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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.

To Miss Anita Karg, in appreciation for her helps. Otto & Isa Degener

OUTRAGEOUSLY PRESUMPTUOUS!
AGAIN
Breadfruit, Artocarpus altilis (J.P. du Roi) Deg. & Deg.
AND
Tahiti-Chestnut, Inocarpus fagifer (J.P. du Roi) Deg. & Deg.

Otto (*kane) & Isa (*wahine) Degener
Authors, Flora Hawaiiensis

To make a long story still longer, I wish to explain that my mother's great-great-grandfather and my father's great-grandfather was the same man, to wit Friedrich Christian Ludwig Henneberg (1748-1812), Private Secretary to Duke Karl Wilhelm Ferdinand in Braunschweig (Brunswick). After Napoleon conquered the Duchy, Henneberg, under Napoleon's brother Jerome, became regent. This and more we explain in our Flora Hawaiiensis 2/15/66. French influence naturally at that time eclypsed the German. Johann Philipp du Roi (1741-1785), Court Physician (Hofmedicus) and botanist, was seven years younger than Henneberg, and hence their families evidently fraternized and danced the French minuet at the Ducal Court. How keen a physician du Roi may have been we have no way of telling; but he was a busy correspondent of the younger Linnaeus, who named the Rubiaceous genus Duroia in his honor in 1781. Du Roi published on Botany, one of his books being reprinted in several revised editions even after his death.

In 1907 (and again in 1910) my parents and I sailed from our home in New York City to visit relatives in Germany and Austria. In Braunschweig I was introduced to two elderly "Vetter" or cousins, evidently on my father's side of the family rather than on my mother's. Their names were pronounced "Dürwa," but spelled differently. Richard du Roi, the elder, held some government post in Berlin; while his younger brother (old to me) owned a cigar factory in Braunschweig. My cousins did not interest me in the least. But the younger, who lived in the suburbs, had the hobby of raising yokohama or phoenix fowl, which kept me fascinated when not interrupted by tasty afternoon coffee or chocolate with whipped cream and petits fours. Du Roi frequently won awards at Poultry Shows throughout Europe. His roosters were raised on high perches reminiscent of those to which parrots are now tethered. Thus they did not damage their tail and sickle feathers, which grew 10 to 15 feet long. To let them be dragged along the floor of a chicken coop would have been disastrous. The yokohama breed, originally from Kochi Prefecture, is so unique that the Japanese Government in 1922 ruled it a natural monument.

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*Kane, Hawaiian vernacular for "man"; wahine, for "woman."

With the above preamble ended for the present, we wish to consider the proper scientific name of the breadfruit and of the Tahiti-chestnut. For years the former taxon has gone under the name Artocarpus communis J.R. & G. Foster, Char. Gen. 101. 1776. The specific name communis is antedated, however, by altilis, the trivial name in the combination Sitodium altile. This 1773 nomen nudum of Parkinson was legalized by the mysterious botanist "Z" in his "Die Pflanzen der Insel Outahitæe, aus der Parkinsonischen Reisebeschreibung gezogen, und mit Anmerkungen erläutert von Z." Der Naturforscher 4:240. 1774. Without knowing who "Z" might be, it seems to us a bit premature or presumptuous to officially name the breadfruit Artocarpus altilis (Parkinson ex "Z") Fosb., in Journ. Wash. Acad. Sci. 31(3):95. 1939.

According to Recommendation 46C of the Code, "When a name has been proposed but not validly published and ascribed to him by another author, the name of the former author followed by the connecting word ex may be inserted before the name of the publishing author." To unburden ourselves of dead wood so to speak, we desire dropping reference to the artistic youngster Sydney Parkinson hardly out of his teens. This is in good taste, as the following shows: "If it is desirable or necessary to abbreviate such a citation," the good book states, "the name of the publishing author, being the more important, should be retained." Thus we could shorten the presumed scientific name to read Artocarpus altilis ("Z") Fosb. Yet this is prohibited according to Article 46, a mandate and not a recommendation. It states that "For the indication of the name of a taxon to be accurate and complete and in order that the date may be readily verified, it is necessary to cite the name of the author who first validly published the name concerned - - -." Realizing the "Z" is hardly a name, we consider the binomial printed in 1939 not validly published and hence ignore it.

After reading Herman Manitz' fascinating "Friedrich Ehrhart und die Publikation des 'Supplementum Plantarum' von Linné Filius." Taxon 25(2/3):305-322. May 1976, we personally pounced upon pages 305, 311, 313-315, 319 and 320, especially noting with gusto page 314. The "Z" and "Sz" stand respectively for Johann Philipp du Roi and presumably for "Sage" or "saying" of du Roi. When he published his binomial for the breadfruit du Roi was 33 years old. We here publish our version of the correct binomial, citing the original synonym beneath:

ARTOCARPUS ALTILIS (J.P. du Roi) Deg. & Deg., comb. nov.
Syn. Sitodium altile J.P. du Roi in Der Naturforscher 4:240. 1774.

Applying the same reasoning to the Tahiti-chestnut, which the kane writer knew from Fiji (Degener, O. Naturalist's South Pacific Expedition: Fiji. Pp. 76, 131, 215. 1949.), we here publish our version, with original synonym beneath:

Breadfruit

INOCARPUS FAGIFER (J.P. du Roi) Deg. & Deg., comb. nov.
Syn. Anistum fagifer J.P. du Roi in Der Naturforscher 4:230. 1774.

Continuing our preamble as a postscript to save the reader suspense, we admit that the cousins du Roi were men of character: For instance, they had not been on speaking terms for many years. When the kane's parents gave their farewell dinner to relatives and friends in the best Braunschweig hotel, we children sat at a "Katzentisch", while the du Roi brothers sat on either side of my mother at the foot of the main table. Not wishing to break their habit of silence, the du Roi's regaled each other with interesting conversation, never directly to one another, but invariably through my mother as intermediary. In the city, "Ratze", perhaps not wishing a senile end, would raise his cane and strutt through the thickest street traffic with carriage horses rearing and rubber automobile horns blaring. He would cheerily beckon us to follow with the remark: "Komm, komm, no one is allowed to run over you." He perished in the middle of Kurfürstendamm, Berlin, under the hooves of two horses during World War I; while his brother died in bed in Braunschweig, we presume, of emphysema and a cigar smoker's heart.

Now properly named Artocarpus altilis (J.P. du Roi) Deg. & Deg., and Inocarpus fagifer (J.P. du Roi) Deg. & Deg., breadfruit syncarps and Tahiti-chestnut legumes need no longer turn in their imu graves in shame. PAX VOBISCUM to men and plants alike.

Should I ever be able to totter to a 'phone in Braunschweig and read the fine print in the Directory, I shall contact every "Henneberg," "du Roi" and "Z" listed in an attempt to unearth familial roots. This may augment the aid received from Buchheim, Braunschweig Stadtkirchenamt, Braunschweig Ordnungsamt, Fambach, Fosberg (sphalm.?), Karg, Manitz, Specht und St. John.

(Submitted for publication April Fool's Day 1978.)

Kaena Point, Hawaiian Islands
and
A Prodromus Regarding Some Taxa in Sesbania (Leguminosae)

Otto & Isa Degener

Whether the Spaniards, while sailing their galleons before the trades from Acapulco to Manila south of the Hawaiian Archipelago and back to Acapulco north of it, ever introduced decimating diseases to the Polynesians is a moot question. But that Captain Cook, later in spite of strict precautions, introduced social and other diseases to the susceptible natives during his rediscovery of the Hawaiian Islands in 1778 is well authenticated. Cook estimated the population of the Archipelago in 1778 at 400,000, how accurately we do not know. By 1832, because of this and subsequent contacts with Europeans and their "civilization," the Hawaiians had dwindled to 124,449; by 1836, to 107,954; and by 1850, to 86,593! In 1950, by the way, the census lists only 162 pure Hawaiians, but 73,277 part-Hawaiians. At the present time, the Hawaiians as a pure race are practically extinct, though fortunately many residents can proudly claim some little Polynesian blood coursing in their veins.

Not wishing to be ruler of a Nation with a dwindling population Kauikeaouli, crowned King Kamehameha III, and the Royal Hawaiian Agricultural Society, promoted the immigration of foreigners. Due to these efforts about two hundred Chinese arrived on the British bark "Thetis" January 3, 1852. These men were engaged as plantation laborers for $3.00 per month; and were supplied with food, clothing and a house. Immigration from then on continued by leaps and bounds, especially from the Orient, from the Azores and in less numbers from Europe. In 1925 these hordes of men were earning $30 in wages per month, with additional advantages such as free hospitalization; while the kane writer, (O.D.) an immigrant from New York Ostby was teaching with an advanced degree Botany at the University of Hawaii with a princely salary of $180 per month.

The above preamble shows why so many of Hawaii's older citizens and their older offspring, by now prominent in business, the professions and in the Legislature are hard workers, thrifty, "practical," and eminently ambitious. They are a splendid lot as a whole in spite of rather elementary training limited to the Three Rs taught in poor plantation village schools, when not interrupted by the practice of child labor. Their background too often convinced them that if a plant no matter how scientifically or intellectually valuable or stimulating it looked, could not be used for fuel,

lalo-loa - Ipomoea batatas, a form

lama - Diospyros, native species. Engl. mela

lamia - Boehmeria nivea. Engl. ramie

lamie - see lamia

Lani'i - Ipomoea batatas, a form

lanalana - Cananga odorata. Engl. ylangylang

laniuma - Pelargonium species. Engl. Pelargonium

lani-wai - see leni-wai

lani-wela - Conyza

lapa - Ipomoea batatas, a form

lapa - Colocasia antiquorum, a form

lapalapa - Cheirodendron platyphyllum and form with leaflets wider than long and apt to ~~tremble~~ flutter in breeze

lapine - Cymbopogon citratus. Engl. lemongrass

lauae - see lauwae

lauae-haole - Phlebodium aureum. Engl. golden phlebodium

lauae-kane - ? ? me too)

lauae-wahine - ? ?(me too)

lauele - see lauhele

lauele - see ilihai

lauawa - Clerodendrum speciosissimum. Engl. Java glorybower

lauhele - ?

lauhue - some unidentified, poisonous cucurbit ?

lauii % - Doodia

medicine or food for man or beast it was worthless "grass," the Pidgin English word for "weed." Thus to most of these influential, immigrant old-timers the endemic plants and the endemic animals that depend upon them for food and shelter are today expendable unless they can be made into wood chips for selling to the paper industry in the Orient or can be transformed via the vegetarian food chain into exotic axis and blacktailed deer, goats, sheep, pronghorn and other herbivores available for hunters. Fortunately an increasing number of biologists ~~early~~ more recently schooled on the Mainland and biologically akamai (clever, smart) sons and daughters of these old-timers are determined with almost missionary zeal to teach the grandchildren to appreciate "scientific and historical information" of the northwest end of Oahu, State of Hawaii. They realize that "grass," like the small sundew, has greater intellectual value than a 300 foot tall eucalyptus. They intend to end the wholesale errors of their elders. They are beginning to retard the present ghastly slaughter of endemic plants and animals, the destruction of unique geological features, and evidence of ancient Hawaiian culture under the crunch of the bulldozer. The King of Beasts (cf., "The Wizard of Oz") is certainly not Felis leo, but Homo sapiens!

One outstanding younger teaching group centers its activity at the University of Hawaii under the Sea Grant/Marine Advisory Program and the Hawaii Committee for the Humanities. Teacher Edward Arrigoni, author; and Marine Advisory Specialist Raymond Tabata, editor, published "A Nature Walk to Ka'ena, O'ahu" February 1977 in an edition of about 1,000 copies. This field book of 112 pages, on legal size paper, is cheaply printed by photo-offset and, at the time of our writing this review, free to those who write to the University for a copy. It concentrates on a limited area of northwest Oahu jutting out toward Kauai. Slanted primarily for the use of teachers, Scout leaders and hiking groups as well as individuals, this work should gain many more than 10,000 proselytes for the conservation and appreciation of Nature.

Besides a map of the area involved, four plates and four figures, this guidebook for the six mile coastal excursion includes 56 figures of plants besides one plate and one figure of fishes. Some of the illustrations are poor due to the poor quality of paper and printing, but all are clear enough for identifying the specimens in the field. Of the 57 plants involved, 26 are naturalized and mostly weedy, about 14 are native to the Hawaiian Islands and elsewhere, and about 16 are endemic (or peculiar) to the Hawaiian Islands. Botany, in the hitherto neglected Hawaiian Islands, is progressing rapidly thanks largely to monographers.

Hence the binomials by which plants have been known locally for many years are found to need correction. For instance, Arrigoni, following the kane (O.D.) reviewer's Flora Hawaiiensis printed July 3, 1933, uses for the endemic cotton the binomial Cheesyium tomentosum Nutt.; while, according to the researches of W.I. Wilbur in February (Taxon, p.140), the name must be changed to G. sandvicense Parl. Similarly, the popolo of the Hawaiians must no longer be known as Solanum nigrum L., but, according to R.J.F. Henderson in September 1974 (Contr. Queensl. Herb. p. 33), as S. nodiflorum subsp. nutans R.J. Henderson. We, however, choosing to consider the taxon a variety rather than a subspecies, prefer a slightly different trinomial which may be a slight improvement or the opposite.

The loveliest plant described and figured is the ohai, Sesbania tomentosa Hook. & Arn., s.s.(Bot. Beech. Voy. 286. 1836.), a member of the Leguminosae. It is actually a spreading tree usually only up to 3 dm., tall, a true bonsai. Its silvery , silky-pubescent leaves overshadow its greenish yellow and salmon pink flowers. It was common in the '20s when first collected by the kane writer, but now on the verge of extinction. He knows it only from the north shore of the study area and, fearing its extermination due to cattle pastured there, scattered its seeds in the '30s about the former S.N. Castle property at the opposite end of the island at Waimanalo about forty miles distant.

As little has been published about endemic taxa of Sesbania occurring in the Hawaiian Islands we here indulge in a mélange of scientific facts and pure speculation:

Though the hard seeds sink in ocean water, the dry legumes carrying them may float for a considerable length of time. Not only xerophytes but halophytes as well, we speculate the original sesbanias, or ohai of the Hawaiians, during the past millions of years established themselves on most if not all of the scattered large and small islands of our slender archipelago. Mingling between islands was rare enough to interfere greatly with isolation-induced speciation. We are pretty well convinced that if our many islands from Hawaii to Midway and beyond were thoroughly combed for ohai, well over a score of distinct species and strong varieties would be discovered.

Lest Vaughan MacCaughey's early observation go unnoticed, we here quote it:"A brilliant sea-shore shrub is the ohai (Sesbania tomentosa). This is a much-branching legume, six to twelve feet high; the leaves have eight to eighteen pairs of pinnae, and the large scarlet flowers are in loose axillary racemes. The natives are fond of the bright flowers, and the bush is often to be found in the vicinity of the little beach settlements, particularly along the arid leeward shores, where vegetation is scanty." (The Wild Flowers of Hawaii. Amer. Bot. 22:100. 1916) We doubt the accuracy of the specific name.

A truly definitive monograph of the Sesbania taxa of the Hawaiian Archipelago awaits the thorough collecting of material the thorough collecting of material (perhaps with the aid of the Coast Guard, Fish and Wildlife Service and a monetary grant to visit isolated islets), discovering historical material scattered im herbaria of

the World and becoming familiar with it, and growing from seeds diverse material under controlled conditions. Thereafter would follow the usual studies of gross morphology augmented by the newer ones involving chromosomes and pollen. Presently greatly handicapped, we here present our prodromus arranged by island rather than by taxon; a fully illustrated description of two pages for each species awaits eventual publication in the Board of Agriculture series.

__Necker__: Christopherson, E., & Caum, E.L. Bull. Bishop Mus. 81:7. 1931, record "A few plants, low and widespread along the flat top of the main part of the island; most of these less than 2 feet high, but spreading as much as 6 to 10 feet in diameter; much favored as nesting site by boobies and frigate birds."

__Niihau__: C.N. Forbes enumerates __S. tomentosa__, a determination we question, for this island in Occas. Pap. Bishop Mus. 5(3):22. 1913. Christopherson & Caum (ibid., p. 6. 1931.) report a taxon as being "Distributed all over the island but nowhere in dense stands."

__Kauai__: J.F. Rock, on page 155, 1920, discussing the __ohai__, states that "on Kauai, near Mana, it is a branching erect shrub several feet in height." It is apparently extinct unless some dormant seeds should spring to life and escape straying cattle there.

__Oahu__: Mann, H., Flora Hawaiian Islands on page 54, 1867, states: "Hab. Waianae, Oahu, and perhaps in other parts. Puna, Hawaii, Niihau." The __kane__ writer, residing not far from Waianae, knew about forty plants growing along the coast between Kawaihapai and Kaena Point. He kept the taxon under observation for about a decade before publishing an illustrated description of it as __Sesbania tomentosa__ Hook. & Arn., in his __Flora Hawaiiensis__ May 11, 1937. This is the species covered by the present field book, a plant on the verge of extinction.

__Molokai__: Rock, discussing the __ohai__ in the book mentioned above, reports its occurrence "on the sand dunes at Moomomi on the dry west end of that island. It forms dense mats over the white coral sands, covering quite an area." At the Bailey Hortorium in Ithaca, New York, is his specimen with an illegible date on his label that appears to be March 1909. There, also with an illegible label - we try to guard against this loss by using India ink - is Forbes' No. 604 collected in Moomomi March 24, 1915. On April 25, 1928 the __kane__ writer collected No. 17,954, noting on the label "Flowers narrow, crimson, arid sand dune, Moomomi, Isl. Molokai." It was on the verge of extinction. As the Chilean mesquite (__Prosopis__) does not grow there but rather further to the lea, the voracious introduced Indian deer which fatten on its abundant, juicy, sweetish pods had bypassed a few plants of the unpalatable, dry podded __ohai__. This probably accounts for its survival. It is certainly a species deserving protection from extermination.

"Preoccupied with other matters, No. 17,954 was set aside undescribed with a colleague as __Sesbania tomentosa__ var. __molokaiensis__ Deg. & Sherff in Amer. Journ. Bot. 36:502. 1949. After Allan B. Bush (1881-1960), Supt. of Grounds & Structures, University of Hawaii, raised seeds on the Campus to flowering, this antiquated disposition of the taxon proved too conservative. We therefore here rename it __Sesbania molokaiensis__ (Deg. & Sherff) Deg. & Deg.

A second taxon of __Sesbania__ has come to our personal attention. Please note the observations and comparisons Mr. Noah Pekelo, Jr., of the Dept. of Agri. & Conservation at Kaunakai ("K'kai") made for us in his letter of March 19, 1961: "I have taken a keen interest in the legume __Sesbania__, for although this small tree is not common here, it is utilized for feed by both deer and cattle and has the ability to withstand grazing. Most of the __Sesbania__ which I am familiar with are found growing on the semi-arid ridges of Central Molokai at Moomomi. The plant is growing prostrate within a patch of beach grass, the seeds and flowers of this plant are entirely different from that of the trees growing along the ridges, the seed pods are as long as the mountain plant's pod but is curved; the flowers of the beach plant appear narrower and are a deep crimson in comparison to the mountain plant. If possible I would like to receive all information possible on these plants. Should you require specimens I would be happy to collect what you may need for identification."

The Moomomi taxon we recognized to be S. molokaiensis; but we were unsure about the other and asked if we could "see it some day." We arrived on Molokai the latter part of June whereupon Mr. Pekelo drove us east mauka (mountainward) of "K'-kai" to his find. We noted the endemic, glaucous pricklepoppy (argemone), with its white flowers and the endemic nehe (hipochaeta) with its yellow heads, but failed to note the ohai we had come to study! Suddenly we noticed the ohai thinly scattered about us. They were almost invisible trees about 5 meters tall with slender, virgate trunks and slender, subhorizontal branches bearing a few scanty tufts of leaves from which a few flowers and pods were hanging. The flowers had a pale green calyx. The standard was greenish yellow without but with faint radiating salmon streaks diffusing together particularly toward the margin; it was salmon with a dull greenish tinge within. Wings without were pale rose ending with a darker tip, with a whitish streak extending from broad base 1 mm. along lower margin to peter out two thirds from the base; it was yellowish rose within. The keel was paler rose without and had a 2 mm. wide lower margin extending half way toward the tip. The stramineous pods were arcuate, commonly 20 cm. long, 5 mm. wide and 2 mm. thick. These contained about 25 closely packed chocolate brown seeds 5 mm. long. The collection is Degners & Noah Pekelo No. 32,430. Waikakupala Ridge, East Molokai, this slope with endemic Chenopodium papaleo, Hipochaeta, Euphorbia, Argemone etc. June 30, 1961.

This ghost-like species, rarely a bit more compact, had been described and named by Rock "Sesbania tomentosa var. arborea Rock n.v.", on his sheet collected February 1919 at "Mauna Loa, Molokai." Bishop Museum Herbarium

Perhaps questioning the validy of his trinomial, Rock refers to it more fully in his 1920 book Indigenous Trees of Hawaii 155-156. 1920. His plate, incidentally, is not of S. tomentosa Nutt., s.s. He states that "Recently the arborescent type of Sesbania tomentosa has been discovered by Mrs. L.M. Dunbar on the slopes near Mahana on the west end of Molokai. She reports it as a tree 12 to 15 feet in height. The leaves are longer, the leaflets smaller and more numerous than the creeping variety (S. molokaiensis) on the same island at the beach sands of Moomomi. It is, however, identical with it with the exception of being arborescent; it may be designated as Sesbania tomentosa forma arborea Rock f.n." Rock states likewise that the species itself is on Kauai, Oahu, Molokai and Hawaii. With this statement we agree as to Oahu only. S. tomentosa here on Oahu Whether Rock's Mauna Loa plant is identical with Mrs. Dunbar's find is immaterial. The latter is the type to which his name belongs. We here modernize this archaic name to its proper Sesbania arborea (Rock) Deg. & Deg.

5 Lanai: While house guests of engineer Adolph Deska and his amateur botanist wife Edean, we met the talented schoolboy Robert Hobdy, now State Forester. Answering our query regarding strange plants, he lead us August 21, 1957 to the ohai which we distributed as Degener et al., No. 24,187. The label reads: "West of Kuahua Gulch at 750 ft. elev., Lanai. On arid pili-Sida-Argemone-Lipochaeta slope; about 10 S., trees remaining among some larger dead ones. No other trees of any other kind in vicinity. (1 ft. high tree with few slender horizontal 3-5 ft. long branches; flowers pale red to orange tinged; outer surface of standard, however, greenish yellow; lower part of keel whitish; fl. fading yellowish.)" Inspection of specimens in the Bishop Museum revealed that G.C. Munro's No. 395 collected at 300 feet elevation at Kamoku was the same. Kaohai specimens, on the contrary, collected by him May 25, 1914 and again March 1915 are too coarse to be the same. We believe this latter taxon extinct. Grateful paying guests of the Dole Pineapple Company under Manager Aldridge and the National Science Foundation we returned to Lanai to botanize from July 1963 through January 1964. We found no other ohai stand except that represented by No. 24,187, the type of the taxon here newly described as:

SESBANIA HOBDYI Deg. & Deg.,

5½

SESBANIA HOBDYI Deg . & Deg. Abor 1 m. alta

No. 34,187

~~Of the taxa~~ We know from field observations, and now deposited ~~as~~ vouchers in leading botanical institutions, ~~this~~ miniature twiggy pale yellowish silky tomentose xerophytic dwarf tree up to about 1 meter tall with some few horizontal branches extending 3 to rarely 15 dm., resembles the similarly small but more graceful halophyte S. tomentosa of coastal Oahu. Less silky pubescent, the former taxon shows the veins and veinlets of its leaves more prominently. Floral parts differ in their proportions in the two taxa, but hardly enough to excite us. Regarding the calyx, that of the Lanai plant is larger and proportionately wider, and is not gibbous at its upper back as is the Oahu plant. Both have deltoid lobes. As to corolla, the standard of the Lanai taxon is a trifle narrower, though in the distal part both are similarly orbicular. Wings and keel are a bit longer and narrower in the former. Seeds are similarlyly olive green. With the name briefly validated so the taxon can now be officially listed as an endangered species, if not now exterminated, we have time for the preparation of a carefully executed illustrated description to accompany that of S. tomentosa when funds are available.

(6) Kahoolawe: A specimen almost reduced to cigaret beetle frasse by zoologist Ball's sealing the local museum's wooden herbarium cabinets with putty against the entrance of insects in 1922, shows that this island did harbor some Sesbania. Probably long-viable ohai seeds still in the soil might reestablish the taxon on this island were officials prodded to practice biological control to kill off the scourge of feral goats which prefer endemic to exotic plant fare. As the island is properly "off limits" to humans and has been freed of beef cattle, Kahoolawe vacations, without supplimentary food, on the island, of the State's prides of zoological park lions would not only reestablish its former dry forest but save the island from erosion. The cost of such vacations for these genial, giant pussycats would be trivial as only a helicopter and a tranquilizer gun would be necessary to end it.

(7) MAUI: This island, in the geologic past, consisted of two. Now, however, connected by a massive sandy isthmus replete until recently with endemics now largely exterminated by the sprawling community of Wailuku. It seemed truly anomalous that no one had discovered a taxon or two of ohai on East and on West Maui. So it was not surprising to receive a letter dated July 8, 1977 from Mr. Rene D. Sylva, ??????????? Park, with the following paragraph: "You may be interested to hear that I found an ohai (Sesbania spp.) on Maui in the Kahakuloa area, 100 yards west of Nakalele Point lighthouse. The plant had been run over by a jeep which had broken off the stem. This stem was at least two inches in diameter and the plant is prostrate on the ground in a very dry and windy location; also it is in a dying condition. Fortunately there was a part of the plant still in fairly good condition with two flowers and two seed pods on it. I managed to rescue two small seedlings and they are growing in good condition at our small Botanical Garden."

HAWAII: Kalae, the most southerly point of the archipelago, is covered by yellow Pahala 7
ash from an enormous explosive eruption in the geologic past of Mauna Loa. The area, due to some fresh and barely potable brackish springs and to prime fishing because of rich, up-welling ocean currents, was heavily populated by the Hawaiians in spite of the arid climate. Stone salt pans, some papamu (...), and house sites are scattered about. Ka Heiau o Kalalea is near the tip, constructed to induce the gods to increase the reproduction of three species of fishes. This temple still has a crude altar. Fishermen, of course, no longer believe in the gods of their ancestors - well, on second thought, the fish might bite just a bit better with a can or two of beer left on the altar. Today we notice mostly Kirin and Schlitz brands. After the rediscovery of the Islands by Captain Cook in 1778, a stone wall was constructed enclosing a strip of the western part of Kalae almost half a mile long and 75 feet wide. Protected from timid feral goats day and night by the presence of fisherman and from pastured cattle by the stone fence, this area was outstanding by harboring a dense forest of dwarf trees, reminiscent of some famed dwarf willow forests in Scandinavia.

The dwarf forest at Kalae consisted of an undescribed ohai with a single trunk mostly about a foot (dc.) high from which spreading branches grow horizontally. The Hawaiians, as we know from MacCaughey, prized such plants. A few ohai, we found, grew sporadically for miles along the coast to the East where protected from cattle by a few jagged rocks, or by rock shelters hastily constructed by fishermen as protection from the wind. With a little imagination one can visualize that such a forest, stretching uninterrupted except by a few aa lava flows, must have retarded the Pahala ash from blowing out to sea before the introduction of herbivores. Our finds are by no means the first. Lt. Oliver S. Picher, in his letter of December 10, 1938, was quite explicit and eloquent in describing the taxon and where it grew at "South Cape. - - - The flowers were more safron- than salmon-colored and so startling that even a ham like me stopped and examined them. If what I gathered would be of any interest to you, I will send it to you."

According to G.O. Fagerlund & A.L. Mitchell (Nat. Hist. Bull. 9:41. 1944.) of the National Park their specimens came "from a dense colony at Apua Point." Ranger Donald W. Reeser in his memorandum of November 5, 1971 reports that "The only colony of this plant in the Park is near Apua Point. Seeds germinate easily. - - -. This is an important plant to try to get established at various parts of the coast."

About a year ago Mr. Reeser discovered an ohai in the Park at several thousand feet elevation inland. The material was too fragmentary for us to be certain whether differences between it and the coastal taxon were ecologic or genetic. Comparison a few years hence of plants grown side by side from seed at the Park greenhouse should solve the puzzle.

Impressed at the time by C. Brewer & Company's little museum at Punaluu, catering to tourists visiting their attractive dining room near a black sand beach, and the promise of landscaping, we described this coastal taxon as Sesbania tomentosa var. breweri Deg. & Deg., ~~in manuscript.~~ We distributed (prematurely) type (NY) and cotypes extensively with the following label: "Degeners & Piccos 32,425. Ubiquitous & thriving only near shark [sic] heiau, Kalae or South Point, Kau Desert, Hawaii. Halophyte growing on Pahala ash 100 feet from ocean. Feb. 23, 1968." We, however, resolved to alter our trinomial selected in ~~February~~ 1968 ~~because of~~ when later statistics and general obsolescence of machinery ~~indicates to~~ convinced us of the gradual death of the sugar industry; because of our shock at seeing the costly devastation caused by the tsunami of November 29, 1975, to the attractive ~~museum~~ natural history museum for tourists; ~~and~~ because of our disgust and dismay by the bulldozing of large areas of ~~endemics so little known that they have escaped listing in the "Red Book" of~~ rare and endangered ~~species~~ endemics for replacement with pretty uninteresting exotics quite out of place for tourists visiting the Islands, to enjoy their Hawaiian authentic surroundings. After biology teacher John Obata kindly raised our Kalae seeds to flowering in his Honolulu garden next to Oahu's Sesbania tomentosa, we were convinced that we did not have a mere variety before us but actually a distinct species. Pertaining to ... brief diagnosis:

SESBANIA HAWAIIENSIS Deg. & Deg., sp. nov.

A more recent visit to *Kalae to photograph ~~to photograph~~ the area for this article

*For non-botanical information , consult the Bishop Museum's Pac. Anthropological Records. 6-9:1-126. 1969.

was shocking. The stone wall enclosing shrine and dwarf ohia forest had been breached in two places. This vandalism allowed hungry Hereford cattle, ranging over the Pahala ash covered with bitterly poisonous Portulaca cyanosperma Egler and sparse grasses to defile the shrine and to annihilate the forest. In this half mile stretch not even a plant remained fit for an herbarium specimen, though the ash was fortunately peppered with its viable, ~~bright~~ orange brown seeds. It is so inconsistent that today part-Hawaiians, even at the loss of life, are making such a notorious hullabaloo about political niceties regarding Kahoolawe used by the ~~U.S.~~ United States Navy to prepare us against aggression, yet ignore Kalae sacred to their Polynesian forebears and the home of a genus of plants cherished by them. It ~~must be~~ seems an embarrassing ridiculous paradox that this vandalism is tolerated, of all groups, by the Hawaiian Homes Commissioners, custodians of this outstanding area! Perhaps in this age of enlightened young men, a cattle proof fence with turnstile will be constructed for the protection of ten acres about the heiau, and the area established as a State Monument or Park with attendant. Thanks to the countless viable ohai seeds lying in and on the ash, the bonsai forest would spring up and begin to flourish within five years. The area would cater to residents as well as to tourists and military ~~xxxxxxx~~ personnel. As these last will be the major source of income for our State in the future, from a purely mundane standpoint if not from an intellectual one, why not add one more worthy place of interest for them to visit?

The above discussion, stimulated by the field book here reviewed, shows ~~again~~ how little is known about ~~such a genus as Sesbania~~ the Hawaiian Archipelago. ~~We~~ trust the present paper convinces botanists of the World that the rapidly dwindling endemic Phanerogam flora is ~~only partially understood~~ (that of lower groups even ~~less than that~~), and that some younger residents such as Arrigoni, Hobby, Obata, and Sylva are helping to retard the extermination of some of our Island's unique Creations.

Kaena Point, Hawaiian Islands
and
A Prodromus Regarding Some Taxa In Sesbania (Leguminosae)

Otto & Isa Degener
Authors, Flora Hawaiiensis

Whether the Spaniards, while sailing their galleons before the trades from Acapulco to Manila south of the Hawaiian Archipelago and back to Acapulco north of it, ever introduced decimating diseases to the Polynesians is a moot question. But that Captain Cook later, in spite of strict precautions, introduced social and other diseases to the susceptible natives during his rediscovery of the Hawaiian Islands in 1778 is well authenticated. Cook estimated the population of the Archipelago in 1778 at 400,000, how accurately we do not know. By 1932, because of this and subsequent contacts with Europeans and their "civilization," the Hawaiians had dwindled to 124,449; by 1836, to 107,954; and by 1850, to 86,593! In 1950, by the way, the census lists only 162 pure Hawaiians, but 73,277 part-Hawaiians. At the present time the Hawaiians as a pure race are practically extinct, though fortunately many residents can proudly claim some little Polynesian blood coursing in their veins.

Not wishing to be ruler of a Nation with a dwindling population Kauikeaouli, crowned King Kamehameha III, and the Royal Hawaiian Agricultural Society, promoted the immigration of foreigners. Due to these efforts about two hundred Chinese arrived on the British bark "Thetis" January 3, 1852. These men were engaged as plantation laborers for $3.00 per month; and were supplied with food, clothing and a house. Immigration from then on continued by leaps and bounds, especially from the Orient, from the Azores and in less numbers from Europe. In 1925 these hordes of men were earning $30 in wages per month, with additional advantages such as free hospitalization; while the kane writer (O.D.), an immigrant from New York City, was teaching with an advanced degree Botany at the University of Hawaii with the princely salary of $180 per month.

The above preamble shows why so many of Hawaii's older citizens and their older offspring now prominent in business, the professions and in the Legislature are hard workers, thrifty, "practical" and eminently ambitious. They are a splendid lot as a whole in spite of rather elementary training limited to the Three Rs taught in poor plantation village schools, when not interrupted by the practice of child labor. Their background too

SESBANIA TOMENTOSA Hook. & Arn.

(Flora Hawaiiensis)

often convinced them that if a plant no matter how scientifically or intellectually valuable or stimulating might be could not be used for fuel, medicine or food for man or beast it was worthless "grass," the Pidgin English word for "weed." Thus to most of these influential, immigrant old-timers the endemic plants, and the endemic animals that depend upon them for food and shelter, are today expendable unless they can be made into wood chips for selling to the paper industry in the Orient or can be transformed via the vegetarian food chain into exotic axis and blacktailed deer, goats, sheep, pronghorn and other herbivores available for hunters. Fortunately an increasing number of biologists more recently schooled on the Mainland and biologically akamai (clever, smart) sons and daughters of these old-timers are determined with almost missionary zeal to teach the grandchildren to appreciate "scientific and historical information" of the northwest end of Oahu, State of Hawaii. They realize that "grass," like the small sundew, has greater intellectual value than a 300 foot tall eucalyptus. They intend to end the wholesale errors of their elders. They are beginning to retard the present ghastly slaughter of endemic plants and animals, the destruction of unique geological features, and evidence of ancient Hawaiian culture under the crunch of the bulldozer. The King of Beasts (cf., "The Wizard of Oz") is certainly not Felis leo, but Homo sapiens!

One outstanding younger teaching group centers its activity at the University of Hawaii under the Sea Grant/ Marine Advisory Program and the Hawaii Committee for the Humanities. Teacher Edward Arrigoni, author; and Marine Advisory Specialist Raymond Tabata, editor, published "A Nature Walk to Ka'ena, O'ahu" February 1977 in an edition of about 1,000 copies. This field book of 112 pages, on legal size paper, is cheaply printed by photo-offset and, at the time of writing this review, free to those who write to the University for a copy. It concentrates on a limited area of northwest Oahu jutting out toward Kauai. Slanted primarily for the use of teachers, Scout leaders and hiking groups as well as individuals, this work should gain many more than 10,000 proselytes for the appreciation and conservation of Nature.

Besides a map of the area involved, four plates and four figures, this guidebook for the six mile coastal excursion includes 56 figures of plants besides one plate and one figure of fishes. Some of the illustrations are poor due to the poor quality of paper and printing, but all are clear enough for identifying the specimens in the field. Of the 57 plants involved, 26 are naturalized and mostly weedy, about 14 are native to the Hawaiian Islands and elsewhere, and about 16 are endemic (or peculiar) to the Hawaiian Islands. Botany, in the hitherto neglected Hawaiian Islands,

is progressing rapidly thanks largely to monographers. Unfortunately Arrigoni uses for the endemic beach spurge the archaic generic name Euphorbia, when Chamaesyce must be used. Similarly, the popolo of the Hawaiians must no longer be known as Solanum nigrum L.; but according to Henderson in September 1974 (Contr. Queensland Herb. p. 33) as S. nodiflorum subsp. nutans R.J.F. Henderson. We, however, choosing to consider the taxon a variety rather than a subspecies, prefer a slightly different trinomial which may be a slight improvement or the opposite.

The lovliest plant described and figured in our only plate is the ohai, Sesbania tomentosa H. & A., s.s. (Bot. Beech. Voy. 286. 1836.), a member of the Leguminosae. It is actually a spreading tree usually only up to 3 dm., tall, a true bonsai. Its silvery, silky-pubescent leaves overshadow its greenish yellow and salmon-pink flowers. It was common in the '20s when first collected by the kane writer, but now on the verge of extinction. He knows it only from the north shore of the study area and, fearing its extermination due to cattle pastured there, scattered its seeds in the '30s about the former S.N. Castle property at the opposite end of the island at Waimanalo about forty miles distant.

As little has been published about endemic taxa of Sesbania occurring in the Hawaiian Islands, we here indulge in a mêlange of scientific facts and pure speculation:

Though the hard seeds sink in ocean water, the dry legumes carrying them may float for a considerable length of time. Not only xerophytes but halophytes as well, we speculate the original sesbanias, or ohai of the Hawaiians, during the past millions of years established themselves on most if not all of the scattered large and small islands of our slender archipelago. Mingling between islands was rare enough to interfere greatly with isolation-induced speciation. We are pretty well convinced that if our many islands from Hawaii to Midway and beyond were thoroughly combed for ohai, well over a score of distinct species and strong varieties would be discovered.

Lest Vaughn MacCaughey's early obervation go unnoticed, we here quote it: "A brilliant sea-shore shrub is the ohai (Sesbania tomentosa). This is a much-branching legume, six to twelve feet high; the leaves have eight to eighteen pairs of pinnae, and the large scarlet flowers are in loose axillary racemes. The natives are fond of the bright flowers, and the bush is often to be found in the vicinity of the little beach settlements, particularly along the arid leeward shores, where vegetation is scanty." (The Wild Flowers of Hawaii. Amer. Bot. 22:100.1916.) We doubt the accuracy in all cases of the specific name.

A truly definitive monograph of the Sesbania of the Hawaiian Archipelago awaits the thorough collecting of material (perhaps with the aid of the Coast Guard, the Fish and Wildlife Service and a monetary grant to visit isolated islets), discovering historical material scattered in herbaria of the World and becoming familiar with it, and growing from seeds diverse material under controlled conditions. Thereafter would follow the usual studies of gross morphology augmented by the newer ones involving chromosomes and pollen. Presently greatly handicapped, we here present our prodromus arranged by island rather than by taxon. A fully illustrated description of two pages for each species awaits publication in the Flora Hawaiiensis.

Necker: Christopherson, E., & Caum, E.L. Bull. Bishop Mus. 81: 7. 1931, record "A few plants, low and widespread along the flat top of the main part of the island; most of these less than 2 feet high, but spreading as much as 6 to 10 feet in diameter; much favored as nesting site by boobies and frigate birds."
Niihau: C.N. Forbes enumerates S. tomentosa, a determination we question, for this island in Occas. Pap. Bishop Mus. 5(3):22. 1913. Christopherson & Caum (ibid., p. 6. 1931.) report a taxon as being "Distributed all over the island but nowhere in dense stands."
Kauai: J.F. Rock, Leg. Plants Haw., on page 155, 1920 discussing the ohai, states that "on Kauai, near Mana, it is a branching erect shrub several feet in height." We suspect it extinct unless some dormant seeds should spring to life and escape straying cattle there.
Oahu: Mann, H., Flora Hawaiian Islands on page 54, 1867, states: "Hab. Waianae, Oahu, and perhaps in other parts. Puna, Hawaii, Niihau." The kane writer, residing not far from Waianae, knew about forty plants growing along the coast between Kawaihapai and Kaena Point. He kept the taxon under observation for about a decade before publishing an illustrated description of it as Sesbania tomentosa Hook. & Arn., in his Flora Hawaiiensis May 11, 1937. This is the species covered by the present field book, a plant on the verge of extinction. It is beautiful with its leaves so densely silky pubescent that the veins and veinlets of the crowded leaflets are obscure.
Molokai: Rock, discussing the ohai in his book mentioned above, reports its occurrence "on the sand dunes at Moomomi in the dry west end of that island. It forms dense mats over the white coral sands, covering quite an area." At the Bailey Hortorium, Ithaca, New York, is his specimen with an illegible date on his label that appears to be March 1909. There, also with an illegible label - we try to guard against this loss by using India ink - is Forbes' No. 604 collected at Moomomi March 24, 1915. On April 25, 1928 the kane writer collected No. 17,954, noting on the label "Flowers narrow, crimson, arid sand dune, Moomomi, Isl. Molokai." It was on the verge of extinction. As the Chilean mesquite(Prosopis) does not grow there but rather further to the lea, the voraceous

Indian deer which fatten on its abundant, juicy, sweetish pods had bypassed a few plants of the ohai with its unpalatable, dry pods. This probably accounts for its survival. It is certainly a species deserving protection from extermination. Preoccupied with other matters, No. 17,954 was set aside until described with a colleague as Sesbania tomentosa var. molokaiensis Deg. & Sherff in Am. Journ. Bot. 36:502. 1949. After Mr. Allan B. Bush (1881-1960), Supt. of Grounds & Structures, University of Hawaii, raised seeds on the Campus to flowering, this antiquated disposition of the taxon proved too conservative. We therefore here rename it Sesbania molokaiensis (Deg. & Sherff) Deg. & Deg.

A second taxon of Sesbania has come to our personal attention. Please note the observations and comparisons Mr. Noah Pekelo, Jr., then of the Dept. of Agri. & Conservation at Kaunakakai (K'kai) made for us in his letter of March 19, 1961: "I have taken a keen interest in the legume Sesbania, for although this small tree is not common here, it is utilized for feed by both deer and cattle and has the ability to withstand grazing. Most of the Sesbania which I am familiar with are found growing on semi-arid ridges of central Molokai at Moomomi. The plant is growing prostrate within a patch of beach grass, the seeds and flowers of this plant are entirely different from that of the trees growing along the ridges, the seed pods are as long as the mountain plant's pod but is curved; the flowers of the beach plant appear narrower and are a deep crimson in comparison to the mountain plant. If possible I would like to receive all information possible on these plants. Should you require specimens I would be happy to collect what you may need for identification."

The Moomomi taxon we recognized to be S. molokaiensis; but we were unsure about the other and asked if we could "see it some day." We arrived on Molokai the latter part of June, whereupon Mr. Pekelo drove us east mauka (mountainward) of "K'kai" to his find. We noted the endemic, glaucous pricklepoppy (Argemone) with its white flowers and the endemic nehe (Lipochaeta) with its yellow heads, but failed to note the ohai we had come to study (Fig. 1)! Suddenly we noticed the plants thinly scattered about us. With age, most were almost invisible trees about five meters tall with slender, virgate trunks and slender, subhorizontal branches bearing a few scant tufts of leaves from which a few flowers and pods were hanging. The flowers had a pale green calyx. The standard was greenish yellow without but with faint radiating salmon streaks diffusing together particularly toward the margin; it was salmon with a dull greenish tinge within. Wings without were pale rose ending with a darker tip, with a whitish streak extending from broad base 1 mm. along lower margin to peter out two thirds from the base; it was yellowish rose within. The keel was paler rose without and had a 2 mm. wide lower margin extending half way toward the tip. The stramineous pods were arcuate, commonly 20 cm. long, 5 mm. wide and 2 mm. thick. These contained

Fig. 1. Noah Pekelo, Jr., inspecting S. ARBOREA (Rock) Deg.& Deg.

about 25 closely packed chocolate brown seeds 5 mm. long. The collection is Degeners & Pekelo No. 32,430. "Makakupaia Ridge, East Molokai. Arid slope with endemic Chenopodium pekeloi, Lipochaeta, Chamaesyce, Argemone etc. June 30, 1961." This ghost-like species, rarely a bit less etherial, had been described and named by Rock "Sesbania tomentosa var. arborea Rock n.v.", on his Bishop Museum herbarium sheet collected February 1919 at "Mauna Loa, Molokai."

Perhaps questioning the validity of his trinomial, Rock refers to his plant more fully in his Leg. Pl. Haw. 155,156. 1920. His plate, incidentally, is not of S. tomentosa Nutt., s.s. He states that "Recently the arborescent type of Sesbania tomentosa has been discovered by Mrs. L.M. Dunbar on the slopes near Mahana on the west end of Molokai. She reports it as a tree 12 to 15 feet in height. The leaves are longer, the leaflets smaller and more nuerous than the creeping variety [S. molokaiensis] on the same island at the beach sands of Moomomi. It is, however, identical

with it with the exception of being arborescent; it may be designated as Sesbania tomentosa forma arborea Rock f.n.". Rock states likewise that the species itself is on Kauai, Oahu, Molokai and Hawaii. With this statement we agree as to S. tomentosa being on Oahu only. Whether Rock's Mauna Loa plant is identical with Mrs. Dunbar's find or with our No. 32,430 is immaterial. The February 1919 specimen is the type to which Rock's trivial name belongs. We here modernize this archaic name to its proper status as Sesbania arborea (Rock) Deg. & Deg.

Lanai: While house guests of engineer Adolph Desha and his amateur botanist wife Edean, we met the talented schoolboy Robert Hobdy, now State Forester. Answering our query regarding strange plants, he lead us August 21, 1957 to the ohai which we distributed as Degener et al., No. 24,187 (Fig. 2). The label reads: "West of Kuahua Gulch at 750 ft. elev., Lanai. On arid pili-Sida-Argemone-Lipochaeta slope; about 10 S., trees remaining among some larger dead ones. No other trees of any other kind in vicinity. (1 ft. high tree with a few slender horizontal 3-5 ft. long branches; flowers pale red to orange tinged; outer surface of standard, however, greenish yellow; lower part of keel whitish; fl. fading yellowish.)" Inspection of specimens in the Bishop Museum revealed the G.C. Munro's No. 395 collected at 300 feet elevation at Kamoku was the same. Kaohai specimens, on the contrary, collected by him May 25, 1914 and again March 1915 are too coarse to be the same. We believe this latter taxon extinct. Grateful paying guests of the Dole Pineapple Company under Manager Aldridge and in part aided by the National Science Foundation we returned to Lanai to botanize from July 1963 through January 1964. We found no other ohai stand except that represented by No. 24,187, the type of the taxon here newly described and deposited in New York as:

SESBANIA HOBDYI Deg. & Deg., sp. nov. Arbor 1 m. alta; foliola tomentosa; calyce 13 mm. longo, lobis acuminatis; vexillo 32 mm. longo; alis 31 mm. longis; carina 32 mm. longa, 9 mm. lata.

This taxon, with the type No. 24,187 deposited in NY, is a miniature twiggy xerophytic dwarf tree of inland Lanai up to about 1 meter tall with some few horizontal branches extending 3 to rarely 15 dm. It superficially resembles the similarly small but more graceful halophytic S. tomentosa of coastal Oahu. Less silky pubescent, the former taxon shows the veins and veinlets of the under side of its leaves more prominently. Floral parts and coloring differ in their proportions in the two taxa, but hardly enough to excite us. Regarding the calyx, that of the Lanai plant is larger and proportionately wider, and is not gibbous at its upper back as is the Oahu plant. Both have deltoid lobes. As to corolla, the standard of the Lanai taxon is a trifle narrower, though in the distal part both are similarly orbicular. Wings and keel are a bit longer and narrower in the former. Seeds are similarly

Fig. 2. Robert Hobdy inspecting S. HOBDYI Deg. & Deg.

olive green. With the name briefly validated so this taxon can be officially listed as an endangered species, if not now exterminated, we have time for the preparation of a carefully executed illustrated description to accompany that of S. tomentosa when funds are avaiable. The flowers are more colorful, reminiscent of those of S. molokaiensis.

KAhoolawe: One of us saw a specimen almost reduced to cigaret beetle frasse by zoologist Ball's sealing the local museum's wooden herbarium cabinets with putty against the entrance of insects in 1922. This sheet had been collected by C.N. Forbes et al., between February 10 and March 10, 1913. This shows that this island did harbor some Sesbania. Possibly long-viable ohai seeds still in the soil might reestablish the taxon on this island were officials prodded to practice biological control to kill off the scourge of feral goats which prefer endemic to exotic plant fare. As the island is properly "off limits" to humans and has been freed of beef cattle, we facetiously (?) suggest rotating, without supplimentary food the State's

prides of zoological park lions on the island. It would not only reestablish its former dry forest but save it from further wind erosion. The cost of such vacations for these genial, giant pussycats would be trivial as only a helicopter and a tranquilizer gun would be necessary to end it.

Maui: This single island, in the geologic past, consisted of two. Now, however, it is connected by a massive sandy isthmus replete until recently with endemics now largely exterminated by the sprawling community of Wailuku. It seemed truly anomalous that no one had discovered a taxon or two of ohai on East and on West Maui. So it was not surprising to receive a letter dated July 8, 1977 from Mr. Rene D. Sylva, Superintendent of a State park, with the following paragraph: "You may be interested to hear that I found an ohai (Sesbania sp.) on Maui in the Kahakuloa area, 100 yards west of Nakalele Point lighthouse. The plant had been run over by a jeep which had broken off the stem. This stem was at least two inches in diameter and the plant is prostrate on the ground in a very dry and windy location; also it is in a dying condition. Fortunately there was a part of the plant still in fairly good condition with two flowers and two seed pods on it. I managed to rescue two small seedlings and they are growing in good condition at our small Botanical Garden." Should Mr. Sylva manage to collect good material for serious study, will this coastal Maui taxon prove to be like Oahu's S. tomentosa? Seeds of both are somewhat alike in color. Or will the Maui plant, due to long isolation, be yet another novelty on the verge of extinction?

Hawaii: Kalae, the most southerly point of the archipelago, is covered by yellow Pahala ash from an enormous explosive eruption in the geologic past of Mauna Loa. The area, due to some fresh and barely potable brackish springs and to prime fishing because of rich, upwelling ocean currents, was heavily populated by the Hawaiians in spite of the arid climate. Stone salt pans (Fig. 3), some papamu (native checkerboard) and house sites are scattered about. Ka Heiau o Kalalea (Fig. 4) is near the tip. It is a heiau ho'oulu, constructed to induce the gods to increase the reproduction of three species of fishes: ahi (tuna), malolo (flyingfish) and opelu (mackerel). This temple still has a crude altar. Fishermen, of course, no longer believe in the gods of their ancestors - well, on second thought, the fish might bite just a bit better with a can or two of beer left on the altar. Today we notice mostly Kirin and Schlitz brands. After the rediscovery of the Islands by Captain Cook in 1778, a stone wall was constructed enclosing a strip of the western part of Kalae almost half a mile long and 75 feet wide. Protected from timid feral goats day and night by the presence of fishermen and from pastured cattle by the stone fence, this area was outstanding by harboring a dense forest of dwarf trees, reminiscent of some famed dwarf willow forests in Scandinavia.

Fig. 4. Ka Heiau o Kalalea or temple.

Fig. 3. Ancient stone salt pan for evaporating sea water.

The dwarf forest at Kalae consisted of an undescribed ohai with a single trunk mostly about 1 dm. high from which spreading branches extend horizontally. The Hawaiians, as we know from MacCaughey, prized such plants. A few ohai, we found, grew sporadically for miles along the coast to the East where protected from cattle by a few jagged rocks, or by rock shelters hastily constructed by fishermen as protection from the wind. With a little imagination one can visualize that such a forest, stretching uninterrupted except by a few aa lava flows, must have retarded the Pahala ash from blowing out to sea before the introduction of herbivores. Our finds are by no means the first. Lt. Oliver S. Picher, in his letter of December 10, 1938, was quite explicit and eloquent in describing the taxon and where it grew at "South Cape. - - - The flowers were more safron- than salmon-colored and so startling that even a ham like me stopped and examined them. If what I gathered would be of any interest to you, I will send it to you." According to G.O. Fagerlund & A.L. Mitcell (Nat. Hist. Bull. 9:41. 1944.) of the National Park their specimens came "from a dense colony at Apua Point." Ranger Donald W. Reeser in his memorandum of November 5, 1971 reports that "The only colony of this plant in the Park is near Apua Point. Seeds germinate easily. - - -. This is an important plant to try to get established at various parts of the coast."

About a year ago Mr. Reeser discovered an ohai in the Park at several thousand feet elevation inland. The material was too fragmentary for us to be certain whether differences between it and the coastal taxon were ecologic or genetic. Comparison a few years hence of plants grown side by side from seed at the Park greenhouse should solve the puzzle.

Impressed at the time by C. Brewer & Company's little museum at Punaluu catering to tourists visiting their attractive dining room near a black sand beach, and the promise of elaborate landscaping; we described this coastal taxon in manuscript as S. tomentosa var breweri Deg. & Deg. We prematurely distributed type (NY) and cotypes extensively with the following on the label: "Degeners & Piccos 32,425. Ubiquitous & thriving only near shark [sic] heiau, Kalae or South Point, Kau Desert, Hawaii. Halophyte growing on Pahala ash 100 feet from ocean. Feb. 23, 1968." We later resolved to change this trinomial because of our shock in noting the bulldozing of large tracts of rare and endangered endemics for replacement with pretty uninteresting exotics quite out of place for tourists interested in matters authentic Hawaiian. To make matters worse, the attractive and instructive museum was destroyed by the tsunami of November 29, 1975. After biology teacher John Obata kindly raised our Kalae seeds to flowering in his Honolulu garden next to Oahu's S. tomentosa we were convinced the Island of Hawaii taxon to be a distinct species. Had it occurred on several islands of

our group, we would name it S. sandwicensis. Convinced it is restricted to the "Big Island," with its yellow seeds approaching the color of Pahala ash, we briefly describe and name it for convenient "Red Book" listing:

SESBANIA HAWAIIENSIS Deg. & Deg., sp. nov. Arbor 1-2 dm. alta; foliola supra glabra sed subtus glabrata; calyce 15 mm. longo, 8 mm. alto, lobis acuminatis; vexillo 31 mm. longo, 23 mm. lato; alis 32 mm. longis; carina 32 longa, 9 mm. lata. Semina flavo-brunnea.

Low spreading leafy tree rarely 2 dm. tall, with glabrate branches yellowish and somewhat silky tomentose when young. Leaves up to 17 cm. long and 5 cm. wide; petiole and rachis somewhat silky tomentose; leaflets not crowded and overlapping, with veins and veinlets evident on both surfaces, glabrous above, glabrate below. Calyx 15 mm. long, 8 mm. high, gibbous at upper base, with lobes acuminate. Corolla with standard 31 mm. long, 23 mm. wide, with distal part ovate and retuse; wings 32 mm. long, 6 mm. wide; keel 32 mm. long, 9 mm. wide. Seeds more or less orange brown.

A more recent visit to *Kalae to photograph the area for this article was shocking. The stone wall enclosing shrine and dwarf ohai forest had been breached in two places. This vandalism allowed hungry Hereford cattle, ranging over the Pahala ash covered with bitterly poisonous Portulaca cyanosperma Egler and sparse grasses to defile the shrine and to annihilate the forest. In this half mile stretch not even a plant remained fit for an herbarium specimen, though the yellow ash was fortunately sprinkled with its viable, orange brown seeds. It is so inconsistent that today part-Hawaiians, even at the loss of life, are making such a notorious hullabaloo about political niceties regarding the Island of Kahoolawe used by the United States Navy to prepare us against aggression, yet ignore Kalae sacred to their Polynesian forebears and the home of a genus of plants cherished by them. It seems an embarrassingly ridiculous paradox that this vandalism is tolerated, of all groups, by the Hawaiian Homes Commissioners, custodians we were told, of this outstanding area! Perhaps in this age of enlightened young men, a cattle proof fence with turnstile will be constructed for the protection of ten acres about the heiau, and the area established as a State Monument or Park with an attendant. Thanks to the viable ohai seeds lying in and on the ash, the bonsai forest would spring up and begin to flourish within five years. The area would cater to residents as well as to tourists and to military personnel like Lt. Picher. As these strangers will be the major source of income for our State in the future, from a purely mundane standpoint if not from an intellectual one, why not add one more worthy place of interest for them to visit?

The above discussion, stimulated by the Arrigoni field book here reviewed shows, as in the genus Hibiscus (Phytologia 35(6): 459-470. 1977.), how little is known about most phanerogams native to the Hawaiian Archipelago. Our knowledge of most lower groups is still more conspicuous by its superficiality. Fortunately some younger residents such as Arrigoni, Hobdy, Obata, Sylva and Tabata are helping educate our youth to retard the extermination at least of some of our Islands' unique Creations. Perhaps blinded by the old fable that the grass is greener on the other side of the fence, it is high time older residents realized that stone-dead mars and moon do not compare intellectually, scientifically and economically in importance with the Hawaiian Archipelago with its rapidly evolving endemic biota. Let us all strive to maintain it.

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*For nonbotanical information consult the Bishop Museum's Pacific Anthropological Records 6-9:1-126. 1969.

Fig. 5. S. HAWAIIENSIS Deg. & Deg.

GOULDIA IN HAWAII
by
Otto & Isa Degener

In preparing a paper for the Pacific Science Congress to be held in Honolulu this Fall, we had occasion to review literature on the rubiaceous genus Gouldia. We believe we are contributing a somewhat better understanding of the genus as it is found in the Hawaiian Islands by the following nomenclatural changes, mostly altering monographer F.R. Fosberg's various, rather conservative taxa to the next higher rank:

1. GOULDIA KAALA var. RUSSII (Fosb.) Deg. & Deg. (Syn. G. terminalis var. kaala f. Russii Fosb. in B.P. Bishop Mus. Bull. 147: 49. 1937.) 2. G. OVATA var. HETEROPHYLLA (Fosb.) Deg. & Deg. (Syn. G. term. var. ov. f. heterophylla Fosb. ibid. 52.) 3. G. OVATA var. KALAUPAPA (Fosb.) Deg. & Deg. (Syn. G. t. var. o. f. kalaupapa Fosb. ibid. 51.) 4. G. OVATA var. LYDGATEI (Fosb.) Deg. & Deg. (Syn. G. t. var. o. f. Lydgatei Fosb. ibid. 53.) 5. G. OVATA var. MAKAWAOENSIS (Fosb.) Deg. & Deg. (Syn. G. t. var. o. f. makawaoensis Fosb. ibid. 50.) 6. G. OVATA var. MAUNAHUI (Fosb.) Deg. & Deg. (Syn. G. t. var. o. f. maunahui Fosb. ibid. 51.) 7. G. OVATA var. MEMBRANACEA (Fosb.) Deg. & Deg. (Syn. G. t. var. o. f. membranacea Fosb. ibid. 53.) 8. G. OVATA var. OBOVATA (Fosb.) Deg. & Deg. (Syn. G.t. var. o. f. obovata Fosb. in Bull. Torr. Bot. Cl. 70 : 391. 1943.) 9. G. OVATA var. PETIOLATA (Fosb.) Deg. & Deg. (Syn. G. t. var. o. f. petiolata Fosb. in B.P. Bishop Mus. Bull. 147: 53. 1937.) 10. G. OVATA var. PUNAULA (Fosb.) Deg. & Deg. (Syn. G. t. var. o. f. punaula Fosb. ibid. 53.) 11. G. OVATA var. SANTALIFOLIA (Fosb.) Deg. & Deg. (Syn. G. t. var. o. f. santalifolia Fosb. ibid. 51.) 12. G. OVATA var. STOREYI (Fosb.) Deg. & Deg. (Syn. G. t. var. o. f. Storeyi Fosb. ibid. 52.) 13. G. OVATA var. SUEHIROAE (Fosb.) Deg. & Deg. (Syn. G. t. var. o. f. Suehiroae Fosb. ibid. 52.) 14. G. OVATA var. WAILAUENSIS (Fosb.) Deg. & Deg. (Syn. G. t. var. o. f. wailauensis Fosb. ibid. 52.) 15. G. CORDATA var. ACUMINATA (Fosb.) Deg. & Deg. (Syn. G. t. var. cordata f. acuminata Fosb. ibid.

45.) 16. G. CORDATA var. MOLOKAIENSIS (Fosb.) Deg. & Deg. (Syn. G. t. var. cord. f. molokaiensis Fosb. ibid. 45.) 17. G. CORDATA var. NEALAE (Fosb.) Deg. & Deg. (Syn. G. t. var. cord. f. Nealae Fosb. ibid. 45.) 18. G. AXILLARIS var. HAWAIIENSIS (Fosb.) Deg. & Deg. (Syn. G. Hillebrandii var. hawaiiensis Fosb. ibid. 61.) 19. G. AXILLARIS var. NODOSA (Fosb.) Deg. & Deg. (Syn. G. Hillebr. var. nodosa f. eunodosa Fosb. ibid. 61.) 20. G. AXILLARIS var. NODOSA f. LANCIFOLIA (Fosb.) Deg. & Deg. (Syn. G. H. var. n. f. lancifolia Fosb. ibid. 61.) 21. G. AXILLARIS f. GLABRIFOLIA (Fosb.) Deg. & Deg. (Syn. G. H. var. typica f. glabrifolia Fosb. ibid. 60.) 22. G. AXILLARIS var. MICROPHYLLA (Fosb.) Deg. & Deg. (Syn. G. H. var. t. f. microphylla Fosb. ibid. 60.).

Among the over 60 categories of Dr. Fosberg's putative hybrids, ~~discussed in 17 pages,~~ may lurk specimens that are true forms and even true varieties without any hybrid admixture; ~~conversely~~ on the contrary, in some of the above putative varieties recognized by us may lurk some nothomorphs developed by recent or more likely ancient hybridization and backcrossings. Hence the excellent monograph by Dr. Fosberg should not lull the collector into thinking that the study of local Gouldiae has been completed. He should continue to gather and study representatives of this genus, whose 2n chromosome number varies from approximately 72 to 105, in the field and attempt to untangle questions of hybridization experimentally,

rather than

Presently home owners on the edge of Haw. Volc. Nat. Park, the reviewers intend to publish an additional "Partial review" of the "Atlas" after more extended field work and after checking the determinations of voucher specimens cited.

NORTHERN BALD EAGLE
Haliaetus leucocephalus alascanus

Every October, the first of about 300 bald eagles can be seen soaring over Lower McDonald Creek in Glacier National Park. They are looking for spawning Kokanee salmon that swim from Flathead Lake, fifty miles west of the park, up the Middle Fork River to the shallow creek that empties out of Lake McDonald. The salmon lay their eggs here and die soon after. The gathering of the eagles has been a spectacular annual event since several years after the salmon were artificially introduced to Flathead Lake in 1916.

Except on occasions such as this, bald eagles are seldom gregarious. As to exactly where these Glacier visitors originate, how they remember the time and place of this particular salmon run, and where they go when the salmon are gone, much remains to be learned.

The northern bald eagle nests in forested regions, in high trees near large bodies of water. The nests are made mostly of heavy sticks, lined with mossy soil and down. Used year after year, they are repaired and built up until they may become as large as ten feet across and often as high. There may be one to four eggs to a nest, but the average is two. Both male and female help in building the nest, incubating the eggs, and raising the offspring.

The eaglets grow rapidly, reaching and even temporarily surpassing the size and weight of an adult before they are a few months old. A full-grown bird may weigh up to twelve pounds and have a wingspread of over seven feet. Average weight of a full grown bald eagle is about eight pounds. It takes from five to seven years to acquire the yellow beak, the impressive all-white "bald" head cap, and white tail feathers. Those that have almost reached maturity will show some of the older brown

feathers mixed with the white. Adult and immature eagles molt completely once each year in gradual stages.

During their six-week visit to Glacier National Park, the transient eagles roost overnight in trees near the foot of Lake McDonald. By day they patrol the river or perch on nearby snags and trees in search of dead fish or those that are destined to die within a few weeks. When a salmon swims by, the eagles will wade or jump into the water, sometimes up to chest level, and latch onto the fish with their sharp talons. The meal is eaten on the ground or flown to a tree to be hastily devoured from head to tail within a few minutes. The more skillful adult will sometimes swoop down to pluck a fish out of the water with its feet.

Fish are sometimes pirated, often by an aggressive immature eagle that lands on his rival with talons extended. An adult will usually take the loss philosophically, watching the intruder devour the fish only a few feet away. Unlike their more relenting elders, immature eagles sometimes spar over a catch, flapping their wings and screaming obscenities at each other.

Fishing is the bald eagle's favorite pastime and means of livlihood. When fish are scarce they will eat the remains of any available carcass and, less frequently, kill smaller animals like fowl and rodents. (It is interesting to note that while at Glacier, eagles and ducks are often in close proximity and pay little attention to each other.) These impressive birds are essentially scavengers, and not the villains they are often unjustly accused of being. During their stay at Glacier Park they help tremendously to prevent the pollution that would result from thousands of dead salmon. Though protected by federal law, their worst enemy is man, particularly in areas where he feels that all fishing rights belong to him. Indiscriminate target

practice and agricultural pesticides have also taken a heavy toll, placing our national emblem on the ever-growing list of endangered wildlife.

The congregation of bald eagles at Glacier National Park can best be viewed in early November from the Apgar bridge area just north of the road junction to West Glacier. Though some are accustomed to the sight of cars and visitors, they are sensitive to excessive noise and movement and will leave if there is too much distraction. Posted restriction signs should be observed by everyone to help insure that this remarkable event will continue every year.

FOUR NEW STATIONS OF LYCOPODIUM PROTHALLIA[1]

OTTO DEGENER

(WITH PLATES XI–XIII AND TWO FIGURES)

On March 29, 1922, while on a geological trip on East Rock Mountain, Great Barrington, Massachusetts, the writer noticed a few small lycopods growing in the shelter of a bowlder. Since these plants did not appear to be like any of the common lycopods in the region, they were removed and found to be sporelings, several of which still had the gametophytes attached. Unfortunately time did not permit a thorough investigation. The slope of East Rock where the specimens were found had been stripped of timber several years previously, so that bramble thickets had had time to form among the stumps and old laurel bushes. The soil from which the plants were taken was a medium sandy loam, thinly covered by a moss. There was little moisture in the soil, although the slightly overhanging rock no doubt hindered the drying influence of the sun except during the morning. The area that was turned over to get the plants might easily be covered by the hand. There were seven specimens, four of the sporophytes being still firmly connected with the gametophytes, and three showing only the disintegrating foot with which they had absorbed nourishment from the sexual plant.

The gametophyte strikingly resembles a carrot in shape. It is roughly conical, not counting the small crown at the top where the sexual organs are located. It is dirty gray in color and exhibits a pubescence due to rhizoids. The smallest specimen unearthed had a prothallium 2.5×7 mm., while the sporophyte had just barely reached the surface of the soil 15 mm. above. The root, arising from the sporeling above its foot, had divided three times

[1] In December 1922, after this paper had been written, the writer found hundreds of prothallia and sporelings of *L. cernuum* near the active crater of Kilauea, Hawaii. Since these plants grew under very unusual conditions, it is hoped to deal with them in a separate paper.

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PRITCHARDIA AND COCOS IN THE HAWAIIAN ISLANDS

Otto & Isa Degener

When Captain were rediscovered the Hawaiian Islands in 1778, only two genera of palms grew in the Hawaiian Islands. The one was Pritchardia, consisting of many taxa of fan-leaved or palmate palms; the other, Cocos, consisting of a single feather-leaved or plumose palm. Odoardo Beccari and Joseph F. Rock in 1921 published their magnificently illustrated work entitled *"A Monographic Study of the Genus Pritchardia, 1-77. It is the last,

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*Mem. B.P. Bish. Mus. Vol. 8 (1).

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authoritative work on the group. Though we know it conceals errors, we do not yet know enough to correct them. The species are native mostly to Micronesia and Polynesia, attaining their major development in the Hawaiian Archipelago. They grow from sea level to about 5,000 feet elevation; from desert to dense rainforest. According to Beccari & Rock's findings, there are about 25 species and five varieties extending from the Island of Hawaii westward to distant Nihoa. Since 1921 additional taxa have been described, some of questionable validity.

Beccari & Rock describe as new, single individual palm trees planted in hot, lowland gardens, and not known anywhere in the wild. Could such individual palms be the offspring of seeds collected in the rainy mountains of our islands? Do they merely look like new because they are growing under greatly changed conditions? We do not presently know.

One of our local botanists, Dr. Harold St. John, collected specimens from a single palm in the mountains near Punaluu, Oahu and, using the monograph, keyed it to a certain species. At a different season he visited the identical palm, collected additional material and, using the same key, came to an entirely different species! Obviously, something is wrong somewhere.

While botanizing for five months in 1928 on Molokai, the kane writer searched for Pritchardia and noted some growing cultivated near the coast in the garden of an elderly Hawaiian known to him as Levi. From the writer's his part-Hawaiian assisant, in whom Levi had confided, he learned that Rock had heard about loulu palms growing in some Molokai fastness. He offered Levi pay to go and fetch him specimens. As Rock refused the price Levi wanted, Levi resolved to have his cake and eat it too. So he agreed to Rock's more modest offer but, instead of climbing the mountain range to get specimens of the elusive palm, he merely substituted material from a tree in his yard. Levi thought it a great joke, and chuckled while telling the asistant about the deception. Evidently some Molokai taxon is listed erroneously in the monograph as to habitat.

We see no way of greatly revising Baccari & Rock's work, excellent for the time and conditions under which it was produced, without concentrating on collecting herbarium specimens from all colonies still extant, a task facilitated by airplane spotting of these conspicuous trees. Seeds from each colony, preferably from the same palm from which voucher material had been preserved, should then be planted under uniform conditions with similarly procured seeds from other colonies. Such cultivated plants must then be compared with one another when they finally flower and fruit, as well against the vouch-

A.I. Galushko, "Flora of the Northern Caucasus," a Review

Ott o & Isa Degener

After attending the meetings of the XII International Botanical Cingress in Leningrad in 1975 as mentioned *before, we joined the Caucasus Tour conducted by Prof. Galushko. We were amazed at Dr. Galushko's intimate knowledge of the ferns, "fern alles," gymnosperms and phanerogams about him, and a bit saddened that this wealth of personal knowledge was not generally available. We are now delighted to report that we just received a copy of the 318-page "Flora of the Northern Caucasus" from our friend.

Though the volume, in boards, is published in Russian in the Cyrillic alphabet, names of Families and lower categories appear in the Roman. Thus we "outsiders" can gain an intriguing bird's eye views of what genera, so many common to temperate North America, exist there. The almost 3,900 species, according to our perusal of the index, are scattered among about 360 genera in 54 families.

Actually a field guide with emphasis on geographic distribution, this vade mecum is enhanced with 76 plates and figures. A few trivial misspellings occur, one being that of "Pulsatilla" under one of the cuts.

Unable to translate into English the information given where copies can be purchased, we suggest writing for them to the author at his home: Fevralskaya Street 273, T. Pyatigorsk, 357528, U.S. Russia.

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*Phytologia 17(4):409-411. 1977.

Dec. 2, 1978

Dear Harold & Alma:

We herewith submit a book review that somewhat connects with our 1977 one. Hope you can accept it.

We are back at the beach. Isa at times suffering a bit from osteoporosis. She continues to live normally, but walking on city cement pavement is followed at night with some pain - strangely. I seem to be holding my own in spite of advanced age.

Isa's mother is now staying with us, permanently we hope. We are drawing her to take over the whole house on the road, not one of the duplexes.

Greetings of the Season. Will the young family be able to visit with you? Were they still in Po'keepsie it would be so easy.

Aloha from

~~Isa~~ & O. H. D.

A.I. Galushko, "Flora of the Northern Caucasus": A Review

Otto & Isa Degener

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HAWAIIAN ACADEMY OF SCIENCE

c/o University of Hawaii Honolulu, Hawaii 96844

June 27, 1979

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body of water warrants careful monitoring at this time. Diatoms are useful not only for indication of present conditions but can indicate long term trends of improvement or degradation as it develops. This study points up the much improved but as yet incomplete clean-up of the Nashua River in this study area.

References:

Palmer, C.M. A Composite Rating of Algae Tolerating Organic Pollution Journal of Phycology #5 1969

Lowe, Rex L. Environmental Requirements and Pollution Tolerance of Freshwater Diatoms U.S. Govt. Printing Office, Washington, D.C. 1974 334 p.

A. I. GALUSHKO, "FLORA OF THE NORTHERN CAUCASUS", A REVIEW

Otto & Isa Degener

After attending the meetings of the XII International Botanical Congress in Leningrad in 1975 as mentioned *before, we joined the Caucasus Tour conducted by Prof. Galushko. We were amazed at Dr. Galushko's intimate knowledge of the ferns, "fern alles," gymnosperms and phanerogams about him, and a bit saddened that this wealth of personal knowledge was not generally available. We are now delighted to report that we just received a copy of the 318-page "Flora of the Northern Caucasus" from our friend.

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Published 2/15/79

Ott o & Isa Degener

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FLORA OF THE NORTH CAUCASUS

Otto & Isa Degener
New York Botanical Garden

We were impressed by the display of modern Floras, many beautifully illustrated in color, at the XII International Botanical Congress in Leningrad in 1975. We felt frustrated that these were figuratively as well as actually closed books to us by being printed in Russian in the Cyrillic alphabet. While on a week's tour of the Caucasus under leadership of Prof. A.I. Galushko, we emphatically expressed our conviction that the Science of Botany was hampered by so many botanists in different parts of the World publishing in a Babel of tongues. We broached the suggestion that Russian works should be accompanied by an English summary; and English, by a Russian one. Workers then would not only profit by foreign research, but would avoid wasting time by duplicating it.

Our opinion expressed to Dr. Galushko in 1975 was evidently convincing. It certainly fits in with Russia's wish for bi-national scientific *collaboration. An example is the 200-page book about the "Flora of the North Caucasus and Questions of its History," edited and in part authored by Dr. Galushko in 1976. Though no English summary appears, subtitles are in English and the 1,000 - 1,200 Latin plant names, such as Achillea millefolium, Equisetum arvense, Quercus rubor and Xanthium californicum, are in Roman type.

Dr. Galushko, mindful of bi-national cooperation, under date of January 20, 1977, wrote us "that the interests of your and our scientists go beyond the limits of their own Contries." Without his kind help, we could never have prepared the following review:

"Flora of the North Caucasus and Questions of its History," A. I. Galushko, Editor & Coauthor. 200 pages. 1976. 1 Pushkin Street, Stavropol, U.S.S. Russia. Price 1 ruble, 20 copeck.

Chapter 1. Galushko, A.I. "An Analysis of the Flora of the Western Part of the Central Caucasus." 125 pages, 17 tables, 11 maps.. The flora of the highest parts of the Main Caucasus, namely Prielbrusye, Balkaria and Western Ossetia is systematically, ecologically and arealogically analysed. It shows that every zone in the Central Caucasus is a refuge. Nine types of areals and 31 complexes have been noted: the boreal areal predominates with 834 species or 36%, the Caucasian with 511 or 22%, the Mediterranean with 312 or 14%, the fore-Asiatic areal with 273 or 12%, and five less important ones. One hundred twenty four endemic taxa are attributed to the North Caucasus. A map shows the above centres of species formation, of which the

* Irwin, H.S. Détente and the Green World. Garden Journ. 176-179. 1976.

biggest, Elbrusski, has 27 endemics and the "Jurassic cuesta" has 21. Another map shows location of the nine principal refuges. The role of epeirogenesis, glacial epochs and the epochs of arid climate in floragenesis is stressed. Contrary to many botanists, the author maintains that the Central Caucasus shows no vertical vicariism; but many examples of horizontal vicariism. This shows the antiquity of the oreophytes in the Caucasus and that the local oreophytes are not connected with the present flora of the plains and elevated areas. In short, the second are not derived from the first.

Regarding the glacial period, contrary to the belief of many others, the author contends that "syncretic" or mixed floras prove the reality of glacial epochs and that the amount of syncretion of the periglacial flora is proportional to how far south glaciation extended. His evidence is based on analysis of recent periglacial floras of glaciers Ulluchiran and Karachul (extending down to 3,200 m.), Azau (2,400 m.), and Besengi (2,130 m.). He maintains it is impossible to explain the floral compositions of every zone without postulating ancient and more recent broad glacial and interglacial migrations. Regarding arid periods, he stresses their exclusive importance in floragenesis, and notes that in the Holocene the North Caucasus (presently part of the Boreal plant association) was a portion of the Mediterranean plant association, and that the flora of the Central Caucasus during the last 20,000 years fluctuated between boreal-mesophytic and xerophytic-Mediterranean as well as xerophytic and steppe-like types. An example of a semiarid zone, or a zone of oreoxerophytes, shows the survival of the period when the Central Caucasus was part of the Mediterranean flora. Two maps illustrate his new floragenetic conclusions on the position of the zones in the glacial (Würm) and in the arid Holocene time. Maps show areas of numerous Caucasian species, the migration of mesophyllic and xerophyllic floras in the Caucasus during the Holocene; and tables listing the species. A chronological survey of the main stages of floragenesis and a table of local changes in the Pliocene-Pleistocene follow.

Chapter 2. Prima, V.M. "Some Questions of the Floragenesis of the Upper Alpine Flora of the Eastern Caucasus." 27 pages, 1 map. This article, verifying Galushko's conclusions, divides the Eastern Caucasus into three districts: Tersko-Argunski, Koisunski and Transsamurski. It compares the alpine and subnival floras of 269 species of the Eastern Caucasus, Verkhnaya Svanetia, Bolshaya Liakhva, Western part of the Central Caucasus, Central Transcaucasus and Maly Caucasus (Armenian plateau).

Chapter 3. Nemirova, E.S. "Geographical Distribution of Species Jurinea Cass., Sect. Neobellae Nemirova and some Questions of the Floragenesis." 4 pages, 1 map. The floragenesis of the genus Jurinea (Asteraceae), an endemic Caucasian Section of Neobellae, is given based on the geographic spreading of its taxa

throughout the Caucasus. Two centres of origin and the present occurrence of taxa of Section Neobellae are postulated. The Western Caucasus is the primary center where Pumilae and Levieranae of the Subsection Coronopifoliae and the Subsection Mamullosae thrive. In fact, Mammulosae is endemic to the Western Caucasus. The Central Caucasian centre is a derivative even though an ancient one, within the limits of which the majority of species of Subsection Coronopifolia occur. They developed at the end of the Pliocene. In summary, the wealth of taxa in the Central Caucasus is due to two invasions: one during the Pliocene and one during the Riss-Würm. A map shows the direction of migrations.

Chapter 4. Prima, V.M. "On Some of the Particularities of the Upper Alpine Flora of the Baba-Dag Mountains." 14 pages. A check list of taxa, many new, on the mountain Baba-Dag shows its relationship in the Caucasian flora.

Chapter 5. "Floragenetical Regions of the Peredovoj Ridges (Terski-Ridge and Sunjenski-Ridge) of Checheno-Ingushetia." 9 pages, 1 map. Five floristic regions and several subregions occur such as the Malgobekski, Bragunski, Eastern part of the Sunjenski Range, and Alkhanchurto-Sunjenski. The Bragunski region is the most original. The most characteristic species are listed.

Chapter 5. Prima, L.C., & Galushko, A.I. "On Aquatic Flora of Kissyk Lake." This article deals with the "Types of Woods and Forestry in the Checheno-Ingushetia."

The reviewers are mortified that after preaching that articles in English should have a brief summary in Russian printed in the Cyrillic alphabet that they can find no Russian scholar in the Island of Hawaii to write it for them, and no printer in Ann Arbor with a Cyrillic font to print it for them! Dr. Galushko, please excuse us.

"Flora of the North Caucasus and questions of its history" by A.I. Galushko (editor). 1976. 200 pages. USSR, Stavropol City, I Pushkin Street, 1976. Price 1 rouble, 20 copeck.

It is a collection of 7 scientific articles containing 6 chapters by 5 authors.

Article by A.I. Galushko, "An Analysis of the Flora of the Western Part of the Central Caucasus." (135 pages, 17 tables, 11 maps).

The article contains an analysis of the flora in the highest part of the Main Caucasus, Prielbrusye, Balkaria and Western Ossetia. The flora of the area is analysed. All the analyses: systematic, ecological, arealogical embrace the region as a whole and its zones. In the author's opinion, the results of the analyses testify to the fact, that in the Central Caucasus every zone is a refuge, and subnival zone is of importance only in periods of deglaciation and that this zone is the product of the glacial period. Nine types of areals and 31 complexes have been singled out. Species with boreal areal predominate-834 species (about 36% per cent). The second place is occupied by the species with Caucasian areal, that is all Caucasian and regional endemics-511 species or 22 per cent of the flora). In the third place are the species with Mediterranean areal-312 species (about 14% per cent). In the fourth place are the species with fore-Asiatic areal-273 or 12% per cent). Endemism is given a thorough examination: geographic localisation of endemics, conditions for the formation of endemism, etc. In all 124 endemic taxons have been established in the North Caucasus. The article contains a diagram of geographic location of the main (five) centres of species formation (the biggest of which: Elbrusski centre-with 27 endemic species and the centre of "Jurassic Cuesta"- the 21 species). Another diagram demonstrates the location of the principal refuges, 9 of them. In the work much consideration has been given to the role of epirogenesis, glacial epochs and the epochs of arid climate in florogenesis. Contrary to the opinion of many Caucasian botanists, the author arrives at a conclusion, that in the Central Caucasus there are no examples of vertical substitution, that is vertical vicarism. But there are many examples, confirming the presence of horizontal vicarism (vicarism within the limits of one zone - vicarism of species and vicarism of series). This fact, in the author's opinion, testifies to the antiquity of the oreophytes in the Caucasus and shows, that the local oreophytes are by no means connected with the present flora of the plains and elevated areas, that is the first ones are no derivatives of the second ones.

~~Speaking about~~ Regarding the glacial period, contrary to the belief of many others, ~~the author notes, that the opponents of glacial epochs find confirmation of their views in the fact of the existence of so called~~ Galushko contends that "syncretic" or mixed floras" ~~(that is mixed floras). The author holds that by their existence they~~ prove the reality of glacial epochs and that the amount of syncretism of the periglacial flora is ~~in~~ proportionate to ~~the degree of glaciation, or to be more precise, how~~ far South glaciation extended ~~spreads to the south~~. ~~This conclusion the author has drawn from the~~ His evidence is based on analysis of recent ~~of the present day~~ periglacial floras of ~~the~~ glaciers Ulluchiran and Karachul (~~they come~~ extending down to ~~the height of~~ 3200 m), Azau (to 2400 m) and Besengi (to 3130 m). ~~The author also notes, that~~ He maintains it is impossible to explain the flora composition~~s~~ ~~of the floras~~ ~~in~~ of every zone without ~~acknowledging~~ postulating ancient and more recent broad glacial and interglacial migrations, ~~which took place both in the remote past and not very long ago, what also contradicts the notions of some Russian and European botanists.~~

~~Speaking about~~ Regarding arid epochs periods, the author lays stress on ~~the~~ their exclusive importance ~~in~~ in floragenesis, and notes, that in the Holocene the North Caucasus (at present a part of the Boreal Plant Ass., ~~kingdom~~) was a portion of the Mediterranean ~~kingdom~~ Plant Ass., and that the flora of the Central Caucasus ~~over the period of the~~ during the last 20,000 ~~thousand~~ years ~~(the more so for the space of all the Pleistocene) more than once as now to a greater degree bor-~~ fluctuated between Boreal-mesophylic ~~now more~~ and xerophylic-Mediterranean, as well as xerophyt. desert-like or steppe-like. ~~The author has singled out~~ An example of a ~~special~~ semiarid zone, or a zone of oreoxerophytes, ~~This zone is a~~ shows the survival of ~~that~~ the period when the Central Caucasus was ~~a~~ part of the Mediterranean ~~kingdom~~ Flora ~~kingdom~~ and ~~Mediterranean region~~. The ~~floragenetic~~ conclusions of ~~the author are illustrated~~ by Two maps, ~~reflecting his view~~ illustrate his new on the position of the zones in the glacial (Würm) and in ~~the~~ arid epochs ~~of~~ Holocene. ~~The work contains the~~ Maps show ~~maps of the~~ areals of numerous Caucasian species, ~~the maps of~~ the ~~ways of~~ migration of mesophylic and xerophylic floras in the Caucasus during the ~~in~~ Holocene; ~~voluminous~~ and tables list ~~of~~ Caucasian plants. ~~App. All the maps and diagrams are original. The work contains~~ A chronological survey of the main stages of floragenesis and a table of local changes in the Pleocene-Pleistocene follows. ~~There are prognoses for the future.~~

Chapter 2.

~~The article by~~ V.M. Prima, "Some questions of the floragenese of the upperalpine flora of the Eastern Caucasus." 27 pages ~~69 Pages~~, 1 map.

The article deals with the same question as the preceding one and is a confirmation of A.I. Galushko's conclusions by the examples taken from the Eastern Caucasus. In this article the author attempts to ((divide)) the Eastern Caucasus into districts. The authors of this dividing flora into districts, A.I. Galushko and V.M. Prima single out and ground three complexes of districts: Tersko-Argunski, Koisunski and Transsamurski. The fact of division of the Eastern Caucasian flora is considered against the background of all Caucasian floragenesis. It is interesting to look through the comparative list of the Caucasian subnival flora, species numbering 269 names. The list contains some date on the flora of alpine zone of the Eastern Caucasus, Verkhnaya Svanetia, Bolshaya Liakhva, Western part of the Central Caucasus, Central Transcaucasus, Maly Caucasus (Armenian elevations).

Chapter 3

The article by E.S. Nemirova, "Geographical distribution of species Jurinea Cass. Sect. Neobellae Nemirova and some questions of the floragenesis", 14 pages, 1 map.

The article is dealing with the floragenesis of species from Jurinea Cass, an endemic Caucasian section of Neobellae. The author draws floragenetic conclusions on the basis of the studies of the geographic spreading of taxons over all the Caucasus. Two centres of localization and origin of the present day representatives of Neobellae section have been single out. The Western Caucasus is recognized as the most ancient (primary) centre, where at present one comes across the majority of groups of the subsections, specifically Coronopifoliae (group Pumilae, Levieranae) and the group of Mamullosae subsection (it is represented only in the western Caucasus). The Central Caucasian centre is a derivative one, it is secondary and also ancient, within the limits of which the majority of species of all series of species of subsection Coronopifolia concentrate. The author considers this centre to be the most powerful. The end of Pliocene is the time of its rise. Taking into account the degree of morphological disconnection and kindred connections, we may say, that the species in the Central Caucasian centre are a product of two invasions: the Pliocene and the Riss-Würm one. The views of the author are illustrated by a map, demonstaring the direction of migrations.

The article by V.M. Prima "On some of the particularities of the upper alpine

Chapter 4.

SANTALUM PANICULATUM var. CHARTACEUM Deg. & Deg.

Otto & Isa Degener

Two distantly related groups of Santalum are native to the Hawaiian Archipelago. One, called the "freycinetianum group" by *Skottsberg, is more montane, and bears claret colored flowers and a half superior ovary; the other, called the "ellipticum 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 non-specific 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 distant species. In 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 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.

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

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

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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.

art, we doubt he was the first to do so. See Judd, Laura Fish. Sketches of Life in the Hawaiian Islands, page 239. 1880.

Ti leaves were used by the Hawaiians when suffering from

Along the coast of the Hawaii Park once existed the village of Kealakomo. It was badly mauled in 1868 during the eruption of Mauna Loa when the coast line dropped four to seven feet and a tsunami swept inland. Then in 1971 even the ruins were obliterated by lava flows coming from the Kane Nui o Hamo area north of Makaopuhi Crater. An idea of how the natives lived here around 1846 and made use of the leaves of the ti is explained by Chester Smith Lyman in his journal: "We proceeded over this plain not far from the shore about 10 miles, when we came to the little naked village of Kealakomo, the first human habitation we saw after leaving Kamoamoa. - - - There are but few people in this region, scattered thro' the few poor villages that lie beyond. They are miserably poor, and for some time past have been almost in a state of famine. They get their living by fishing, making salt, and getting fern roots and a few [sweet] potatoes in the mountains. Their salt works are on the naked lava near the sea, the water of which is evaporated in little cups of vessels made of the Ki leaf, and holding of course but a minute quantity of water. These are laid in parallel rows over several acres, and the water poured into them a little at a time ~~xix~~ from calabashes. The process is an extremely slow one, though the salt is said to be excellent for the table. It is sold at the exceedingly low price of 25 cents a bag, which will contain, I should judge, one-half bushel or more - - -."

Along the coast at the foot of Mauna Loa existed the "village of Hauhauha," apparently not much different from Kealakomo. Here *S.S. Hill and a companion, on a sight seeing jaunt, stopped for a rest."' Good haouries [strangers] , remarked an old lady. "'It was not fish only that we ate raw before the missionaries taught us the new religion. When I was a child, half the number of us that are now present would have found your white bodies, fresh killed as we should have eaten them, at least in a time of scarcity, but a meagre meal.~~/ /~~ '" The Hawaiians, unlike the ~~XXXXXX~~ Polynesians of New Zealand or the Melanesians, were never cannibals. Like all races of man, however, some few individuals apparently did partake of human flesh during famines.

*Travels in the Sandwich and Society Islands. P. 190. 1856.

Where smooth, grass covered slopes abounded, Hawaiian children often amused themselves by sliding down hill sitting on a few leafy ~~ti~~/ ti branches, holding the stems between their legs.

HAWAIIAN SISYRINCHIUM OR MAUULAILI (74)

The Hawaiian sisyrinchium (plate --), the mauulaili of the natives, is botanically known as Sisyrinchium acre Mann, thus named by the son of the famed educator Horace Mann. It is peculiar to Hawaii and East Maui, thriving in boggy ground at higher ~~ti~~ elevations.

Well over a hundred species of sisyrinchium are known, ← can this fill 1 line?

Plate --. Tattooed dancer wearing boar tusk necklace and dog tooth anklets (Ibid. Pl. 62. ~~XXXXXXXXXX~~ Lyman H.M. Museum photo.)

How was the staining quality of the mauulaili discovered? Did some early malo-wear~~ti~~ers happen to sit on some of these herbs while partaking of a repast of fish and poi? What merriment there must have been when the Hawaiians arose to discover their buttocks ornamented with intricate markings that would not rub off?

TRITONIA (74)

side. This is the tritonia (Plate --) introduced into these islands as an ornamental probably before 1900. It has unfortunately escaped from cultivation and now grows naturalized in moist meadows and similar places in various districts on the Island of Hawaii as well as at the head of Waimea Canyon on the Island of Kauai. This plant has already become so noxious a weed in pastures, cane fields, and about the Volcano House in the Hawaii Park that it should be eradicated, in spite of its beauty, wherever possible.

or Iris Family. The one is botanically known as Tritonia pottsii Benth. & Hook., while the other is [illegible] Crocosmia aurea Planch. The reultant hybrid first bloomed in 1880 in France. It was named X Tritonia crocosmiiflora Nichols in 1887.

The tritonia, as the illustration shows, bears long, slender, upright leaves. These are attached to an extremely whort, thick, erect stem, called a corm, that somewhat resembles an onion bulb in shape. From this, subterranean branches arise to radiate in all directions and to give rise at their ends to a second series of corms and upright leaves, This type of growth continues indefinitely, the slender underground branches between the corms finally dying and isolating the new growth into apparently separate plants distinct from the old. Actually all such "plants" are simply pieces of the original one. Such asexual pieces are termed clons. A colony of tritonia can rapidly spread over a field asexually by such corms, as well as sexually by seed. For a hybrid to do so by the latter method and still breed true was a disagreeable surprise indeed.

BANANA OR MAIA (75)

"hand." After the fruit has ripened, the "plant" XXXXX really just one erect branch, dies. Suckers, however, arise from its base to become isolated into new individual plants later on.

troglodytarum var. acutibracteata MacDaniels) which was introduced into these islands from the South Seas early in the Nineteenth Century. Ordinarily this flower cluster bends over as Plate --- shows.

Banana (Musa nana Lour.) here shown, to thirty-five feet, in the fei or bolabola banana. In most cases the collective bracts covering the staminate flowers fall, but in the Chinese species the terminal bracts are persistent. The bunches commonly bear five to nine hands, totalling about 250 freits. In the proligic "king-of-thousands,"

Until some technical matters are verified to be true, most botanists call the common banana Musa paradisiaca var. sapientum (L.) Ktze., and the plantain Musa paradisiaca L. Would Linnaeus really have named the plantain, practically inedible unless first cooked by Eve for Adam, the plant native to Paradise? Before abadoning the mythical couple to their fate, we wish to mention that we join others in suspecting some giant Musa herb bore the forbidden fruit, not an apple tree. The old "bunch" will bear bananas at the base; while the upper,dangling part fancifully resembles a scaly serpent with gaping mouth.

All bananas show dark spots, the abortive seeds, in the pulp; XXXX or, in very rare cases, have viable seeds. These are hard, more or less round, and often angular.

to appease the insulted dieties. The bana, considered a male life form because of the shapes of the fruit and the flower cluster, was particularly kapu to females.

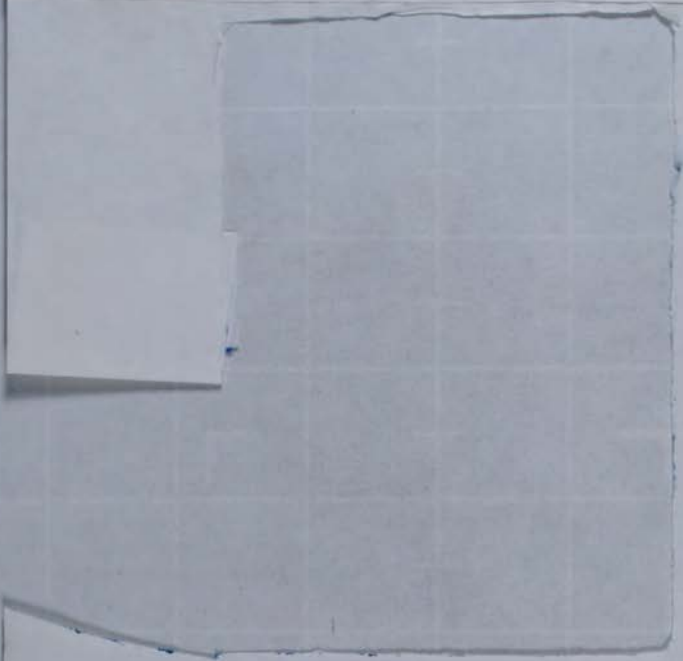
Though the early American missionaries tried to keep their children from associating with those of the Hawaiians, Henry M. Lyman (Haw. Yesterdays. Page 61. 1906.) of Hilo as a boy learned a tasty, local custom; "Often we explored the banana groves in search of the honey that fills the nectary of the blossom; this was one of the luxuries that took the place of the candy and sweetmeats of which we had read but which we had never see."

HAWAIIAN GINGER OR AWAPUHI (76)

The common gingerlily (Plate), Hedychium coronarium Koenig, is not native to the Hawaiian Islands, but to India. It was purposely brought here over a hundred years ago as an ornamental because of its large, white, fragrant flowers. A yellow-flowered species, H. flavescens Carey , was also introduced. Both soon escaped from cultivation and now may be found growing naturalized at lower elevations on almost all the Islands in damp localities. The white- as well as the larger yellow-flowered gingerlily may be seen growing along the roadside between Hilo and Kilauea in great numbers.

Although producing flowers in abundance, these two species rarely mature seed. They spread from place to place chiefly by means of their creeping and branching rootstocks. The flowers of both are gathered abd strung into fragrant garlands, or lei. These were formerly offered for sale to travelers the moment they disembarked upon these shores

MOKULEIA BEACH SHIBEI?



Windrow of millions of living and dying megalops along polluted Mokuleia Beach, Oahu, May 25, 1977.

One of us has lived at Mokuleia Beach, Waialua, Oahu since 1935, and has seen the waters washing the reef fronting our property slowly deteriorating in quality. Though we never made bacteriological nor chemical tests, the ever increasing abundance of indicator limu proves it. These plants thrive in water enriched by nitrogen and organic matters such as that gained from seeping cesspools. These index plants are the grass green limu-ele-ele (related to the seaweed known by the suggestive name Enteromorpha intestinalis); the grass green sea-lettuce (Ulva lactuca s.l.); and the almost microscopic blue-green lyngbya (L., probably majuscula) causing "swimmer's itch" where crushed against the skin under the bathing suit.

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14 & 33 be subdivided into 65 two-acre lots where the land use is designated for Agriculture and the Zoning is AG - 1 Restricted Agricultural District. Here on 141+ acres they propose to establish 65 two-acre farm house lots. To us to consider two acres with normally a home and a 2-car garage agricultural is outright shibei. The planting of perhaps one avocado, one mango, ten papaya trees and a row each of eggplant and beans hardly proves the land is in agricultural use! To us it seems like simply semantic subterfuge - a tinge of anarchy. Other average citizens came to the same conclusion as well as the City Council's Agricultural Task Force if we understand the June 14, 1978 article in the Honolulu Advertiser.

To aggravate this request for "2-acre farm lots" to an outrage, we find that the applicant, represented by his lawyer, not a biologist, had the audacity to request and get an Environmental Impact Statement waived! August 9, 1977 we wrote Director G.S. Moriguchi, Dept. Land & Utilization, Honolulu our protest about this flagrant breach of a wise regulation. Our protest was of no avail.

Waiving one EIS that would undoubtedly condemn the construction of 65 homes on zoned agricultural land facing Mokuleia Beach started the "monkey see, monkey do" syndrome. Now another concern wishes to repeat the disaster for still another 50 homes more or less adjoining the 65.

Readers of Hawaii Coastal Zone News must realize that an additional 100 a more homes means the drainage of detergents and human sewage from that many additional cesspools percolating through a cracked and cavernous fossil reef that acts more like a sieve than a bacterial filter. With the Mokuleia beach and reef already showing signs of eutrophication, or "illness" as the photo shows, the additional cesspools will indeed cause disaster.

Finally we must add the somewhat boring but importamt non-biological facts that the "Water Resources Research Center expressly lists "Wave Exposed Reef Communities" such as Mokuleia Beach as "Limited Consumptive," with a Water Quality standard for "Total Kjeldahl, Nitrogen, Ammonia, etc., etc., where "Toxic Substance - Shall not exceed concentrations recommended by the Environmental Protection Agency for marine waters." Why, we repeat, have we wise regulations and laws when we waive them?

As tax payers and citizens resident of Mokuleia, we repeat our demand for an Environmental Statement for the Mokuleia Beach area. Its waiver is questionably ethical and is illegal. To gain common sense justice, must we citizens engage some Mainland attorney to represent us?

Dr. Otto Degener
Botanist, Univ. of Hawaii, 1925-27
Naturalist, Hawaii National Park, 1929

Dr. Isa Degener
Botanist, Bot. Garden & Bot. Museum,
Berlin, Germany, 1948-53
Coauthor, Flora Hawaiiensis

Though little additional building of dwellings has occurred during the past forty years, except recently in the Puuiki area, this deterioration from a high Class A Water to a low Class B Water fronting the beach is easy to explain: Population pressure has often illicitly changed 1- and 2-car garages into cheap rental units. As a result, overburdened cesspools with detergents and human excrement now seep onto the reef as colorless effluvia as never before. Without thinking too much about E. coli and pathogenic organisms one may be swallowing, swimming and surfing along Mokuleia Beach is still enjoyable if one partakes of a cleansing shower to wash away itchy lyngbya, infectious Streptococci and who knows what else.

May 25, 1977 at 6:30 A.M., when we went to the beach fronting our property, we noted dying and dead crustaceans in the immature stage known as "megalops". From this they molt into the final form appearing as a gourmet treat on the dining table. Walking from the Salvation Army's Camp Homelani west along the beach about a half mile as the 'alalā flies, these megalops were lying by the millions in an almost continuous pinkish windrow, occasionally lapped by ripples. How much further along the beach the dying and dead extended we did not walk to find out. Later in the day we met Game Warden Clinton, alerted to the phenomenon by another beach resident, who like us had collected specimens for later identification. Voucher specimens are Accession No. 780010 HA /1, portunid megalops, collected by O. Degener, identified by W.J. Cooke, deposited at the Memo Processing Center, Naval Undersea Center, Hawaii Laboratory.

With only the megalops stage all of half inch body length available, we consulted with William J. Cooke, Dept. of Zoology, University of Hawaii, to find that this "Mokuleia krill" was either the edible ku-honu (Portunus sanguinolentus) or the edible mo'ala (Podophthalamus vigil). Had the Island of Hawaii been involved, we might have ascribed this holocaust to a submarine eruption; but for Oahu, we ascribe it to pollution by human overpopulation. The continuation of healthy reef and open ocean life off Mokuleia has evidently become fragile. The tragic waste of such an observed biomass is a double one: the destruction of crabs of commercial value as food directly for man; and the destruction of food for fish that contribute to the sampan- and sport-fishing industries. How many other edible organisms were killed that were not washed ashore?

Why do our elected Legislators enact wise regulations and laws, and then perhaps from whim or out of friendship flirt with anarchy by condoning exception after exception? Such political laymen ignore the carefully studied recommendations of experts and technicians whom they themselves have been instrumental in appointing! The Mokuleia residents seem to be victimized in this respect.

August 25, 1977 a Public Hearing regarding a Shoreline Management Permit was held at the Waialua Recreation Center with Mokuleia Associates, the Applicant; and Attorney Mervyn W. Lee, the Agent. The request was that Tax Map Key 6-8-06, 1, 9,

14 & 33 be subdivided into 65 two-acre lots where the land use is designated for Agriculture and the Zoning is AG - 1 Restricted Agricultural District. Here on 141+ acres they propose to establish 65 two-acre farm house lots. To us to consider two acres with normally a home and a 2-car garage agricultural is outright shibei. The planting of perhaps one avocado, one mango, ten papaya trees and a row each of eggplant and beans hardly proves the land is in agricultural use! To us it seems like simply semantic subterfuge - a tinge of anarchy. Other average citizens came to the same conclusion as well as the City Council's Agricultural Task Force if we understand the June 14, 1978 article in the Honolulu Advertiser.

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Botanist, Univ. of Hawaii, 1925-27
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MOKULEIA BEACH SHIBUI?

One of us has lived at Mokuleia Beach, Waialua, Oahu since 1935, and has seen the waters washing the reef fronting our property slowly deteriorate in quality. Though we never made bacteriological nor chemical tests, the ever increasing abundance of indicator limu proves it. These plants thrive in water enriched by nitrogen and organic matters such as that gained from seeping cesspools. These index plants are the grass green limu-ele-ele (related to the seaweed known by the suggestive name Enteromorpha intestinalis); the grass green sea-lettuce (Ulva lactuca s.l.); and the almost microscopic blue-green lynbya (L., probably majuscula) causing "swimmer's itch" where crushed against the skin under the bathing suit.

Though little additional building of dwellings has occurred during the past forty years, except recently in the Puuiki area, this deterioration from a high Class A Water to a low Class B Water fronting the beach is easy to explain: Population pressure has illicitly changed 1- and 2-car garages into cheap rental units. As a result, overburdened cesspools with detergents and human excrement now seep onto the reef as colorless effluvia as never before. Without thinking too much about E. coli and pathogenic organisms one may be swallowing, swimming and surfing along Mokuleia Beach is still enjoyable if one partakes of a cleansing shower to wash away itchy lynbya, infectious Streptococci and who knows what else.

May 25, 1977 at 6:30 A.M., when we went to the beach fronting our property, we noted dying and dead crustaceans in the immature stage known as "megalops." From this they molt into the final form appearing as a gourmet treat on the dining table. Walking from the Salvation Army's Camp Homelani west along the beach about half a mile as the 'alalā flies, these megalops were lying by the millions in an almost continuous pinkish windrow, occasionally lapped wet by ripples. How much further along the beach the dying and dead extended we did not walk to find out. Later in the day we met Game Warden Clinton, alerted to the phenomenon by another beach resident, who like us had collected specimens for later identification.

With only the megalops stage all of half inch body length available, we consulted with William J. Cooke, Dept. of Zoology, University of Hawaii, to find that this "Mokuleia krill" was either the edible ku-honu (Portunus sanguinolentus) or the edible mo'ala (Podophthalamus vigil). Had the Island of Hawaii been involved, we might have ascribed this holocaust to a submarine eruption; but for Oahu, we ascribe it to pollution by human overpopulation. The continuation of healthy reef and open ocean life off Mokuleia has evidently become fragile. The tragic waste of such an observed biomass is a double one: the destruction of crabs of commercial value as food directly for man; and the destruction of food for fish that contribute to the sampan- and sport-fishing industries. How many other edible organisms were killed that were not washed ashore?

Why do our elected Legislators enact wise regulations and laws, and then perhaps from whim or out of friendship flirt with anarchy by condoning exception after exception? Such political laymen ignore the carefully studied recommendations of experts and technicians whom they themselves have been instrumental in appointing! The Mokuleia residents seem to be victimized in this respect.

August 25, 1977 a Public Hearing regarding a Shoreline Management Permit was held at the Waialua Recreation Center with Mokuleia Associates, the Applicant; and Attorney Mervyn W. Lee, the Agent. The request was that Tax Map Key 6-8-06: 1, 9, 14 & 33 be subdivided into 65 two-acre lots where the land use is designated for Agriculture and the Zoning is AG - 1 Restricted Agricultural District. Here on 141+ acres they propose to establish 65 two-acre farm house lots. To us to consider two acres with normally a home and a 2-car garage agricultural is outright shibei. The planting of perhaps one avocado, one mango, 10 papaya trees and a row each of eggplant and beans hardly proves the land is in agricultural use! To us it seems like simply semantic subterfuge - a tinge of anarchy. Other average citizens came to the same conclusion as well as the City Council's Agricultural Task Force if we understand the June 14, 1978 article in the Honolulu Advertiser.

To aggravate this request for "2-acre farm lots" to an outrage, we find that the applicant, represented by his lawyer, not a biologist, had the audacity to request and get an Environmental Impact Statement (i.e.) waived! August 9, 1977 we wrote Director G.S. Moriguchi, Dept. Land & Utilization, Honolulu our protest about this flagrant breach of a wise regulation. Our protest was of no avail.

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Botanist, Univ. of Hawaii, 1925-27
Naturalist, Haw. National Park, 1929

Dr. Isa Degener

1949-53.

Botanist, Bot. Garden & Bot. Museum, Berlin, Germany
Coauthor , Flora Hawaiiensis

Drs. Otto & Isa Degener

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Windrow of millions of living and dying megalops along polluted Mokuleia Beach, Oahu, May 25, 1977.

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Degeners' Leaflet No.4, published 8/30/78.

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Dr. Isa Degener

[redacted]

Coauthor, Flora Hawaiiensis

Fish viscera might sicken you; Marquesan sardine is a killer

Advertiser photo by Charles Okamura

Randall displays a handful of the poisonous Marquesan sardines.

By ROBERT W. BONE
Advertiser Staff Writer

Warning! If you like fish, that's fine. But please don't eat the viscera (that is, the intestines, or guts) of any fish caught in Hawaiian waters right now.

Even more important, do not eat any part of a tiny fish called the Marquesan sardine.

Eating the viscera of fish right now might make you very sick. But eating the Marquesan sardine can kill you.

These are the messages from state Health Department officials and other local medical/scientific people yesterday after sicknesses reported on Oahu and the Big Island and one recent death on Kauai.

All were connected with eating poisoned fish.

Luckily, the number of persons who might eat the innards of a fish is low. Rare, too, is the person who might consume a Marquesan sardine. It's normally used as bait only and, at about 5 inches in length, it's usually considered too small for human consumption.

Dr. Robert Melton, Kauai district health officer, confirmed yesterday that officials are looking here at two kinds of poisoning from the sea.

"We want people to be aware that fish poisoning is taking place," said Melton. "At this time, it is advisable not to eat the viscera of fish, and also advisable not to eat the small Marquesan sardines.

"We are investigating a suspected poison and seeking assistance from the scientists. There's something out there the fish are eating, but we don't know what it is."

The recent cases on the Big Island and some illnesses reported last month from Pokai Bay on Oahu are caused by ciguatera, a seasonal disease sometimes carried in fish viscera. The disease brings on nausea, vomiting, abdominal pains, diarrhea and other severe discomforts.

"You almost wish you could die, but you generally don't," explained Dr. John Randall, an icthyologist at the Bishop Museum.

But Randall is looking into the other poison, a much more powerful one, which he said is occasionally carried by some clupeids, a group of small tropical fish that includes sardines and herrings. Its exact nature is unknown to science, but it apparently comes from something the fish ate.

Over the past weekend, Randall received the remains of a fish recovered from the garbage can of a man who died after eating it on Kauai. He identified the creature as the Marquesan sardine.

"He ate this fish at 10 o'clock and by 3:45 in the morning, he suffered cardiac arrest," Randall said. "They revived him, but by the following noon, he had another attack and died. That can't be ciguaterra, which is never that rapid and rarely fatal." Randall therefore concluded that it was probably the clupeid poisoning, a toxin rare enough that it doesn't even have its own name.

"There have been cases reported in which people have died within 15 minutes after eating the fish," Randall said.

He explained that the normally safe Marquesan sardine was brought to Hawaii by the state Fish and Game Division in 1955 and that 136,300 of them were then released in the waters around Oahu. Brought in specifically as a bait fish, it has proved effective in that role.

He also said that although the recent case of clupeid poisoning is the first reported in Hawaii, it is not unknown in the warmer waters of the South Pacific.

Randall believes that the unidentified poison might prove to be saxitoxin, the same substance carried by the paralytic shellfish that lives along the Pacific Coast. He hopes to send a portion of the fish found in the Kauai garbage can to colleagues at the University of Tokyo who recently found saxitoxin in some tropical crabs, and ask them to test the material.

Randall also said that he has some samples of whole Marquesan sardines kept on ice, bought recently as baitfish in Kauai, but that there is no immediate way of knowing if they also contain the poison.

"I thought I might give a little of it to my cat, but my wife said no, no," he said.

Honolulu Advertiser
Thursday, Oct. 12, 1978 A-3

In habitat of endangered bird

Big Isle blaze still raging

11/29/77

By HUGH CLARK
Hon. Advertiser Big Island Bureau

POHAKULOA, Hawaii — A forest fire on the slopes of Mauna Kea raged out of control yesterday for the third straight day, burning more than 1,000 acres of vital habitat for the endangered palila bird.

State forester Libert Landgraf last night reported from the fire line that he thought the blaze was nearly contained as tired crews sought to complete a firebreak around its perimeter.

Almost 600 firefighters, using bulldozers and helicopters, were battling the blaze in a remote area between the 7,500- and 8,500-foot levels on Hawaii's tallest mountain.

The fire burned through mamane-naio forest on Mauna Kea's southern slopes where the small Hawaiian palila bird lives.

Landgraf said the area is regarded as a "critical habitat" for the bird. The adult palila is about six inches long and has a bright yellow head and breast. Its back is gray and the abdomen is grayish-white.

The rare bird lives only in the mamane-naio forest between 6,000 and 8,000 feet high and only on Mauna Kea. It depends on the mamane trees for survival, feeding mainly on green seed pods of the tree. It also will eat insects and naio berries.

By 5 p.m. yesterday, 500 soldiers from the Pohakuloa Training Area plus 55 state forestry division employees were battling the blaze that started sometime Friday.

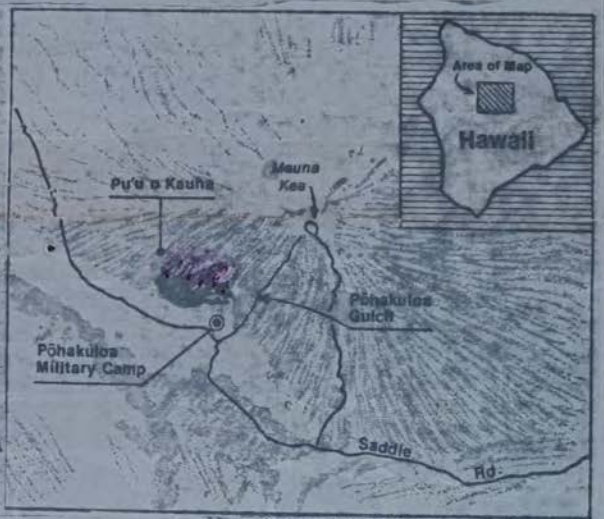
The forestry employees included 22 men from Maui, Kauai and Oahu who were brought in to provide relief for 33 Big Island men described as "dog tired" from nearly 72 hours of nonstop firefighting.

Landgraf blamed the fire on "some human cause." He said either a hiker or hunter likely was responsible for the fire that started in the steep area above the Army's training center.

The firefighting effort was hindered all weekend by strong mountain winds that whipped up the flames.

Three bulldozers and several military helicopters aided in the effort along with a private helicopter from Waimea that Landgraf rented.

The fire site is inaccessible by vehicle. Firefighters have had to hike several miles up the mountain to reach the forested area.



Big Island fire down but not out forester reports

Hon. Adv.
11/30/77

HILO — Military and state firefighters yesterday began a "tremendous" mop-up of more than 1,000 acres of native forest that was destroyed during a three-day fire on the upper slopes of Mauna Kea.

The careful watch over the charred area began yesterday after a three-day effort contained the blaze Monday evening.

[illegible]

blaze destroyed "critical habitat" of Hawaii's endangered palila bird, a yellow and gray bird that lives on the seed pods of the mamane tree.

"There's still a lot of burning going on inside," said State Forester Libert Landgraf.

Yesterday, he gave 33 Big Island state forestry employees a chance to recuperate from three days of fighting the remote fire that burned along the mountain from the 7,500-to 8,500-foot elevation. They were replaced on the fire by 22 men called in from Oahu, Maui and Kauai.

By last night, the Big Islanders were sleeping back on the fire line to make sure the still-burning area does not send sparks beyond the fire lines cut by tractors.

The area was too hot yesterday for scientists to determine the extent of the loss of wildlife and the degree of damage to the palila sanctuary.

Because there is almost no water in the Saddle area of the Big Island between Mauna Kea and Mauna Loa, the fire fighters have been using [illegible] to smother the fire. In some [illegible]

Degener xeroxed 125;
Ikuns independently in
Wisconsin, 300 more for
wide distribution.

O.D.

Reprinted from Phytologia, 37(4): 281-284. 1977.

HELP

Save the Dwindling Endemic Flora of the Hawaiian Islands at Least as Herbarium Specimens for Museums of the World

Otto Degener

Though this disturbing article was submitted to a local periodical for publication February 27, 1977, it was returned as unsuitable for printing July 26. Disappointed, I here submit it for the more international readers of Phytologia. As an addendum, I wish to mention a release received July 21 from the State of Hawaii's Department of Land and Natural Resources.

Our older executives and legislators, usually the product of schools concentrating on the Three Rs and ignoring the teaching of Biology, hardly realize that the intelligent World about us is horrified by our bull-in-the-china-shop attitude toward the outstanding biological treasures Nature has provided for us. These are an ever increasingly important magnet for attracting wealthy tourists and scientists to our shores. So I was not surprised when I received a request dated February 10, 1977 from E.H. Rapoport, Fundacion Bariloche, Rio de Negro, Argentina for information about the present status of our native flora and the name, date of introduction and extent of each of our exotic plants - especially our pernicious weeds. Though the task is impossible because of its enormity, I am mailing him with this, my present report, articles by Honolulu Star-Bulletin Conservation Editor Whitten appearing 8/22/68 and 2/21/77 concerning Clidemia hirta (L.) D. Don or Koster's Curse, a member of the Melastomataceae.

The late Dr. Harold Lyon, a botanist by training and an efficient Director of the Hawaiian Sugar Planters' Experiment Station in Honolulu, was a powerful man with a strong, persuasive personality. He was convinced that our uplands should become a thick tangle of plants to increase by fog drip and rainfall water for irrigating the lowland sugarcane fields. Employees of the Station, such as Fred Hadden, were instructed that wherever they might travel, to bring seeds and other propagules back to the Islands. He was particularly interested in banyans and strangler figs of all kinds, the late Dave Fullaway concentrating on their study and becoming an expert on the peculiar wasps effecting their pollination. Dr. Lyon favored these figs, he told me to my horror, because the plants had no timber value and hence jungles consisting of them would never succumb to the lumberman's ax but catch water undisturbed for ever. Many of such plants were grown in the Station's nursery in Wahiawa, Island of Oahu, now a State Botanical Garden.

One of the exotics in Wahiawa was Clidemia hirta, carefully grown in ns under the supervision of Forester George McEldowney and staff. Be- s interested solely in endemic plants and the animals that depend on m for food and shelter, I feebly protested in the late '40s the plant- of the Clidemia seedlings in the Pupukea-Kahuku area of Oahu where I spending so many days gleaning its endemic riches for permanent pres- tion in the museums of the World. My unheeded protest was countered yon's remark that the species was particularly promising as, similar ntana, its seeds would be widely disseminated by birds like the dove ynah.

To Miss Marilyn Barnhorst, with aloha,
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Considering the present Mokuleia fiasco, would not a jury
suspect a "silent political partner" was involved in delibera-
tions after, 1.) learning of Deputy Attorney General Maurice S. Ko-
tö's Sept. 3, 1975 opinion, 2.) Acting Director William E. Wan-
ket's Aug. 16, 1977 letter, 3.) Dr. James S. Kumagai's April 12,
1977 letter, and 4.) Mr. Pacarro's clandestine actions as des-
cribed in the Honolulu Advertiser of Nov. 1, 1977?
Should not the posthumously Mokuleia decision be considered
null & void, and all evidence be reviewed anew by a
cleanly purged City Council? We average citizens
are increasingly losing confidence in our
legislators. Why should we be obliged to retain
an attorney at $100 per hour to undo possible flagrant
errors by public servants whose salaries have
already been paid by us via taxation?

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I had collected this tropical American shrub of the Melastome Family while Botanist of the Anne Archbold Expedition to Fiji in 1940, my voucher specimen being preserved in Harvard's Arnold Arboretum. It had become such a pernicious weed in Fiji that it was known there as Koster's (not Coster's) Curse, in memory of the reckless wretch who had foolishly introduced it. It was not only a costly weed in pastures, plantations and gardens; but a scourge in the forest by crowding out and exterminating - and that means for ever - the endemic flora. It is briefly illustrated in Hosaka & Thistle's "Noxious Plants of Hawaiian Ranges" in 1954; listed by Degener & Degener in their leaflet of plants to be studied along the Poamaho Trail of Oahu, Aug. 27, 1961 by members of the Tenth Pa-Pacific Science Congress; and figured in color by Merlin in his "Hawaiian Forest Plants" in 1976.

Though influential in the spread of Clidemia hirta on Oahu, It is patently unjust to blame Dr. Lyon for the introduction of this noxious weed to the Islands. Had he done so, he certainly would have mentioned the fact in his meticulously kept file of introduced exotics long housed in the Station Library on Keeaumoku Street, Honolulu. Though search for this valuable file at the Lyon Arboretum was futile, I was delighted to learn that retired Forester L.W. Bryan of Kailua-Kona, Island of Hawaii, owns a partial copy that he had made of it a score years ago. His perusal for me of it shows no mention of any Clidemia. That it should have been mentioned in the lost portion is pure conjecture.

Even though insects have been introduced for biological control, such as a moth caterpillar that skeletonizes the leaves, the scourge, disseminated mainly by birds and feral pigs, is spreading to some of the other islands presumably by the vector man on hiking boots and camping gear.

For additional Clidemia information, including sixty references, consult L.L. Wester & H.B. Wood, Dept. Geography, Univ. Hawaii.

Though harmful to Hawaiian Biology with his continuous introduction of some of the most vigorous and harmful weeds from the far corners of the World to help rush our endemic biota to extinction, Dr. Lyon was an efficient, conscientious "sugar" executive, a position for which he was employed; and one of the great benefactors to local horticulture. He not only introduced many plants of great interest and beauty to our gardens and condominium lanai; but established andor materially helped Foster Botanical Garden, Wahiawa Botanical Garden, and the University of Hawaii's Lyon Arboretum, all on the Island of Oahu where tourists eager to see the real Hawaii presently congregate.

But why do we not learn from experience? Recently I read in the local newspaper that a would-be benefactor, apparently a restaurateur and not a botanist, is introducing a Hebe (incorrectly identified in the article) to the Islands because it is so aggressive that it will cover the junk piles, discarded cars and waste places about Honolulu with greenery. This "Down Under" exotic may be a two-edged sword as it may likewise smother with greenery our ornamentals, garden hedges, papaya trees, plantations and ultimately our hard-pressed endemics. Instead of opening up another Pandora's box of expensive problems, should not Beach's Blunder be extirpated before it reseeds itself and emulates Koster's Curse? Federal Law wisely discourages the introduction of exotics - was the Law innocently ignored?

The frightening result of more recently fallaceous thinking of a few individuals endangers the sanctity of our two National Parks, truly Cities of Refuge for endemics peculiar to large areas of the Islands of Hawaii and Maui. They maintain that exotic weeds now fill niches that always have been empty of natives. Even were this true, such weed patches would be foci for the continuous infection of unspoiled primeval surrounding regions. Exotics, for the most part free of the fungi and insects that plague and control their spread in their native home, compete for lebensraum at the expense of endemics having endemic fungi and insects feeding upon them.

Although the release from the State's Department of Land and Natural Resources mentioned above maintains that a forest products industry could "provide some 800 jobs in rural areas and a net cash flow to landowners in the State of $4 million annually," it ignores the costly effect on the lucrative tourist industry; the biological research programs supported by lucrative grants-in-aid; and, in a Biblical sense people can understand, the Sin of exterminating God's endemic Creations unique to the Hawaiian Islands.

Reading further, we learn that "A target of 200,000 acres, equivalent to 10 percent of Hawaii's forest lands, may ultimately be a part of our industrial forest resource base." This approaches the area of Molokai and Niihau combined! The present craze appears to be for "queensland maple, toona, and some eucalyptus." I have noted that pines are likewise favored particularly in the Kona Dis-

trict of Hawaii. Even a lay person knows that a planting of Eucalyptus and Pinus, with their fallen, resinous leaves and needles, produces a surrounding area devoid of a healthy understory of duff producing water-holding underbrush harboring endemic birds and other endemic animals. Today, a casual hour's flight by helicopter above 5,000 feet ground level will disclose numerous, extensive bulldozed and clear-cut areas in midst of the remnant native forests where specific endemics were flourishing in small circumscribed ecological niches. Trees even now are being harvested as "Wood chips for pulp or fuel," and thus sold to countries in the Orient via foreign bottoms - we now lack a merchant marine - which wisely prefer to sacrifice our forests to their own. What ferocious, uneducated Islanders we must be in contrast to refined, intelligent Mainlanders who went so far - too far I believe - to hold up the construction along the St. John River of the one and three tenths billion ($1,300,000,000) Dickey-Lincoln hydroelectric project because the last known station of the Furbush lousewort, an endangered Maine snapdragon, was in jeopardy!

With the imminent decline of the sugarcane and pineapple plantations, there is room for a lumber industry on abandoned "sugar" and "pine" lands at lower elevations. This is especially convincing since August 1977 when local newspapers admonished us to reduce our water usage voluntarily 10% or it shall become mandatory. I find no logic for wiping out our remaining superb native watershed forests with their endemic biota as has been done, for example, on the privately owned, once-fascinating Island of Lanai by bulldozing parallel strips through it and planting rows of exotic Pinus! Expressed differently, it is replacement of a verdant, biologically almost unknown forest that is far more valuable intellectually than the entire surface of moon and mars with a monotonous stand of "weed trees" with no more interest to Man than how many boardfeet or tons of woodchips they will produce in 30-60 years.

The above complaint is like futile howling in the wilderness. We should be realistic and learn from History: Just as drunken orgies during Prohibition Days were not ended by the Volstead Act, so am I convinced conservation laws and regulations will not prevent the imminent extermination of most Hawaiian endemics by exotic weeds and misplaced industries. This annihilation being inevitable by illicit or legal means, botanists - and zoologists should emulate them - of the World should at least preserve Hawaiian specimens NOW to add to museum collections where they can be studied by appreciative future generations.

In summary, I implore colleagues to come,

HELP
SAVE THE DWINDLING ENDEMIC FLORA OF THE HAWAIIAN ISLANDS
AT LEAST AS HERBARIUM SPECIMENS FOR MUSEUMS OF THE WORLD

ALEURITES ERRATICA DEG., DEG. & MUMMEL SP. NOV., (EUPHORBIACEAE)

DES STILLEN OZEANS

Otto & Isa Degener und K. Hummel

History repeats itself, but this time in a miner way.

The double-coconut or Lodoicea maldivica (Gmel.) Pers., has been known from time immemorial as jetsam along the coasts of India and the Maldive Islands. As commonly found, it is a drupe up to 3 dm. long and 8 dm. in circumference, and has a two-lobed apex and base. Whence such propagules had come and from what plant was long a mystery. None could grow to produce a seedling for identification as, to become light enough to float from their place of growth, their fruits had been freed of their heavy seed by decay. Though imperfectly known, F. Pyrard described the fruit or perhaps the endocarp in 1611 in his "Discours du Voyage des Français aux Indes Orientalis." Only after the Seychelles had been discovered in 1743 by Mahé de la Bourdonnais was the mystery surrounding it solved. This large disseminule came from a palm growing on the Islands of Praslin and Curieuse of that archipelago. The drupe is certainly not the largest fruit in the Plant Kingdom - many a common pumpkin (Curcubita pepo L.) exceeds it in size - but its seed is certainly the largest.

As botanical consultants for the Federal Aviation Administration in the winter of 1957-'58, we Degeners spent some time on Canton Atoll, Phoenix Group, in the Pacific Ocean just north of the Equator. During our spare time we amassed a representative collection of ~~kukuis~~

the hundreds of thousands of propagules that winter storms had piled up on its twelve mile long porkchop-shaped beach. Of the hundred or so species collected, Deg. & Deg. No. 24,627 intrigued us particularly.

This rather uniform seed was abundant along the beach - probably tons of them. All were black like the seeds of the kukui or Aleurites moluccana Willd., after the the latter have been exposed to the elements and particularly to the mud of a taro patch. Our novelty has the general shape of the common kukui, yet is conspicuously different in superficially resembling a husked walnut in its longitudinally furrowed ~~"shell" or testa~~ shape. Though sets of the Canton Atoll collection for a few decades have been on deposit at the New York Botanical Garden and have been widely distributed to botanical institutions throughout the World, no one has been able to identify No. 24,627. This find was listed first in *1974, and again listed and figured in **1976. As in the case of the wandering double-coconut, we have the temerity of describing this wandering kukui.

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Seeds of Aleurites moluccana (L.) Willd., and of A. remyi Sherff, both collected in the Hawaiian Islands; and those of the unknown taxon, collected as jetsam on Canton Atoll, are compared. Differences induce us to describe the latter as:

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This study, resembling one based on a fossil find, should alert botanists and foresters in the South Pacific to watch for the mysterious tree that is responsible for these ornamental seeds wandering about on ocean currents. Precisely what is the tree Aleurites erratica like and where is it native? We are so curious!

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Otto & Isa Degener und K. Hummel

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*"Prof, Dr. Dr.", is the proper title.
**Degener, O. Plants Haw. Nat. Park, 193-199. 1930.
***Sherff, E.E. Field Mus., Bot. Ser. 17:558. 1939; Deg. & Deg. Fl. Haw. 190; Aleurites; Remyi 12/27/57; Stone, B.C. Pac. Sc. 21 (4):553. 1967; Deg. & Deg. Some Aleurites Taxa in Haw. - - -. Phytologia 21(5):316. 1971.

Should the reader not like our considering this errant kukui a distinct species, he can lump it. This study, resembling one based on a fossil find, should alert botanists and foresters in the South Pacific to watch for the mysterious tree that is responsible for these ornamental seeds wandering about on ocean currents. Precisely what is the tree Aleurites erratica like, and where is it native? We are so curious!

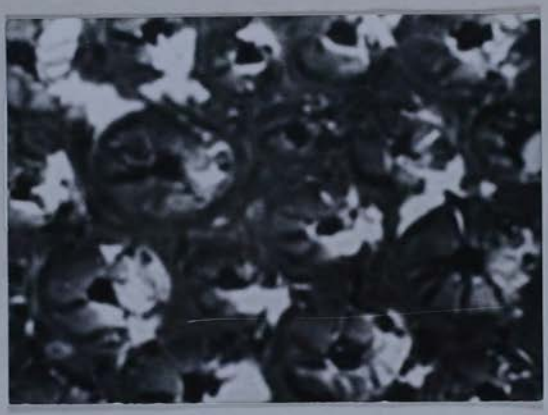

Abb. 1. A. erratica X 1.2; Abb. 6, Palisadenskleriden der Samenschale X 3,000.

Abb. 2. A. moluccana s. s., X 1.3; Abb. 4. Palisadensleriden X 3,000.

Abb. 3. A. m., var. remyi X 1; Abb. 5. Palisadenskerliden X 3,000.

Probl 2/26/76

CONCERNING PLANTS OF THE CAUCASUS

Otto & Isa Degener

After attending mostly fascinating lectures at the XII International Botanical Congress in Leningrad, we joined Field Trip Number 1 to the Caucasus July 11-18, 1975. It was conducted by Dr. Anatol I. Galushko, long Professor of Checheno-Ingushetia University, ably assisted as botanists and translators by his wife, his daughter and his Graduate Assistant Nemirova Lyssi (Ludmila).

One of us, a native New Yorker, knows the flora of that general region; the other, a native Berliner, knows that of Germany; and both of us, having toured Japan, have an inkling of what the flora of that now isolated archipelago is like. When we botanized during this Russian tour, we recognized many genera that we had seen in Eastern North America, Germany and Japan. These are of course the offspring of the ancient circumpolar flora, offspring forced south by an increasingly frigid climate. We collected representative specimens during the trip for the New York Botanical Garden and for the University of Massachusetts.

Many of our questions regarding our collection were recently answered on receiving from Dr. Galushko his newly published book printed in the Cyrillian alphabet. The text is illegible to us except for 530 plant binomials given in the Latin. Moreover as 130 species are illustrated by the author, we were intrigued to recognize strange species in such familiar genera as Acer, Aconitum, Ajuga, Allium, Ambrosia, Asarum, Asperula, Betula, Campanula, Carpinus, Centaurea, Centaurium, Clematis, Convolvulus, Datura, Delphinium, Dentaria, Dryas, Empetrum, Euonymus, Euphorbia s. s., Fagus, Festuca, Gentiana, Helleborus, Inula, Medicago, Moneses, Monotropa, Ostrya, Oxalis, Pedicularis, Plantago, Pyrus, Quercus, Rhamnus, Rhododendron, Rosa, Salsola, Saxifraga, Scrophularia, Secale, Silene, Solanum, Spiraea, Stipa, Teucrium, Thymus, Tilia, Ulmus, Vaccinium, Valeriana, Veronica and Viola.

Now that the reader is attracted to this book, we need no longer hesitate to give its somewhat awesome title. Translated into English, it is "The Vegetation and Flora of Checheno-Ingushetia." The area covers the little-known eastern part of the Terek River basin, East Caucasus. As neighboring, better known regions harbor many endemic angiosperms, Dr. Galushko expressed his conviction to us that "without doubt there are more than 100" still to be discov-

ered in this relatively unknown area. In his 120 page book are numerous chapters, such as concerning the Character of the Vegetation, illustrated with an original map on page 16; Botanical-Geographical Regions, with special emphasis on arid regions united by the author under a "Paleidagestanian District," on p. 67; Useful Plants, p. 71; Edible and Poisonous Mushrooms, illustrated in color, p. 94; and Plants Requiring Protection, p. 113.

We prefer a few orthographic changes, such as using Spiraea for p. 50; Linnaea, p. 57; artemisiifolia, as the combination is derived from "artemisia" rather than from "artemisa," p. 93; halepense, p. 93. We regret this volume lacks an index, an oversight beyond the author's control; this can be supplied in a second edition. Regarding copies and cost, write Dept. of Botany, University, Pushkin St., Stavropol, U.S.S. Russia.

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Buffalo, to NY

NEED FOR A CONTINGENCY FUND
Otto & Isa Degener

It is well known that the Hawaiian Archipelago is so isolated that most of its native animals and plants are endemic. It is less well known that their sheltered existence over millions of years has pampered them so that they are hardly a match in competing for lebenraum with the aggressive Mainland animals and plants that have come to the Islands by accident or design through the agency of Man. The natives as a result fade away to extinction. Furthermore, it is not known except to a few local biologists that if such Mainland intruders are removed, the remaining endemics reassert themselves so that the area approaches its original, pristine state. Two examples of endemics thus reasserting themselves may be mentioned:

In 1929 one of us collected numbers of the endemic Sisyrinchium acre or mau-ula-ili (Fig. 1), a paradoxically yellow-flowered "blue-eyed grass" used formerly by the Hawaiians in tattooing, growing in the rainforest area along the rather bare roadside on the Hilo approach to Hawaii Volcanoes National Park. Within two decades, we doubt a reward of $100 for its rediscovery would have unearthed a single specimen. It had vanished, having been crowded out by dense mats of exotic grasses. Yet in 1970, where a bulldozer had scraped an area clean of these grasses a few years before, the mau-ula-ili was growing as formerly, producing its symmetrical flowers and maturing its seeds. In 1975, however, the area was again covered by a thick sward as before, and this delicate member of the Iris Family had again disappeared.

Voracious feral goats in drier areas and feral swine in wetter ones have been roaming about the Park region shortly after Europeans had introduced the former and the Hawaiians had introduced the latter. They have been decimating and undoubtedly exterminating fascinating elements of the Park biota year after year. Rangers Reeser and more recently Baker concentrated on reducing the Park's goat population until "expert" Mainland carpetbaggers decreed that these animal lawnmowers need not be exterminated, but merely controlled! Despite this discouraing folly by their political superiors that will never solve the danger but allow it to flare up periodically, they built a goat-proof enclosure in the Kau Desert part of the Park as an experiment, and waited. The terrain exposed to goats remained like a mowed, trampled lawn except for some unpalatable exotic shrubs like Lantana camara var. aculeata and Solanum sodomeum. But the enclosure safe from goats developed a thick stand of flowering and seedling introduced weeds overshadowed, however, by a jackbean or awikiwiki (Fig. 2) absolutely new to Science! This beautiful novelty now bears the name Canavalia *kauensis to indicate that it was discovered in the Kau Desert. It is obviously unusually aggressive for a native plant that had evolved without exposure to intensive competition as are Mainland plants.

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*Not to be confused with C. kauaiensis of the Island of Kauai.

NEED FOR A CONTINGENCY FUND
Otto & Isa Degener

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We surmise that a certain low percentage of seeds of the mau-ula-ili and awikiwiki are able to survive, perhaps under unusually favorable conditions in the ground, for decades or even centuries. Every once in a while some few germinate, perchance uncovered by erosion or finally wetted by rainfall, or exposed to oxygen and sunlight. With browsing herbivores or thick stands of weeds about, such endemic seedlings that may appear soon peter out and succumb. But should such naturalized "varmints" andor weeds be absent, such unique seedlings may grow to maturity, reproduce their kind, and restore at least in our National Parks the Paradise of the Pacific character that prevailed before Man and his introductions plundered and defiled it of so many of its biological treasures.

One of us visited Hawaii National Park (now renamed Hawaii Volcanoes National Park) first as tourist in 1922; was employed there in 1929, visited almost yearly to study its native and introduced flora, and finally purchased a retirement home on its boundary. He has observed how the Park has deteriorated since 1922 by the invasion of prolific, aggressive, foreign weeds. Had they been eradicated with their animal vectors when first observed, the Park today would be far more Hawaiian and far less Cosmopolitan in character for the visitor to see. One of the most pernicious is the Hupeh anemone, Anemone hupehensis (Fig. 3), native to China.

Except for a little mopping of stragglers, the goat can be eliminated from the Park now for all time. This will encourage the reestablishment of the native biota of the drier southwestern regions. But what about the wetter areas, such as the rainforest? This is concentrated below the inversion layer and chiefly on the northeastern side of the Park exposed to fog and rain unloaded by the trades. Here the black, feral pig is supreme with its large litters overpopulating practically unhindered the Park rainforest. Here they sleep most of the day in thickets and wander at night nonchalantly across the roads to uproot at will the inedible vegetation in search of naturalized earthworms; eating out the starchy pith of treeferns, enabling wrigglers of mosquitoes carrying avian malaria to breed; and eating all edible vegetation, whether endemic or not. These lean, hungry pigs are foraging as never before, especially for the colonies of Astelia mensiesianaor painiulily (Fig. 4) that cover the forest floor with their silvery stems and leaves, and erect clusters of bright orange berries. Until a few decades ago when the Park had less personnel to discourage clandestine poaching, pig damage was not rampant as now. Parts of the painiu were eaten, but fragments remained to help repair injury to the colony. Today, unfortunately, wherever the delicate native groundcover is disturbed to expose the earth, the Hupeh anemone gets a roothold.

The anemone is particularly dangerous to the rainforest ecosystem of the Park because it is aggressive, each individual plant bears many thousands of silky onepseeded carpels readily disseminated by the wind, and it is so poisonously acrid that nothing in the park will keep it in check by eating it. This ornamental perennial truly lives a blessed life.

The Park's outstanding sucess in almost eliminating feral goats from the dry areas should alert us to the undoubted advantage of eliminating feral pigs from the remaining, wetter areas. The forest would tend to rejuvenate itself, thus instructing and delighting

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the resident and visitor alike. Though we have no proof, some endemic Hawaiian plants may, like the novel awikiwiki vine, again flourish as in former times.

The examples and personal convictions given above are futile unless they stimulate action. Hawaii Volcanoes Park is presently too poor to overcome the pig emergency, particularly because of the recent labor and expense needed for constructing goat proof exclosures throughout areas once goat infested and the damaging earthquake of November 29, 1975. Every employee not occupied with administration and visitor instruction and safety, we feel, should concentrate on research focused on the prevalent pig problem: Extermination of these rooters must have priority. What methods or combination of methods are best? Should it be trapping; scattering by 'plane antifertility drugs concealed in bait; devising a pig-proof fence enclosing different areas of the Park and each Saturday have deputized hunters with their dogs concentrate on pig annihilation: or employing other methods of extermination devised by experts? Lest the native rainforest of Hawaii Volcanoes National Park degenerate within the next few decades into a weed-infested, glorified pigpen, heroic efforts must be initiated without delay.

As pig extermination , yes even pig control, is too costly for the Park to undertake, a contingency fund is long overdue to finance the project. From our observations during extensive travels such isolationist investment by the Congress to the National Park Service sould not evoke the envy andderision that many international gifts evoke.

Legends:

Fig. 1. Hawaiian sisyrinchium or mau-ula-ili.

Fig. 2. Hitherto unknown jackbean or awikiwiki appearing and thriving in goat exclosure in the National Park. (National Park Service photo)

Fig. 3. Chinese Hupeh anemone which displaces the endemic painiulily upon its destruction by feral pigs.

Fig. 4. The endemic silver painiulily.

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SOPHORA IN HAWAII

Otto & Isa Degener

Hillebrand's Flora of the Hawaiian Islands, published posthumously in 1888, on page 108 describes a single endemic species of Sophora, namely S. chrysophylla(Salisb.) Seem., for the Hawaiian Archipelago . He locates the species on "Hawaii! Maui! Kauai!" The writers, and some other local botanists, know the genus from the Islands of Oahu, Molokai and Lanai as well. Mr. Alvin K. Chock, as a thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in Botany at the University of Hawaii, published the results of his two year study of Hawaii Sophorae in Pac. Sci. 10:136-158 in 1956. The Degener collection deposited at the Field Museum was mailed him in January 1954 to aid him in his studies.

Counting such names as Sophora chrysophylla (Salisb.) Seem., and Sophora chrysophylla ssp. glabrata var. ovata subvar. ovata f. maunakeaensis Chock, the monographer recognizes as valid for the Archipelago 1 species, 4 subspecies, 11 varieties, 5 subvarieties and 12 forms. We are less conservative and judge the Islands to harbor more than one species, such as Sophora grisea Deg. & Sherff (in Sherff, Bot. Leafl. 5:24 1951.) and S. unifoliata (Rock) Deg. & Sherff (ibid. p. 25), as well as one each from the Islands of Lanai and Molokai. We consequently here raise to specific rank:

1. SOPHORA LANAIENSIS (Chock) Deg. & Deg.

Sophora chrysophylla sensu Rock, Indig. Trees Haw. Isl. 189. 1913. "A few small trees were found on Lanai just above the homestead of the former manager of the Lanai Ranch Co., in a small gulch all by themselves. Whether they were planted there by human hand or by birds cannot be ascertained, but the former may be more reasonable, as they were not found elsewhere on Lanai."
Not Sophora chrysophylla Seem., Fl. Vit. 66. 1865. "Insulis Sandwich, legit A. Menzies." (Brit. Mus.)
Sophora chrysophylla var. glabrata sensu Rock, Leg. Pl. Haw. 123. 1920. (Lanai.)
Not Edwardsia chrysophylla var. glabrata A. Gray in U.S. Expl. Exp. 429. 1854. (Hawaii.)

Sophora chrysophylla ssp. glabrata var. lanaiensis Chock in Pac. Sci. 10:147. 1956.

The type, deposited in the Marie C. Neal Herbarium of the Bernice P. Bishop Museum, was collected by Rock "On the plateau leeward side, near Koele, back of Gibson Homestead, flowering and fruiting July 29, 1910. George Campbell Munro (May 10, 1866 - Dec. 4, 1963), who was manager of most of the Island of Lanai for many years and saved much of its endemic vegetation from herbivores, wrote voluminous notes concerning Lanai plants about 1927. From a transcription we took a few years before his death, we find: "Sophora chrysophylla glabra, Rock. Native name mamane. Not common, found most commonly on the Kaluanui bench, one plant at Kanepuu from which a number are now growing." Chock cites a plant collected by Munro April 16, 1919, deposited in the Bishop Museum and in NY, from Kaluanui. In a letter to us of July 25, 1957, Mr. Munro wrote us expressly that S. chrysophylla and the var. glabrata grew on Lanai. In fact, regarding the latter, "Rock described this. I did not see it." Munro collected 950 Lanai specimens, which C.N. Forbes determined. A set went to the Bishop Museum; another to the Hawaiian Sugar Planters Experiment Station; and the rarest (letter of Oct. 14, 1950) to the "British Museum, Sydney, Australia."

Thanks to the courtesy of the Dole (Pineapple) Company which rented us a cottage, we resided in 1963-64 for about six months on Lanai to botanize. During this lengthy stay, we discovered just mauka of the pineapple fields presumably the last stand of Sophora lanaiensis, , beautifully rounded, bright green, lacy trees. About 25 herbarium specimens from this colony are being widely distributed under the following label: "Deg. & Deg. 31,383. Almost extinct! (4 thriving, spreading, 3 m. high trees with many branches arising from low trunk; prolific seeder but not a single seedling because of this mat of Melinis grass; petals canary yellow; filaments whitish; anthers yellow; pis-

til greenish yellow.) Kaluanui Bench, Lanai. Decadent, dryish forest with deer browse line. Jan. 24, 1964." Today, with Lanai practically a hunting preserve stocked with feral goat, axis deer, mouflon and pronghorn, we surmise the four trees are no more. At least voucher specimens exist to show how beautiful a creation they were. The above description is based on No. 31,383, healthy trees with 5 to 9 seeds per legume; very rarely, perhaps due to faulty pollination, down to only 1. Chock's description gives the pods "1-5 seeded".

2. SOPHORA MOLOKAIENSIS sp. nov., nom. nud.

June 1, 1961, with Mr. Noah Pekelo, Jr., we drove to Maunahui, Molokai, and from there took a foresters' jeep road makai eastward to the lower edge of the rainforest. Here we discovered a rather gnarled, ugly Sophora new to Science. We collected abundant material and, since Mr. Chock had published on the genus, turned over all our specimens to him. We intended to publish jointly, after a proper drawing had been executed. Before that could be accomplished, Mr. Chock and family removed to the Mainland and the package of specimens lies somewhere in the Museum, where, no one now knows. We believe this species extinct because, when we collected specimens from the plant in 1961, the area, thanks to the jeep road, was being bulldozed in strips for the planting of *Pinus taeda* to foster a lumber industry. Eventually, after the herbarium specimens have come to light, we shall ~~know what~~ properly publish an illustrated description of the ~~extinct~~ Molokai species ~~was like~~, now undoubtedly extinct.

Sadleria, honoring Joseph Sadler (1791-1849), Professor of Botany in Pesth, Hungary, is a Hawaiian genus belonging to the Blechnaceae or Blechnum Family. All have fronds of the general character shown on Plate ---. These ferns live under many different conditions: some near the sea, others on the summits of all but the highest mountains; some in dense rainforests; while others manage to survive on the newest and driest lava or on the moss covered, rocky faces of canyons. Whether six or more species of sadleria exist in the Islands and live under one or more of these conditions is a problem that the botanist has not yet definitely solved.

The fern thus far known simply as Sadleria squarrosa (Gaud.) Mann, even though bearing usually pale tomentum or hair, is the apuu of the Hawaiians. It may be observed on the outer, minior slopes of Haleakala. There it grows only on the moss covered, perpendicular rocks and embankments forming the sides of canyons. During rainy weather the ferns are abundantly supplied with water trickling down the thin layer of moss, but during dry days they are fully exposed to the blazing sun that dries them and their substratum. They are evidently very tenacious of life to be able to withstand such periods of drought and such seemingly unfavorable situations for growth. On some of the cliffs down which water seeps rarely, dwarfed specimens that have almost no rootstock and have fronds barely three inches long may be found in full reproductive vigor. Normal plants have a rootstock about three inches long, and fronds two feet long.

At least two kinds of sadleria may be found in the vicinity of Kilauea, both having an upright trunk half a foot to five or, very rarely, even nine feet high. Hillebrand's sadleria, Sadleria hillebrandii W.J. Robinson, called amau, is the less common. It can be seen growing in numbers, however, in the crevices between the Sulphur Banks and the Military Camp, as well as near the Thurston Lava Tube. Its brittle fronds are usually about one and a half to two and a half feet long. Their stalks as well as the midribs are covered with brown scales, and the smallest veins may be distinctly seen on the under side of the segments especially when the frond is held up against the light.

The common sadleria, S. cyatheoides Kaulf., is called amauuma. It usually becomes more than twice as large as the amau. It may be easily differentiated from the latter by the lack of permanent scales above the base of the tough frond and by the obscurity of all but the midrib in the smallest division of the frond. Along Spatter Ridge Trail near Kilauea-Iki Crater as well as between Kilauea and the village of Volcano, swarms of hybrids occur showing various features intermediate between those of S. Hillebrandii and S. cyatheoides. One of these hybrids is shown in Plate --.

The common sadleria is almost the first plant to grow on fresh lava flows as C.N. Forbes, a former botanist of the Bishop Museum, has shown. Its spores can germinate within five days, as Prof. Alma C. Stokey has noted in her laboratory cultures. Its old decaying fronds and living trunk soon furnish a suitable bed for the wind-blown seeds of the ohia-lehua (p. ---) to germinate. The ohia-lehua seedlings finally develop into the trees so characteristic of the Islands. This fern may be found also in the Kau Desert near Kilauea where not even the desert silene (Plate --) can survive the heat, dryness, and high concentration of salts in the soil. To be sure, the plants bear only two or three depauperate fronds in the midst of a dozen dead ones that have accumulated over a period of many years.

In the mid 1800s the soft scales protecting the buds of the common sadleria were gathered, as were those of the preferred Cibotium (p. --), and shipped to California as pulu amauuma. There they were used as stuffing for pillows and mattresses. Before the white people came with

ing the marginal one. All these plants belong to the *Polypodiaceae* or Fern Family.

CLIFFBRAKE OR KALAMOHO LAULII

The cliffbrake (Plate 10), the *kalamoha laulii* of the Hawaiians, is known botanically as *Pellaea ternifolia* (Cav.) Link, and, like many ferns, belongs to the family *Polypodiaceae*. Our plant is native, not only to the Hawaiian Islands, but to warm and tropical America as well. This is not a true cliff plant as its name would indicate, but rather prefers to grow in very dry soil among ledges or embankments exposed to the full heat of the sun. It grows within the boundaries of both sections of the National Park and, though rare, has been found on the inner slopes of Haleakala Crater. Along the trail that leads from Kilauea to the summit of Mauna Loa it is rather abundant in spite of the livestock that is pastured where it grows.

SADLERIA

Sadleria is the name of a group of ferns peculiar to the Hawaiian Islands. All have fronds of the character shown on Plate and all belong to the family *Polypodiaceae*. The plants live under many different conditions: some near the sea, others on the summits of all but the highest mountains; some in dense rain forests, while others manage to survive on the newest and driest lava or on the rocky faces of canyons. Whether four or more kinds of sadleria exist in the Islands and live under one or more of these conditions is a problem that the botanist has not yet definitely solved.

The fern known as *Sadleria polystichoides* (Brack.) Heller, or it may be collected along the Olinda Pipe Line Trail on Maui a[illegible] below the north-west boundary of the Haleakala Section

~~Park~~. Here it grows only on the moss-covered perpendicular rocks and embankments forming the sides of the canyons. During rainy weather the plants are abundantly supplied with water trickling down the thin layer of moss but during fair days they are fully exposed to the blazing sun that dries them and their substratum. They are evidently very tenacious of life to be able to withstand such periods of drought and such seemingly unfavorable situations for growth. On some of the cliffs down which water seeps rarely, dwarfed specimens that have almost no rootstock and have fronds barely three inches long may be found in full reproductive vigor. Normal plants have a rootstock about three inches long and fronds two feet long.

At least two kinds of sadleria may be found in the vicinity of Kilauea, both having an upright trunk half a foot to five or, very rarely, even nine feet high. ~~Hillebrand's sadleria~~, *Sadleria Hillebrandii* W. J. Robinson, called *amau* by the Hawaiians, is the less common. It can be seen growing in numbers, however, in the crevices between the Sulphur Banks and the Military Camp, as well as near the Thurston Lava Tube. Its [brittle] fronds are usually about one and a half to two and a half feet long. Their stalks as well as the midribs are nearly always covered with brown scales, and the smallest veins may be distinctly seen on the under side of the segments, [especially when held up against the light.]

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The common sadleria is almost the first plant to grow on fresh lava flows [as] ~~as the late, unfortunate~~ C. N. Forbes, [a former] botanist of the Bishop Museum, has shown. [Its spores can germinate within five days, as Prof. Alma G. Stokey has noted in the laboratory cultures.] Its old decaying fronds and living trunk soon furnish a suitable bed for the wind-blown seeds of the *ohia lehua* (p. 232) to germinate. The *ohia lehua* seedlings finally develop into the trees so characteristic of the Islands. This fern may be found also in the Kau Desert near Kilauea where not even the desert silene (Plate 38) can survive the heat, dryness, and high concentration of salts in the soil. To be sure, the plants

bear only two or three depauperate fronds in the midst of a dozen dead ones that have accumulated over a period of many years.

A generation or two ago the soft scales protecting the buds of the common sadleria were gathered, as were those of the *Cibotium* (p. 29), and shipped to California as *pulu amauman*. There they were used as stuffing for pillows and mattresses. Before the white people came with their manufactured cloth, the Hawaiians macerated the stalks of fronds of this fern and beat them together as a sizing with the bark of various plants in the making of their *kapa*, or bark cloth (p. 132).

The *amaumau* also furnished a red dye for their *kapa*. The outer part of the trunk was mashed and its juice was squeezed into a calabash, or vessel. To this red liquid, according to some authorities, salt was added to produce coagulation, while according to others no salt was used. Since the Hawaiians had no metal or earthenware dishes to enable them to boil liquids, hot stones were placed in the calabash to boil and to evaporate some of the water in order to concentrate the dye which was then ready for use.

The early name of the fire pit within Kilauea Crater, according to the Hawaiians, is *Lua Pele*, or the Pit of Pélé, goddess of volcanoes. A later name, and one less often used, was *Halemauman*, meaning "the house of *amaumau* fern". This name was given to it either because of the presence of a lava cone, now gone, that somewhat resembled the temporary shelter built of *amaumau* by the Hawaiians on their visit to the region or, less likely, because of the former abundance of this fern on the floor of the Crater of Kilauea. Though the word for "everlasting" is also spelled *mau*, the two Hawaiian words are pronounced in an entirely different way, *mau* being a single syllable and *a-ma-u-ma-u* being many. "The House of Everlasting Fire", the English name for the center of activity in Kilauea, though very appropriate and worthy of retention, is consequently not a translation of the original Hawaiian one as popularly supposed.

The starchy pith of Hillebrand's sadleria, the *amau*, was cooked in the ground and eaten by the Hawaiians, though not as commonly as was that of the *hapuu* (p. 30). The young fronds were also cooked for eating, somewhat resembling asparagus in taste. In ancient times for planting vegetables, the Hawaiians covered the ground in the drier regions with *amau*, and probably also *amaumau* fronds. Then when they noticed that it would rain, they removed the fronds and planted their seed. After the rain [illegible], the

BRAMWELL, D., & Z. WILD FLOWERS OF THE CANARY ISLANDS. A REVIEW

Otto & Isa Degener

We had planned to attend the botanical symposium last year at the Viere y Clavijo botanical garden in the Canary Islands, and hence cleared our shelves of much good legible but shopworn literature pertaining to Hawaii to mail to Director Bramwell in time for distribution to the assembling delegates. Due to awkward 'plane schedules, we at length reluctantly abandoned our flight.

Because of our interest in this fascinating archipelago and our wish to compare it with the Hawaiian one, Dr. David Bramwell and Zoë I. Bramwell mailed us a complimentary copy of their "Wild Flowers of the Canary Islands." The book we prize was published in 1974 and is extremely rare in the New World and in many countries elsewhere. The intriguing reason is hardly explained by the statement that "The edition was published by Excmo. Cabildo Insular de Tenerife (Aula de Cultura) in association with Stanley Thornes (Publishers) Ltd, London. For copyright reasons this edition not for sale in U.K. or in North or South America."!!!!!

The book, in board cover, comprises X + 261 pages that include 118 carefully drawn illustrations essentially of spermatophytes. In addition, the middle binds 64 full-page color plates depicting beautiful, instructive general views and species habitats.

The Canary Archipelago resembles the Hawaiian in many respects such as volcanic origin, a wet windward and a dry leeward side, subtropical lowlands and subarctic highlands, and long geologic isolation. The former archipelago differs in having had a closer contact to Africa than the latter ever had to the Americas or Asia. The Canary phanerogam "flora appears to be an ancient survivor of a bygone age."

The first 43 pages are of general interest, such as History of Botanical Exploration, Climate, Vegetation Zones, Origin of the Flora, Folklore, and Conservation. Regarding the latter, the wholesale extermination of endemics is about as serious as that occurring in the Hawaiian Islands in this Age of the Bulldozer. The authors conclude that conservation "can only succeed by means of a policy of education," a duty presently somewhat neglected in both archipelagos.

It will interest Hawaiian readers especially that the physician William Hillebrand (1821-1886), author of the "Flora of the Hawaiian Islands," an excellent work for its time published posthumously in 1888, "had resided in different parts of Germany and Switzerland after leaving the Hawaiian Kingdom in 1871 and was for some years in Madeira and Teneriffe, where he also collected extensively." This fact, ignored by the Bramwells in their

(4) Of almost 600 native species mentioned in keys and a few lines of description and ~~regions of occurrence~~ not a single species excepting the neigh ubiquitous fern Asplenium trichomanes L., s.l., is common to both archipelagos. A few ~~seem to be the same on paper~~ appear the same when should one follow older views, such as failing to distinguish betweeen Dracaena and Pleomele, a few caryophylls, and Geranium and Neurophyllodes. Familiarity with the plants in the field usually clears the misconception

It will interest local readers especially that ~~XXX~~ William Hillebrand, author of the "Flora of the Hawaiian Islands," an excellent work for its time, published posthumously in 18 1888, "had resided in different parts of Germany and Switzerland, and was for some years in Madeira and Teneriffe, where he also collected extensively." This fact, ignored by Bramwe ll in the history of exploration, induced the Swiss botanist Hermann Christ to name Lotus hillebrandii in the collector's honor. An earlier collector in the Canaries wi was the botanist Pierre Marie Auguste Broussonet (1761-1807)m who was French Consul on Tenerife. We, in Hawaii, are familiar with his name as it is connected with that of the paperbmulberry or wauke, Broussonetia papyrifera (L.)Vent.

Hillebr., W. Fl. Haw. Isl. XII. 1888.

A Hawaiian botanist 9not to mention many others) let loose in the Canaries would find few familiar genera excepting perhaps Artemisia, Carex, Heliotropium, Ilex, Luzula, Messerschmidia, Plantago, Ranunculus, Rubus, Rumex, Smilax, Solanum, Vicia and Viola. A few more genera may appear the same when following published older views that fail to distinguish for example between Dracaena and Pleomele, a few caryophylls, and Geranium and Neurophyllodes. But familiarity with such plants in the field quickly clears the misconception.

Of almost 600 native species mentioned in keys andor a few lines of description and range not a single species except the nigh ubiquitous fern Asplenium trichomanes L., s.l., is common to both archipelagos.

With so many unknowns, a visit to the Canaries would be a fascinating experience, especially with a copy of "Wild Flowers of the Canary Islands" at hand. The book is written fortunately for us in English by the Senior Member of the Department of Botany, University of Reading, England. It is not written in Spanish by the same scholar, who is also Director of the botani garden in the city of Las Palmas (not to be confused with the Island of Las Palma) on Gran Canaria.

BOOK REVIEW
Otto Degener

Unable to identify with Casimir Pyramus deCandolle's descriptions all the Peperomia species I had collected since 1922, I was delighted that Dr. Truman George Yuncker came to the Hawaiian Islands for nine months during 1932-33 as a Bishop Museum Fellow in Yale University to concentrate on the genus. I promptly turned my collection over to him for study, he identifying my material and citing it in his "Revision of the Hawaiian Species of Peperomia." Bish. Mus. Bull. 112:1-131. 1933. Before I received a copy of this publication, Piperaceae specialist Prof. "William Trelease (1857-1945) of the University of Illinois, Urbana, wrote me under date of May 3, 1933: "From what I could see, it is providential that I did not get at the Piperaceae, for Dr. Yuncker, who is very painstaking, is doing them far more critically - now that he can see them in the field - than I could have done, and at the same time is laying an excellent foundation of judgement from the species of the South Seas." During his visits to the Hawaiian Islands, I occasionally joined him in botanizing In fact, I even rented Dr. Yuncker and family my beach home on windward Oahu. The four Yunckers loved their stay except for the daily duty of feeding my flock of 200 colorful pigeons which roosted on the shingle roof, kept it rainproof, and occasionally burned Dr. Yuncker's thinning head of hair with hot guano.

Dr. Yuncker died January 1964. Thanks to Mrs. Ethel C. Yuncker's long familiarity with her husband's studies and unfinished manuscripts, Dr. Alcides R. Teixeira of the Institute of Botany, Sao Paulo, Brazil, was able to arrange for the publication of "The Piperaceae of Brazil. I - PIPER - Group I, II, III, IV.", in Hoehnea 2:19-366. Dec. 1972. The table of contents of the monograph indicates at a glance that the present publication concentrates on all Brazilian Piper species except those that bear leaves usually less than 10 cm. wide and with their "midrib branched to the upper fourth or throughout." This group is reserved for later publication with the genera Ottonia, Pothomorphe, Sarcorhachis and Peperomia, the last genus by some authors raised to a family of its own. Of the species 167 here keyed and thoroughly described with "Type Locality," "Distribution," and "Materials Examined," 69 are authored by deCandolle, two by Trelease, Piper ripununianum by Trelease & Yuncker, and 65 by Yuncker alone. The work ends with 167 full-page plates,

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*Holographs are deposited at the Hunt Institute for Botanical Documentation and at the New York Botanical Garden.

BOOK REVIEW

Otto Degener

In 1959 G. C. Ruhle published a 94-page "Haleakala Guide", with a colored photograph of the silversword (Argyroxiphium sandwicense DC.) native to the Island of Maui. Now appears a companion booklet of 72 pages, "Waimea Canyon and Kokee, A Nature Guide" (Kauai Publishing Co., Lihue, Hawaii, $1.50), with a color photograph of the Kauai silversword (Wilkesia gymnoxiphium A. Gray). The author is Thelma A. Hadley, and her sponsor the "Hui O Laka".

This booklet does not limit itself strictly to northwest Kauai but wisely depicts an informative map of the entire island. It describes climate, geology, soil and topography, trails, legends, birds, mammals and, above all, plants. There are 42 half-tones, that of mist drifts at Kalalau Lookout being particularly lovely.

As in so many publications, all typographical and other errors have not been weeded out of the final proof. Though it was permissible in the old days to spell the name either "Honoruru" or "Honolulu", it is not now permissible to spell "crutches" for "clutches", as appears on page 60. What raises the hackles of an old biologist like the reviewer, however, is the word "animal" used for "mammal" on page 3, "berry" used for "capsule" on page 39, and "trees and plants" used as a heading on page 9 as though a tree were not a plant! "Trees, shrubs and herbs" could have been used or, simply, "Plants". The so-called "broad-leaved cactus" is Opuntia megacantha Salm-Dyck, a plant with tiny, caducous, awl-shaped leaves and a broadened stem. The pukiawe (Styphelia tameiameiae (Cham. & Schlecht.) F. Muell. & S. douglasii (A. Gray) Skottsb.) belongs to the Epacris Family, while the ukiuki (Dianella sp.) belongs to the Lily Family. The silversword is not limited to Maui. David Douglas, before his murder on the slopes of Mauna Kea, Island of Hawaii, by the escaped convict Ned Gurney, used its dry stalks as firewood. Not six native lobelias are peculiar to Kauai, as stated on page 30, but well over 30; and the second paragraph of page 31 obviously applies to Cyanea leptostegia A. Gray rather than to the Dracaena, better called Pleomele.

Zingiber (not Zingeber) zerumbet is a ginger thought to be of ancient introduction by the Polynesians from the South Seas, and is probably about as native to the Hawaiian Islands as are the Hawaiians themselves. The iliahi about the Kokee Museum is Santalum pyrularium A. Gray, with claret flowers; while S. ellipticum Gaud., with greenish-yellow flowers, is mostly a coastal plant of other islands. From the late Earl E. Sherff's monographic study of the lapalapa (Cheirodendron) we know that at least ten kinds are native to Kauai, the species C. platyphyllum (H. & A.) Seem., being endemic to Oahu alone. All are characterized by leaves bearing many leaflets that

tremble in the slightest breeze. The koa of Kauai is not Acacia koa A. Gray but the distinctly Kauai species called Acacia kauaiensis by Hillebrand in 1888 and subsequent botanists.

The author's account of man's stewartship of this wonderful region is most disheartening. With man's silly introduction of the passionflower (Tacsonia mollissima HBK) that smothers native trees, the raspberry (Rubus penetrans L. H. Bailey) and tibouchina (Tibouchina semidecandra Cogn.) that crowd out native shrubs and herbs, the barn owl which is a veritable flying mongoose, the goat and mouflon that browse along dry cliffs and ledges already subject to erosion without four-footed help, and the blacktailed deer that will devastate the endemic bog flora of Waialeale, man is wrecking within less than 200 years a flora that has taken 20 or so million years to perfect. Then, in this Age of the Bulldozer, man proudly slashes a road with his new toy through the endemic jungle from the end of the Kalalau Parking Area around the head of Kalalau Valley. The road leads practically from nowhere to nowhere, and is par excellence the ideal method for destroying the beauty of this entire area by erosion -- in fact, such erosion may promote an eventual break-through between Kalalau Valley and the Waimea Canyon System. May the Lord have mercy on the poor Souls who have contributed to the rape of Kauai's natural resources and beauty!

The present state of Kauai has stimulated in some quarters the current demand that the most interesting and scenic areas remaining of this island be placed under the jurisdiction of the National Park Service. Having observed the malignant changes about Waimea Canyon and Kokee since 1922 during protracted botanical expeditions, the reviewer feels it is too late to expect the Federal Government to pull the chestnuts out of the fire for citizens of Hawaii Nei. Without a king's ransom, Kauai can never be brought back to a natural state within the standard required of a National Park. If the Department of the Interior has reasonable funds available for establishment of a National Park with outstanding Polynesian characteristics, it should concentrate on American Samoa, an area that resembles Kauai before the haole opened his Pandora's box of biological evils.

It is regrettable that the author did not spend a few hours properly checking the scientific names used for possible errors. As it now stands, the "Guide", interesting and informative otherwise, will help perpetuate errors of identification among gullible readers.

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The above review was prepared by Dr. Otto Degener, distinguished author of the monumental "Flora Hawaiiensis" and a lifelong student of the Hawaiian flora.

SOME NEW LOCATIONS FOR NEW ZEALAND MOSSES

Hans Hörmann and Otto & Isa Degener

Aware that the endemic terrestrial flora of the Hawaiian Islands, originally barren lava erupting from the ocean floor, had come millions of years ago mainly from the southwest via air currents, ocean currents and migratory birds, we Degeners decided to roughly sample how the Phanerogam flora of New Zealand resembled and/or differed from that of our home archipelago. Leaving the Island of Oahu we arrived, interrupted by a brief stay in Fiji, in Auckland, New Zealand, January 5, 1969. Besides collecting Pteridophytes and Phanerogams, we collected some mosses before leaving New Zealand for home January 25. The present paper is based on annotated identifications of the Degeners' collection by Hörmann. Voucher specimens have been deposited at the New York Botanical Garden and elsewhere.

After having botanized extensively in the Fijian and Hawaiian Archipelagos and less so elsewhere for ourselves and monographers, we Degeners decry two faulty methods occasionally used in citing the collectors' plant labels: First, labels written in English and belonging to particular herbarium sheets were translated by an Austrian author into German as best he could. The result, published in his monograph of a Phanerogam Family, hardly imparted the correct meaning of the collector, in this instance O. Degener. Second, to economize in the copying of the collectors' rather precise labels, another monographer deleted most of it and substituted little else than the rather large District in which the specimen had been found. This might be an ambiguous "anywhere" within a radius of many, many miles. The above instances are particularly pernicious when the monographer has tampered with the data on the collectors' original label of a type specimen or a specimen that may become a type years hence. Concerning our collections, mainly deposited at the New York Botanical Garden and to a lesser extent at perhaps seventy-five or so other institutions throughout the World, we recommend that serious students read our authentic labels, or xerox copies of them, written by us or our assistants in India ink.

Though very emphatic about the above, we Degeners wish to stress the possibility of exceptions, offering the present paper as an example: When touring New Zealand by bus, taxi and U-Drive car to collect plants, we depended on the hearsay of tour and taxi drivers, and of neighboring residents regarding the names of localities we had just visited. Armed with this lore, we wrote our labels in India ink and mailed the lot with the specimens to our collaborating bryologist Dr. Hörmann. Upon completion of his determinations, the specimens with labels were distributed far and wide. More

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*The lichen flora, on the contrary, shows close relationship with that of the warm regions of South America. See Klement, O. Zur Kenntnis der Flechtenflora und -vegetation des Hawaii-Archipels. Nova Hedwigia 11:253. 1966.

recently armed with atlases, maps and travel folders, we find that one of our labels warrant correcting. Such corrections are embodied in this paper.

In conclusion: If a collector writes a label for the plant collected, no one should change the wording though feel free to add comments or apparent corrections in brackets. On the contrary, if a collector writes a label for a plant he has collected, and then personally publishes a correction himself the reader should accept, not the legend on the plant's herbarium sheet, but the printed version. We hope the above, unfortunately exemplified by Wimmer, Smith, and the Degeners here, will prompt the promulgation of an additional Article in the forthcoming publication of the new International Rules of Botanical Nomenclature.

The genera of mosses are arranged alphabetically under their families which, in contrast, are arranged *taxonomically. Each species is alphabetically noted by letter according to its geographical distribution, as known to us from unfortunately incomplete literature, thus: (a) for endemic to New Zealand, (b) for New Zealand and Australia, (c) for New Zealand and South America, and (d) for New Zealand and extensively distributed or even cosmopolitan. As all mosses were collected by the Degeners jointly, the plant labels with the specimens state so explicitly. In this article, however, to save space the word "Degeners" before the plant number is omitted.

*See Degeners' Flora Hawaiiana. Leaflet No. 2. Degeners & Hörmann. Mosses of Hawaii. 3/31/75.

SPHAGNALES.

1. Sphagnaceae.

Sphagnum cristatum Hampe. (a, probably). 31,848a (more properly Degeners No. 31,848a). Lake Matheson, Westland National Park, South Island. Forest. Jan. 12. - 31,857a. Minihaha Trail near Fox Glacier, South Island. Dense forest. Jan. 12. This collection has some capsules.

ANDREAEALES.

2.

Andreaea subulata Harv. (d, Australia, Campbell Islands, South Africa, Tasmania.). 31,869b. Te Anau Caves at Lake, South Island. Forest. Jan. 15.

POLYTRICHALES.

4. Polytrichaceae.

Atrichum ligulatum Mitt. (b, Australia, Tasmania.). 31,879a. Cascade, Fiordland National Park, South Island. Nothofagus forest. Jan. 16. - Dendroligotrichum dendroides (Hedw.) Broth. (c, Chile, Fuegia, Juan Fernandez.). 31,829a. Tongariro National Park, North Island. Rainforest at 3,700 feet. Jan. 8. - Oligotrichum tenuirostre (Hook. f.) Jaeg. (a.). 31,882e. Coronet Peak near Queenstown, South Island.

Alpine slope at 5,400 feet. Jan. 14. (Chiefly large, sterile, red-brown specimens.) • Pogonatum subulatum (Menz.) Brid. (b, Australia, Tasmania.). 31,848c. Lake Matheson, Westland National Park, South Island. Forest. Jan. 12. • Polytrichadelphus magellanicus (Hedw.) Mitt. (c, Australia, subantarctic South America and its islands, Tasmania.). 31,882a. Coronet Peak near Queenstown, South Island. Alpine slope at 5,400 feet. Jan 14. - Polytichum alpinum Hedw. (d, Antarctica, Australia, Northern Hemisphere, South America, Tasmania.). 31,830a. Paradise Valley, Fish Hatchery near Rotorua, North Island. Wet woods. Jan. 7. - P. juniperinum Hedw. (d, both Hemispheres, East Australia and many islands.). [illegible] 31,832b. Wanganui, North Island. Exposed areas in city park. Jan. 8 - 31,876b. Homer Tunnel on the Te Anau Lake side, South Island. Near glacier. Jan. 16. - 31,877b. Milford Sound, South Island. Near Sound at 10 feet elev. Jan. 16.

DICRANALES.

7. Ditrichaceae.

Ceratodon purpureus (Hedw.) Brid. (d.). 31,832c. Wanganui, North Island. Exposed areas in city park. Jan. 8. - 31,874c. Te Anau Downs, South Island. Scrub. Jan. 15. 31,884a. Makatipu Lake near Cecil Park, South Island. Shady locality. Jan. 14. • *Distichium capillaceum (Hedw.) B.S.G. (d.). 31,855b. Goldsboro', South Island. Clear-

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*Handicapped by isolation from larger libraries and herbaria, we are limited to our own resources. Thanks to a recent communication from Bryologist William C. Steere, we learn that Hedwig published Cynodentium capillaceum in 1801. Bridel, followed by Linberg, used the generic name Swarzia though preempted by Swarzia or Swatzia used for Phanerogams. The present Distichium, in spite of an earlier homonym, was established by the Bryologia Europaea and officially conserved. Bruch, Schimper and Gümbel are responsible for the binomial we here use.

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ing. Jan. 11.

10. Grimmiaceae.

Rhacomitrium crispulum (Hook. f. & Wils.) Hook. f. & Wils. (b, Campbell Island, Tasmania.) 31,840b. Haruia near Lewis Pass, South Island, Rainforest. Jan. 10. • 31,857n. Minihaha Trail near Fox Glacier, South Island. Dense forest. Jan. 12. • 31,874b. Te Anau Downs, South Island. Scrub. Jan. 15. - 31,879b. Cascade, Fiordland National Park, South Island. Nothofagus forest. Jan. 16. - R. lanuginosum (Hedw.) Brid., s.s. (d, Hawaiian Archipelago, Northern Hemisphere, South Africa.). 31,876a. Homer Tunnel on Te Anau side, South Island. Near glacier. Jan. 16. R. lanuginosum var. pruinosum Hook. f. & Wils. (d, Africa, Hawaiian Archipelago, many South Sea islands, Tasmania. Collections from summit of Mauna Loa, Island of Hawaii, probably

represents the highest elevation for any insular moss in the World. IT WAS NOT COLLECTED IN NEW ZEALAND BY THE DEGENERS.).

11. Fissidentaceae.

Fissidens rigidulus C. Müll. (c, Australia, Chile, Tasmania.). 31,843a. Near Fox Glacier, South Island. This more or less aquatic moss was found in forest stream. Jan.12.

12. Dicranaceae.

Campylopus bicolor (Hornsch.) Hook. f. (d, Australia, South Africa, Tasmania.). 31.877c. Milford South, South Island. Near Sound at 10 feet elev. Jan. 16. - C. clavatus (R. Br.) Hook. f. & Wils. (c, Australia, Campbell Island, Chile, Tasmania.). 31,829b. Tongariro National Park, North Island. Jan. 8. - 31,834b. Paradise Valley Fish Hatchery near Rotorua, North Island. Woods. Jan. 7. - 31,842b. Auckland, North Island. On stone wall & embankment of city park. Jan. 5. - 31,855a. Goldsbor', South Island. Clearing. Jan. 11. - 31,865c. Lake Paringa, South Island, Nothofagus forest. Jan. 16. - C. holomitrium (C. Müll.) Jaeg. (a.). Goldsbor', South Island. Clearing. Jan. 11. - C. introflexus (Hedw.) Mitt. (d.). 31,874d. Te Anau Downs, South Island. Scrub. Jan. 15. - 31,877a. Milford Sound. South Island. Near Sound at 10 feet elevation. Jan. 16. - Dicranum scoparium Hedw. (d, Northern Hemisphere, Japan.). ~~XXXX~~ 31,829c. Tongariro National Park, North Island. Rainforest at 3,700 feet. Jan. 8. - D. trichopodum Mitt. (Tasmania.). 31,847b. Lewis Pass, South Island. Forest at 2,989 feet. Jan. 17. - 31,871b. Pleasant Flat along Haast River, South Island. Jan. 13. - 31,874a. Te Anau Downs, South Island. Scrub. Jan. 15. - 31,877d. Milford Sound, South Island. Near Sound at 10 feet elev. Jan. 16.- Dicranoloma billardieri (Schwgr.) Par. 31,865d. (d, Australia, South Africa, South America, Subantarctic islands, Tasmania.). Lake Paringa, South Island. Dark woods. Jan. 13. - 31,879d. Cascade, Fiordland National Park, South Island. Nothofagus forest. Jan. 16. - D. grossialare (C. Müll.) Dix. (a.). 31,840c. Maria near Lewis Pass, South Island. Rainforest. Jan. 10. - D. platycaulon (C. Müll.) Dix. (a, thus far known from Lake Waikaremoana, Mt. Egmont, Mt. Hirongia, Tararua & Te Moehau, North Island; Dunedin, Durville Island, Mt. Arthur, Stewart Island, & Weheka & Westland, South Island.). 31,869a. Te Anau Caves at lake, South Island. Forest. Jan. 15. - D. plurisetum (C. Müll.) Dix. (a.). Minihaha Trail near Fox Glacier, South Island. Dense forest. Jan. 12. - 31,881b. The Chasm near Homer Tunnel, Fiordland National Park, South Island. Woods. Jan. 16. - Holomitrium perichaetiale (Hook. f.) Brid. (b, Australia, Lord Howe Island, New Caledonia, Stewart Island, Tasmania.). 31,857a. Minihaha Trail near Fox Glacier, South Island. Dense forest. Jan. 12. - Leucobryum candidum (Brid.) Hook. f. & Wils. (d, Australasia, East Indies, Pacific islands.). 31,856b. Harihari, South Island. Jan. 11. - 31,865b. Lake Paringa, South Island. Dark woods. Jan. 13.

13. Dicnemonaceae.

Dicnemon calycinum (Hook. f.) Schwaegr. (a, probably.). 31,840a. Maruia near Lewis Pass, South Island. Rainforest. Jan. 10. - XXXXXXXX 31,845b. Goldsboro', South Island. Shaded stream bank. Jan. 11. - 31,847c. Lewis Pass, South Island. Forest at 2,989 feet. Jan. 11. - 31,855d. Goldsboro', South Island. Clearing. Jan. 11. - 31,856c. Harihari, South Island. Jan. 11. - 31,857r. Minihaha Trail near Fox Glacier, South Island. Dense forest. Jan. 12. - 31,879e. Cascade, Fiordland National Park, South Island. Nothofagus forest. Jan. 16. - D. semicryptum (C. Müll.) Hedw. (a.). 31,871c. Pleasant Flat along Haast River, South Island. Jan. 13. - Mesotus celatus Mitt. (a.). 31XXXXX 31,840e. Maruia near Lewis Pass, South Island. Rainforest. Jan. 10. - 31,857a. Minihaha Trail near Fox Glacier, South Island. Dense forest. Jan. 12. - 31,879f. Cascade, Fiordland National Park, South Island. Nothofagus forest. Jan. 16.

16. Pottiaceae.

Hyophila novae-seelandiae Dix. & Sainsb. (a, thus far known from Lake Waikaremoana, Makaretuu River (Wairoa), Titiokura, Urewera & Waiouru, North Island; Peloris Bridge, South Island. 31,869c. Te Anau Caves at lake, South Island. Forest. Jan. 15. - Tortula laevipila (Brid.) Schwaegr. XXXXX (d, North America; thus far known from Mahia Peninsula, Pourerere, Te Puia Springs, Waihau Bay & Wairoa, North Island.) 31,832e. Wanganui, North Island. Exposed areas in city park. Jan. 8 - XXX T. muralis Hedw. (d, Australia, Northern Hemisphere, South Africa, Tasmania.). 31,832a. Wanganui, North Island. Exposed area in city park. Jan. 8. - 31,834a. Paradise Valley Fish Hatchery near Rotorua, North Island. Woods. Jan. 7. - 31,836a. Wellington, North Island. Exposed rocks on hill. Jan. 5 - 31,842a. Auckland, North Island. On stone wall, & embankment of city park. Jan. 5. - 31,850a. Greymouth, South Island. Dry bank. Jan. 11. W. macrophylla (R. Br.) XXXXXX Sainsb. (a, thus far known from Broken River, Lyttelton Hills & Otago, South Island.). 31,869d. Te Anau Caves at Lake, South Island. Forest. Jan. 15.

EUBRYALES.

24. Orthotrichaceae.

Amphidium cyathicarpum (Mont.) Broth. (d. Australia, Chile, Ecuador, South Africa, Tasmania; thus far known from Lake Waikaremoana, Otupae & Mt. Ohanakoa, North Island; also from Arthur Pass, Dyers Pass, Hawea Flat, Hyde, Molesworth Station, Mt. Armand Range & Tasman Glacier, South Island.). 31,842c. Auckland, North Island. On stone wall & embankment of city park. Jan. 5 - Macromitrium erosulum Mitt. (a, doubtfully endemic.). 31,862b. Near Hunt's Beach, South Island. Exposed tree. Jan. 13. - M. eucalyptorum Hampe & C. Müll. (b. Australia, Tasmania.). 31,835. Maruia near Lewis Pass, South Island. Rainy forest floor. Jan. 10. - 31,845c. Goldsboro', South Island. Shaded stream bank. Jan. 11. - 31,855e. Goldsboro', South Island. Clearing. Jan. 11. - M. grossirete C. Müll. & Hodgs. (a, thus far known from Cass, Marlborough, Mt. Cook &

Pine Hill (Dunedin), South Island. 31,840g. Maruia near Lewis Pass. South Island. Rainforest. Jan. 10. - 31,879g. Cascade, Fiordland National Park, South Island. Nothofagus forest. Jan. 16. - M. longipes (Hook. f.) Schwaegr. (a, probably.). 31,848d. Lake Matheson, Westland National Park, South Island. Forest. Jan. 12. - M. orthophyllum Mitt. (a, thus far known from Lake Waikaremoana, Waiororo, Mushine & Wakarara, North Island; Akaroa, Marlborough & Otago, South Island.). 31,857t. Minihaha Trail near Fox Glacier, South Island. Dense Forest. Jan. 12. - 31,871. Pleasant Flat along Haast River, South Island. Jan. 13. - 31,877e. Milford Sound, South Island. Near Sound at 10 feet elev. Jan. 16. - M. weymouthii Broth. (b, Tasmania.). 31,845d. Goldsboro', South Island. Shaded stream bank. Jan. 11. - Schlotheimia brownii Brid. (b.). 31,879h. Cascade, Fiordland National Park, South Island. Nothofagus forest. Jan. 16. - Ulota nova-zealandiae Saish. (a, thus far known from Fanthams Peak Track, Mt. Egmont & Taranaki, South Island.). 31,869e. Te Anau Caves at lake. Forest. Jan. 15. — U. pycnocheta (C. Müll.) Besch. (c, southern end.). 31,829d. Tongariro National Park, North Island. Rainforest at 3,700 feet. Jan. 8.

27. Funariaceae.

Funaria hygrometrica (L.) Sibth. (d.). 31,874e. Te Anau Downs, South Island. Scrub. Jan. 15.

36. Bryaceae.

Bryum argenteum Hedw. (d.). 31,832f. Wanganui, North Island. Exposed areas in city park. Jan. 8. - 31,834c. Paradise Valley Fish Hatchery near Rotorua, North Island. In woods. Jan. 7 - B. pendulum (Hornsch.) Schimp. (d, Northern Hemisphere.). 31,862b. Coronet Peak near Queenstown, South Island. Alpine slope at 5,400 feet. Jan. 4. - B. truncorum Brid. (d.). 31,829e. Tongariro National Park, North Island. Rainforest at 3,700 feet. Jan. 8. 31,881c. The Chasm near Homer Tunnel, Fiordland National Park, South Island. Woods. Jan. 16. - Leptostomum inclinans (Hedw.) R. Br. (b, Australia, Tasmania.). 31,847a. Lewis Pass, South Island. Forest at 2,989 feet. Jan. 11. - L. macrocarpum (Hedw.) R.Br. (a.). 31,832a. Wanganui, North Island. Exposed areas in city park. Jan. 8.

38. Mniaceae.

Mnium rostratum Schrad. (d.). 31,879i. Cascade, Fiordland National Park, South Island. Nothofagus forest. Jan. 16.

[illegible] (c, Australia, Falkland Islands, southern South America, Tasmania.). 31,857a. Minihaha Trail near Fox Glacier, South Island. Dense forest. Jan. 12.

42. Bartramiaceae.

Bartramia robusta Hook. f. & Wils. (a.). 31,882c. Coronet Peak near Queenstown, South Island. Alpine slope at 5,400 feet. Jan. 14. - Breutelia pendula (Hook. f.) Mitt. (b, Australia, Subantarctica, Tasmania.). 31,848e. Lake Matheson, Westland National Park, South Island. Forest. Jan. 12. - 31,857x. Minihaha Trail near Fox Glacier, South Island. Dense forest. Jan. 12. - Conostoma australis Sw. (c, Ecuador, Campbell Islands, Falkland Islands, southern South America, Tasmania.). 31,882d. Coronet Peak near Queensland, South Island. Alpine slope at 5,400 feet. Jan. 14.

43. Rhizogoniaceae.

Cryptopodium bartramioides (Hook. f.) Brid. (a, thus far known from Coromandel, Hunua, Manaku, Masterton, Mt. Egmont, Mt. Ruapehu, Horsewood, Pironesia, Taranua, Te Aroha, Waikaremona & Waipona Forest, North Island; Fiordland, Franz-Josef, Greymouth & Waiho (Westland), South Island.). 31,857v. Minihaha Trail near Fox Glacier, South Island. Dense forest. Jan. 12. - Rhizogonium bifarium (Hook. f.) Schimp. (b, Australia, Tasmania.). 31,840h. Maruia near Lewis Pass, South Island. Rainforest. Jan. 10. - 31,857a. Minihaha Trail near Fox Glacier, South Island. Dense forest. Jan. 12. - 31,869f. Te Anau Caves at lake, South Island. Forest. Jan. 15. - 31,879k. Cascade, Fiordland National Park, South Island. Nothofagus forest. Jan. 16. - Rhizogonium mnioides (Hook. f.) Schimp. (c, Australia, South America, Tasmania.). 31,829f. Tongariro National Park, North Island. Rainforest at 3,700 feet. Jan. 8. - 31,879j. Cascade, Fiordland National Park, South Island. Nothofagus forest. Jan. 16. - R. spiniforme (Hedw.) Bruch. (d.). 31,856a. Marihari, South Island. Jan. 11.

45. Hypnodendraceae.

Hypnodendron arcuatum (Hedw.) Mitt. (b, Australia, Tasmania.). 31,857b. Minihaha Trail near Fox Glacier, South Island. Dense Forest. Jan. 12. - Mniodendron comosum (La Bill.) Lindb. & Broth. (b, Australia, Auckland Islands, Tasmania.). 31,857c. Minihaha Trail, near Fox Glacier, South Island. Dense forest. Jan. 12. - Sciadocladus menziesii (Hook. f.) Lindb. (a.). 31,857a. Minihaha Trail, near Fox Glacier, South Island. Dense forest. Jan. 12. - 31,865a. Lake Paringa, South Island. Bark wood. Jan. 13.

46. Hypopterygiaceae.

Cyathophorum bulbosum (Hedw.) C. Müll. (b, Australia, Tasmania.). 31,845k. Goldsboro', South Island. Shaded stream bank. Jan. 11. - Hypopterygium nova-zealandiae C. Müll. (b, Tasmania.). 31,840k. Maruia near Lewis Pass, South Island. Rainforest. Jan. 10. - 31,848h. Lake Matheson, Westland National Park, South Island. Forest. Jan. 12. - 31,957h. Minihaha Trail near Fox Glacier, South Island. Dense forest. Jan. 12. - H.

setigerum (P. Beauv.) Hook. f. & Wils. (b, Australia, Tasmania.). 31,854l. Goldsborough, South Island. Shaded stream bank. Jan. 11. - 31,869h. Te Anau Caves at lake, South Island. Forest. Jan. 15.

47. Rhacopilaceae.

Rhacopilum robustum Hook. f. & Wils. (a.). 31,829g. Tongariro National Park, North Island. Rainforest at 3,700 feet. Jan. 8. - 31,840i. Maruia near Lewis Pass, South Island. Rainforest. Jan. 10. - 31,845f. Goldsborough, South Island. Shaded stream bank. Jan. 11. - R. strumiferum C. Müll. (b, Australia, Kermadec Islands, Tasmania.). 31,845e. Goldsborough, South Island. Shaded stream bank. Jan. 11.

49. Hedwigiaceae.

Hampeella alaris (Dix. & Sainb.) (b, thus far known from Atiamuri, Kaimai Range, Maungapohatu, Mt. Egmont, Mt. Pirongia, Mt. Ruapehu, Tararua, Taupo & Waikaremoana, North Island; Akatore, Longwood Range, Maruia Springs & Peloris Bridge, South Island.). 31,857d. Minihaha Trail near Fox Glacier, South Island. Dense forest. Jan. 12. - Ptychomnion aciculare (Brid.) Mitt. (c.). 31840j. Maruia near Lewis Pass, South Island. Rainforest. Jan. 10 - 31,845h. Goldsborough, South Island. Shaded stream bank. Jan. 11. - 31,848f. Lake Matheson, South Island. Forest. Jan. 12. - 31,857e. Minihaha Track near Fox Glacier, South Island. Dense forest. Jan. 12. - 31,869. Te Anau Caves at lake, South Island. Forest. Jan. 15. - 31,873-1. Cascade, Fiordland National Park, South Island. Nothofagus forest. Jan. 16. - 31,881d. The Chasm near Homer Tunnel, Fiordland National Park, South Island. Woods. Jan. 16.

59. Meteoriaceae.

Papillaria flavilimbata (C. Müll. & Hampe) Jaeg. (b. Australia, Tasmania.). 31,856d. Harihari, South Island. Jan. 11. - 31,871a. Pleasant Flat along Haast River, South Island. Jan. 13. - Weymouthia cochlearifolia (Schwaegr.) Dix. (c, Australia, Chile, Tasmania.). 31,829h. Tongariro National Park, North Island. Rainforest at 3,700 feet. Jan. 8. - 31,845i. Goldsborough, South Island. Shaded stream bank. Jan. 11.

61. Neckeriaceae.

Thamnium pandum (Hook. f. & Wils.) Jaeg. (b, Australia, Java, New Caledonia, Sumatra.). 31,848g. Lake Matheson, Westland National Park, South Island. Jan. 12. - 31,857f. Minihaha Trail near Fox Glacier, South Island. Dense forest. Jan. 12.

62. Lembophyllaceae.

Camptochaete arbuscula (Hook. f.) Jaeg. (b, Tasmania.). 31,862a. Near Hunt's Beach, South Island. Exposed tree. Jan. 13. - C. ramulosa (Mitt.) Jaeg. (b, Australia, Chatham Islands, Tasmania.). 31,861a. Makarora, Mt. Aspiring National Park, South Island. Epiphytic in thicket along main road. Jan. 13. - Lembophyllum clandestinum (Hook. f. & Wils.) Lindb. (b, Australia, Tasmania.). 31,845j. Goldsborough, South Island. Shaded stream bank. Jan. 11. - ~~31,857a. Cascade, Fiordland National Park, South Island. Dense forest. Jan. 16.~~

31,857e. Minihaha Trail near Fox Glacier, South Island. Dense forest. Jan. 12. - 31,879m. Cascade, Fiordland National Park, South Island. Nothofagus forest. Jan. 16. - L. divulsum (Hook. f. & Wils.) Lindb. (a.). 31,862c. Near Hunt's Beach, South Island. Exposed tree. Jan. 13.

67. Thuidiaceae.

Thuidium furfurosum (Hook. f. & Wils.) Jaeg. (d, Australia, Central & South America, Tasmania.). 31,840-1. Maruia near Lewis Pass, South Island. Rainforest. Jan. 10. - 31,855f. Goldsbor', South Island. Clearing. Jan. 11. - 31,857i. Minihaha Trail near Fox Glacier, South Island. Dense forest. Jan. 12. - 31,879n. Cascade, Fiordland National Park, South Island. Nothofagus forest. Jan. 16. - T. laeviusculum (Mitt.) Jaeg. (b, Australia, Tasmania.). 31,840m. Maruia near Lewis Pass, South Island. Rainforest. Jan. 10. - 31,879o. Cascade, Fiordland National Park, South Island. Nothofagus forest. Jan. 16.

68. Amblystegiaceae.
Acrocladium auriculatum (Mont.) Mitt. (c Australia, South America, Tasmania),

31,840a. Maruia near Lewis Pass, South Island. Rainforest. Jan. 10. - 31,860i. Te Anau Caves at lake, South Island. Jan. 15. - - 31,879s, Fiordland National Park, South Island. Nothofagus forest. Jan. 16.

69. Brachytheciaceae.

Brachythecium plumosum (Sw.) B.S.G. (d.) 31,845n. Goldsbor', South Island. Shaded stream bank. Jan. 11. - 31,855g. Goldsbor', South Island. Clearing. Jan. 11.

73. Hookeriaceae.

Pterygophyllum quadrifarium (Hook. f.) Brid. (a.). 31,853. Near Franz-Josef Glacier Hotel, South Island. Forest. Jan. 11.

77. Sematophyllaceae.

Acanthocladium extenuatum (Brid.) Mitt. (b, Australia, New Caledonia, Tasmania.) 31,845r. Goldsbor', South Island. Shaded stream bank. Jan. 11. - Sematophyllum contiguum (Hook. f. & Wils.) Mitt. (d, Australia, Many Pacific islands, Tasmania.) 31,857j. Minihaha Trail near Fox Glacier, South Island. Dense forest. Jan. 12. - S. Homomallum (Hampe) Broth. (b, Australia, Tasmania; Cape Colville, Mahia Peninsula, Moises Island, North Cape, Mangitoto Island, Titahi Bay & Whangarei, North Island.). 31,857k. Minihaha Trail near Fox Glacier, South Island. Dense forest. Jan. 12. - S. subcylindricus (Broth.) Sainsb. (b. Java; Kaigarea Forest, Kaimai Range, Maungapohuta, Mt. Egmont, Mt. Ruapehu, Ruahine, Taupo & Waikaremoana, North Island; Mt. Cook, Stewart Island.). 31,845o. Goldsbor', South Island. Shaded stream bank. Jan. 11. - S. tenuirostre (Hook. f.) Dix. (d.). 31,955i. Goldsbor', South Island. Clearing. Jan. 11.

78. Hypnaceae.

Acanthocladium extenuatum (Brid.) Mitt. (b, Australia, New Caledonia, Tasmania.).

31,845r. Coldsbor', South Island. Shaded stream bank. Jan. 11. - Hypnum cupressiforme Hedw., s.s.(d.). 31,829i. Tongariro National Park, North Island. Rainforest at 3,700 feet. Jan. 8. - 31,869j. Te Anau Caves at lake, South Island. Forest. Jan. 15. - 31,871e. Pleasant Flat along Haast River, South Island. Forest. Jan. 15. - 31,871e. Pleasant Flat along Haast River, South Island. Jan. 13. - H. c. var. chrysogaster (C. Mull.) Sainsb. 31,855h. Coldsbor', South Island, Clearing. Jan. 11 - 31,857l. Minihaha Trail near Fox Glacier, South Island. Dense forest. Jan. 12. - H. c. var. filiforme Brid. (d.). 31,845p. Coldsbor', South Island. Shaded stream bank. Jan. 11. - 31,857l. Minihaha Track near Fox Glacier, South Island. Dense forest. Jan. 12.

E. halemanui Sherff in Bot. Gaz. 97:582. 1935. (Kauai)

E. kuwaleana Degener & Sherff ex Sherff in Occas. Papers Bishop Mus. 20:9. 1949. (Oahu)

E. olowaluana Sherff in Bot. Gaz. 97:580. 1936. (Maui, Hawaii)

E. skottsbergii Sherff in Bot. Gaz. 97:588. 1936. (Oahu, Molokai)

Gnaphalium hawaiiense Degener & Sherff ex Sherff in Am. Journ. Bot. 36: 507. 1949. (Maui, Hawaii)

Haplostachys bryanii Sherff in Am. Journ. Bot. 21:698. 1934. (Molokai)

H. linearifolia (Drake) Sherff in Bot. Gaz. 96:136. 1934. (Molokai, Maui)

Labordia decurrens Sherff in Am. Journ. Bot. 25:581. 1938. (Kauai, Oahu)

L. degeneri Sherff ex Degener, Fl. Haw. Fam. 302. Aug. 24, 1938. (Kauai)

L. helleri Sherff in Am. Journ. Bot. 25:581. 1938. (Kauai)

L. hymenopoda Degener & Sherff ex Sherff in Am. Journ. Bot. 38:60. 1951. (Oahu)

L. mauiensis Sherff in Am. Journ. Bot. 25:580. 1938. (Maui)

L. olympiana Sherff in Am. Journ. Bot. 25:580. 1938. (Oahu)

L. pedunculata Sherff in Publ. Field Mus. Nat. Hist., Bot. Ser. 17:488. 1939. (Maui?)

L. venosa Sherff in Am. Journ. Bot. 25:579. 1938. (Maui)

L. wawrana Sherff in Am. Journ. Bot. 25:579. 1938. (Kauai)

Lipochaeta acris Sherff in Bot. Gaz. 95:83. 1933. (Kauai, Oahu, Maui, Kahoolawe?)

L. alata Sherff in Bot. Gaz. 95:81. 1933. (Kauai)

L. bryanii Sherff in Bot. Gaz. 95:97. 1933. (Kahoolawe)

L. degeneri Sherff in Bot. Gaz. 95:84. 1933. (Molokai)

L. dubia Degener & Sherff ex Sherff in Publ. Field Mus. Nat. Hist., Bot. Ser. 17:580. 1939. (Oahu)

L. exigua Degener & Sherff ex Sherff in Am. Journ. Bot. 28:30. 1941. (Kauai)

L. forbesii Sherff in Bot. Gaz. 95:83. 1933. (Maui)

L. intermedia Degener & Sherff ex Sherff in Bot. Gaz. 95:102. 1933. (Hawaii)

ably aided by - - x - -,

It is a pity Dr. Gillett failed to note our work on the Scaevola gaudichaudiana complex - among the twenty six papers cited in his litera ture ours are eloquently omitted. Had he done so he would have saved time and funds. That his study independently came to essentially the same conclusion as published in the Flora Hawaiiensis decades before is no surprise.

"Evolution",

Evolution
Prof. R. C. Thurson, Editor,
Dept. Geophysical Sciences,
U. of Chicago
Chicago,

NUMATA & ASANO, "BIOLOGICAL FLORA OF JAPAN" AND REMARKS ABOUT PAEDERIA, PHRYMA, RABDOSIA, RAPANEA, SIGESBECKIA & VITEX

Otto & Isa Degener

One of us being familiar with the phanerogam flora of New England, the other being familiar with that of Germany and both of us having been exposed during a six weeks' tour of Japan in 1964 to the flora of its major islands, we were fascinated with Professors Makoto Numata and Sadao Asano's "Biological Flora of Japan - Sympetalae 2." The book printed in Tokyo by the Tsukiji Shokan Publishing Company on thick stock in 1970 "is the second in a series of five volumes on 'Biological Flora of Japan,' the first of which was issued in 1969. Included in this latest work are 25 families and 86 species from Caprifoliaceae to Clethraceae in sympetalae of dicotyledons." The book in bright green, cloth cover measuring 19.5 X 29 X 2.5 cm., consists of 200 pages. It is bilingual, namely in Japanese and English. It has 86 excellent, full page plates of line drawings facing the same number of pages showing a photograph of a habit of the plant with a brief annotation regarding its "Habitat" and "Life-form." Under the first, linearly arranged and briefly expressed, come Distribution, Climate, Soil, Physiography, and Vegetation; under the second, similarly arranged, Dormancy, Form, Disseminule Form, Radicoid Form, Growth Form, Sociability, Phenology and Remarks. The preface, perhaps expressed more in Japanese phraseology than in English, states that "This is not, of course, a Taxonomic flora, but ecological one mainly based on life-forms. Therefore, it does not aim at the complete enumeration of the whole flora. However, the application of this book to the Japanese flora is not restricted by the above-mentioned treatment of plants, because this is not a taxonomic flora."

As we reviewers are not ecologists, we are not capable of judging the work ecologically. Instead, we examined it taxonomically, and that involved studying the 86 beautifully executed drawings of 86 taxa. In so many cases these show in great detail not only the conventional fruit, seed and parts of flowers; but seedlings, dormant buds, bracts, stem cross sections, and the intricate branching of roots. The only figures we miss are pollen grains. We do not know whether it is stated in Japanese type, but for the sake of the mentally lazy English reader it might have been kind to have specified the family of each species in English at the head of each plate. We should have liked to see cited the author and book responsible for each scientific bi- and trinomial followed.

In leafing through the book, one of us thought he recognized New England plants; while the other thought she recognized European ones. Fascinated, one of us opened volume two of Britton & Brown's Flora and the other, *Rothmaler's Excursionsflora. Both of us seemed to recognize old friends yet, somehow, these friends looked somehow different. The explanation is found conveniently and in great detail in the up-dated reprint of Hui-Lin Li's "Floristic Relationships between Eastern Asia and Eastern North America," pp. 61, maps 56. 1971.

In short (expressing ourselves in a low, English, fog index for the Japanese reader of this review), the once-upon-a-time temperate north polar region possessed a more or less uniform mantle of vegetation. As the warmth decreased, this flora was not only killed off by frigid weather in the north but forced to emigrate southward. As these shivering survivors in Europe, Asia and Eastern North America could no longer readily exchange seeds and pollen, they began to speciate. Hence today's species depicted in Drs. Numata and Asano's fascinating tome, have for the most part close relatives in Both America and Europe. Taxonomically expressed, with of course some exceptions, these Japanese plants do not belong to the species we reviewers know, but they still do belong to the same genera.

Ignoring a few anomalies caused by man's introduction of species from one area to another, we find that of about 66 Japanese genera shown in this volume,

45 occur likewise in the Eastern United States.
35 occur likewise in Europe.
31 occur likewise in both the Eastern United States and Europe.

Tending to consider differences in plants more important than likenesses, we "splitters" prefer to alter a few of the names used:

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*On a protracted botanical excursion by railroad from Montreal to Churchill and back, one of us had the opportunity to meet Dr. & Mrs. Werner Rothmaler and the other to renew her acquaintance with the couple begun in Berlin-Dahlem, West Germany, a decade or so before. Dr. Rothmaler (Aug. 8, 1908 - April 13, 1963) of Ernst-Moritz-Arndt University, Greifswald, East Germany, we remember on the excursion as a tall, slender, very active man with blond hair he whipped into place with a toss of his head. He proved himself an astute taxonomist, readily identifying to the genus most of the plants he collected with us in Canada; why not, as explained above, when the genera are often, almost circumpolar and he knew their German representatives expertly?

Myrsine angustifolia Hosaka, ibid. 42.
Not Myrsine angustifolia D. Dietr. Syn. Pl. 1: 619. 1839-52.
Not Rapanea angustifolia Merr. in Philipp. Journ. Sci. 20: 429. 1922.

We here name this species in honor of A.A. Heller, collector of the type on Kauai, to dispell some of the confusion so well untangled by Hosaka (ibid. 42-45).

Rapanea hosakana Deg. & Deg., nom. nov.
Myrsine sandwicensis var. denticulata Wawra in Flora 57: 526. 1874.
Myrsine sandwicensis var. denticulata Hillebr. Fl. Haw. Isl. 281. 1888.
Myrsine denticulata Hosaka, ibid. 49.
Not Rapanea denticulata Rusby in Phytologia 1: 72. 1934.

This species we here rename for our friend Mr. Edward Y. Hosaka.

Rapanea juddii (Hosaka) Deg. & Deg., comb. nov.
Myrsine juddii Hosaka, ibid. 39.

Rapanea kokeeensis (Hosaka) Deg. & Deg. comb. nov.
Myrsine kokeeana (sic) Hosaka, ibid. 48.

Kokee is not a person, but a locality on Kauai.

Rapanea linearifolia (Hosaka) Deg. & Deg., comb. nov.
Myrsine linearifolia Hosaka, ibid. 41.

Rapanea mezii (Hosaka) Deg. & Deg., comb. nov.
Myrsine mezii Hosaka, ibid. 34.

Rapanea petiolata (Hosaka) Deg. & Deg., comb. nov.
Myrsine petiolata Hosaka, ibid. 45.

Rapanea pukooensis (Lèvl.) Deg. & Deg., comb. nov.
Suttonia pukoensis (sic) Lèveillè in Fedde Repert. 10: 444. 1912. Type is Faurie 42 collected at Pukoo (not Puko), Molokai.
Myrsine pukooensis Hosaka, ibid. 56.

Rapanea st.-johnii (Hosaka Deg. & Deg., comb. nov.
Myrsine st.-johnii Hosaka, ibid. 37.

"Siegesbeckia," as given on the last page of the index, we prefer to spell "Sigesbeckia." We were alerted to the genus because Sigesbeckia orientalis L., is naturalized in the Hawaiian Islands and because this species, a new record for Germany, was collected by one of us in a roadside ditch in Hamburg in 1952. This specimen is deposited in Berlin-Dahlem.

Vitex rotundifolia L. f., shown on plate 99 of Numata & Asano's Flora is so similar to the plate of Vitex trifolia var. simplicifolia Gaud., as shown in Degener, Flora Hawaiiensis under Family 315 Sept. 15, 1946, that we suspect the latter trinomial wrong.

The "Biological Flora of Japan" is so beautifully and thoroughly illustrated that we look forward with expectation for the appearance of the three remaining volumes. We do hope that for each taxon shown we shall have the scientific family name as well as full citation of the literature that validated its bi- or trinomial.

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