and botanists. The kane writer, with Bush & Topping, collected material over thirty years ago from this individual shrub. A visit to this same plant in 1963 to gather Deg. & Deg. No. 28,245 for distribution to a few larger museums showed practically no change in appearance. The label reads: "On perpendicular, rocky bank at Kawaiiki Ditch intake, Kawailoa, Oahu, June 30, 1963." How this taxon relates to other plants on this and remaining islands, we do not presently know. Though it resembles H. kokio Hillebr., of Molokai, it differs in too many features like leaf shape and size of floral parts to be conspecific with it.

HIBISCUS ROEATA St. John in Pac. Sci. 26(3):286. 1972.

This taxon was discovered on "Kauai Island, Waimea Dist., bottom of short Nualolo Trail, 2,250 ft alt, 30 September 1969, Robert W. Hobdy 158 (Bish)." According to Dr. St. John's description the flower is "(apparently red.)" Furthermore, according to a letter from Forester Hobdy dated Dec. 15, 1971 "The Hibiscus (#158) you asked about are quite variable. - - - The flowers show much variety ranging from pale yellow-orange to red. The leaves also show variation in shape and pubescence. I suspect that there is hybridization occurring between the H. St.-johnianus and a maroon Hibiscus described to me by Hans Hansen. I could not find the maroon plants in three trips into the area, but there does seem to be hybridization. What do you [illegible]?

The present prodromus should alert our young colleagues to continuous field work, hunting botanical and cottage gardens for native species that may have escaped the vandalized "Hibiscus Garden," and delving through libraries and herbaria throughout the World for neglected references and sheets of historical importance. Much remains to be done to gain a better knowledge of the red-flowered hibiscus endemic to the Hawaiian Islands.

This study is an example of the fuzzy state of knowledge pertaining to our native genera. In fact, most of them, every bit as interesting but not with conspicuous flowers universally admired, are still less known. So modern man is exterminating such fascinating creations faster than a botanist can list them in a Red Book as being rare and endangered. How can botanists stay the bulldozer from crushing an endemic jungle with unique plants and the animals that depend on them for food and shelter when no biologist has had the time to collect and study its unique biota (Phytologia 34(1):28-32. 1976.). Unfortunately by the Red Book method, the rarest plants have no protection at all as, being unknown, they miss the list! For most isolated and little known island systems, like the Hawaiian, all native species should be considered rare and endangered except a few. These last, like some treeferns, acacia and ohia-lehua, should be listed in a Blue Book of species available for harvesting, for replacement with a sterile golf course, or for judiceous population control.

"Man is endowed with intellect and creative powers so that he may multiply what is given him, but up to now he has not created, he has destroyed. Forests are fewer and fewer, rivers dry up, game becomes extinct, the climate is ruined, and every day of the earth get poorer and uglier." Chekhov, "Uncle Vanya", 1899.