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About the Institute

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.

RUMEX OF HAWAII

Otto & Isa Degener

In 1811 appeared the second edition of William Townsend Aiton's "Hortus Kewensis; or, A Catalogue of The Plants Cultivated in The Royal Botanic Garden at Kew." Aiton, as the title page mentions, was "GARDENER TO HIS MAJESTY." On page 323 he describes, as new, Rumex giganteus, calling it "Tall Dock." He adds that it was native "of the Sandwich Islands. Mr. David Nelson." Furthermore, the next line states that it had been introduced in "1796, by Archibald Menzies, Esq."

David Nelson was Captain James Cook's botanist, while Archibald Menzies was Captain George Vancouver's. Automatically, without much thought, we would have considered a Nelson sheet deposited at the British Museum (Natural History) as the lectotype for the species s.s. We maintain, however, that the lectotype should be a sheet at Kew labelled "R. giganteus Ait. H. Kew. Rumex 40 feet high. Climber, Sandwich Isles, A.M., C68." The initials evidently refer to Archibald Menzies. As Aiton was listing and describing the plants growing in the gardens of Kew, he evidently grew the giant Rumex from seed introduced by Menzies about fifteen years before the catalogue went to press.

According to Skottsberg in *Acta Horti Gotob.* 2:225. 1926, specimen C68 "has leaves with margin and veins pilose, and so is the stem."

In conclusion, after receiving bibliographic and herbarium aid from Messrs. Peter Green, Edgar Milne-Redhead, John F. Reed, George M. Schultze and William T. Stearn, we believe at least two main taxa of Rumex giganteus grew (and still survive) in the rainforest mauka of the Kealahou area, Island of Hawaii, a rainforest that has retreated inland during the past 200 years' attack by Caucasian and Oriental animal and plant invaders:

1. R. giganteus Ait. var. giganteus. A somewhat pilose plant. Type: C68 in herb. British Museum. Though the endemic flora is being rapidly exterminated, we are gratified to have found a liana approaching the type. It is Degener & L.W. Bryan 32,457. Kahua, South Kona, Hawaii. Rainforest at 3,250 feet. May 29, 1969.
2. R. giganteus Ait. var. nelsonii Deg. & Deg., var. nov. Planta glabra. Unlike the previous variety, this one is glabrous. The type we consider to be the specimen deposited in the British Museum under the legend "Rumex giganteus, 'Sandwich Islands, Dav. Nelson.'" During the past two years we have collected this variety, the less rare of the two, in the rainforest from Kulani around the southwestern slope of Mauna Loa to Hualalai. If the historical Nelson plant for any reason cannot be the type, the lectotype would be

"Degeners & Piccos 32,456. Mauna Loa Boys' School, Hawaii. Sprawling tangle in clearing at 5,700 feet. Aug. 10, 1968." A rooted sheet of this liana (renumbered 32,443 and harvested July 26, 1970.)

was planted in the writers' garden at Volcano, Hawaii, next to R. skottsbergii, as described below. Degeners & Piccos 32,458 collected Aug. 15, 1970 "at 2,500 feet, Funaluu mauka, Kau, Hawaii.", is not particularly outstanding because it has a faint tendency to being glabrate; but because it completely fills with its scrambling, overlapping branches, to the exclusion of other plants, a small gulch. Cranwell, Selling & Skottsberg 3,108 is an Island of Hawaii specimen with typical inflorescence, but otherwise a bit strange. It is from the ancient, deeply eroded and somewhat isolated "Kohala Mts., Upper Hamakua ditch trail. 9/17/38."

It is disconcerting, as Skottsberg has indicated for the local taxa of the genus on pages 223-228 and elsewhere, that our species are not clear-cut Linnean ones. Depending on the limited information available to us, we recognize also:

3. R. giganteus var. nelsonii forma anneotens Deg. & Deg. Frutex circa 12 dm. altus. This form maintains the same diffuse, red inflorescence; but approaches R. skottsbergii in its low, erect habit.

Type Locality: "Otto Degener, Isa Degener & L.W. Bryan 32,455. West side of Hualalai, Hawaii. Scrub vegetation at 5,000 feet. July 27, 1967." Type at N.Y., as are all our novelties unless extenuating circumstances make it impracticable to deposit them there. Local Range: Buehler the type collection, Degeners & Amy Greenwell 32,454, from Hualalai, "At 7,000 feet; old aa flow. July 9, 1967", belongs here.

4. RUMEX SKOTTSBERGII Deg. & Deg. SKOTTSBERG DOCK; PAWALE

Rumex giganteus sensu Hillebr. Fl. Haw. Isl. 377. 1888. (In part.)
Rumex giganteus sensu Skottsberg in Acta Horti Gotob. 2:223. 1926.

(In part.) The novelty is named for Dr. Carl Skottsberg, who here gave results of his study of local Rumex taxa.

Rumex giganteus sensu Degener, Plants Haw. Nat. Park 152. 1930; ibid. 1949.

Rumex giganteus sensu Fagerlund & Mitchell in Nat. Hist. Bull. (Haw. Nat. Park) 9:35. 1944.

Rumex giganteus sensu Hubbard & Bender, Trailside Plants Haw. Nat. Park 4:7. 1950.

Rumex giganteus sensu Fosberg in Doty & Mueller-Dombois, Atlas Bioc. Stud. 187. 1966.

Not Rumex giganteus Ait. Hort. Kew. ed. 2:323. 1811. (Rainforest up to about 15 meter long lianas with loose, horizontal to drooping inflorescences brilliantly red but drying castaneous. This complex is represented by an important sheet - R. g. var. nelsonii - collected by David Nelson and deposited in the British Museum (Nat. Hist.) and by one - R. g. var. g. - annotated "Rumex 40 feet high - - -



668.")

Rumex skottsbergii sp. nov. Frutex erectus, 7 - 10 dm. altus; folia ampia elliptica; inflorescentia flavo-viridis. (We believe an illustration is more an "international language" than Latin and should be permitted to substitute for a Latin diagnosis.)

Erect 7 - 10 dm. tall entirely glabrous shrub with many stiffly erect slightly zigzag twiggy longitudinally grooved stems arising from compact rootstalk bearing thick yellowish taproots. Leaves pale green fading yellow: most blades 10 X 4.5 cm., oval with acute apex but toward inflorescence gradually smaller and more ovate- to obovate-elliptic with somewhat cuspidate apex, thick, entire or nearly so and never crisped, with acute to acuminate base; petioles slender, somewhat shorter than lower blades and often longer than upper blades; correa thin, castaneous. Flowers extremely numerous, yellowish green, imperfectly dioecious with staminate and pistillate flowers at times in same fascicle, subtended by minute persistent scarious correae: pedicels 3 - 5 mm. long, filiform except for thickened top, persistent in fruit; inflorescence stiffly erect, compact, enlarging in fruit to become usually broad-conical and 10 - 20 cm. wide. Pistillate flower: outer sepals concave, oval-cuneate to obovate, with obtuse apex, faintly nerved, almost 1.5 mm. long, spreading at anthesis; inner sepals longitudinally recurved to facilitate lateral extrusion of the longer stigmatic branches, ovate with subtruncate base and usually retuse apex, 3 mm. long and almost 2 mm. wide, erect at anthesis, with veins and especially midrib prominent. Ovary 1 mm. long, ellipsoid-trigonus with sharp angles, short-stipitate; styles filiform, each acutely widening into white-translucent broadly fan-shaped stigma irregularly twice and thrice fringed to form about 40 ultimate flat branches. Staminate flower: sepals concave, obovate with obtuse apex, faintly nerved, grading from about 1 mm. long for outermost to 2 mm. long for innermost, suberect; filaments filiform; anthers pale yellow, exserted, obovoid, 1.5 mm. long, emarginate at base and deeply narrowly cordate at apex; aborted ovary 0.5 mm. long, with spreading flat truncate stigmas each half as long. Fruit yellowish green ripening castaneous; outer sepals reflexed, marcescent, not enlarged; inner sepals erect to closely invest nutlet, 4 - 6 mm. long, undulate to somewhat erose-dentate, obtuse to retuse at apex, broadly cordate at base, conspicuously net-veined except for open margin, with midrib prominent without but sulcate within; nutlet shiny, obovoid, deeply trigonus, 2.5 mm. long, obtuse to a minute truncate stalk at base, somewhat beaked.

Type Locality: Degeners & Piccos 32,453. On 1907 Lava Flow, Kau, Hawaii. On lava rubble at 1,600 feet. July 26, 1968. Type at NY, co-types widely distributed.

Local Range: At present we know this species complex is native to Hawaii, where it is common on the ash and aa flows from about Kilau-ea and Kilauea Iki Craters through the aalii, ohia lehua and ukiuki pahoehoe flows of the Kau Desert up the Southwest Rift Zone of Mauna Loa and thence northward into Kona until stopped by forests. It grows from about 2,000 to 7,000 feet elevation. It is strictly a

pioneer, springing up like a weed in bulldozed aa lava. The roots of the seedling apparently rush during the rainy season to reach moist depths for the plant's establishment before advent of the dry season. This common erect xerophyte has been mistaken for the gigantic liana R. giganteus with loose, brilliantly red inflorescence first collected by Nelson, presumably mauka of Kealahakua in the rain-forest. After growing the erect shrub (like Degener's & Piccos 32,453) and the liana (Deg. & Deg. 32,443, Degener's & Piccos 32,456) next to each other for several years at 3,800 feet elevation in our Volcano, Hawaii, garden and noting that both taxa retained their specific characters over several years, we confidently consider R. skottsbergii specifically distinct. In addition to the Island of Hawaii, we suspect this species in several inferior taxa, to be on Maui and Nihoa as explained below.

"Rumex of Hawaii" concentrates on the genus as it occurs on the "Big Island." We here add some of our observations of, and surmises about, Rumex on the smaller islands as well.

Few readers realize that the Hawaiian Archipelago is close to 2,000 miles long, extending from the northwestern Kure and Midway Islands via such reefs, shoals and islets as Hermes, Laysan and Necker to massive Maui and Hawaii. The northwestern islands, first formed, were once of considerable size and elevation, and have since been mostly peneplaned to ocean level. When the island primordia began forming on the ocean floor is debatable. But an indication of how old such islands may be is shown by the find of fossils of Miocene Age - roughly 25,000,000 years ago - in core samples from Midway. These islands were certainly covered with jungle vegetation - now gone - when high enough to form and intercept rainclouds. The southeastern islands are generally younger, still of considerable size and elevation, and clothed with endemics until present interference by man.

As the crow flies, the Island of Hawaii is less than thirty miles distant from the Island of Maui, separated by the 6,000 foot deep Alenuihaha Channel. The possibility that these two islands have ever been connected by a land bridge is extremely unlikely. Yet we find that on Maui occur at least two taxa resembling the R. giganteus and R. skottsbergii complexes. The former is more or less represented by two sheets, namely 1.) Forbes 1050M, "Keaenae [Keanae] Gap, Halehaku. Crater of Haleakala," East Maui, Aug. 3, 1919. It bears a typical diffuse inflorescence. The area, as we know personally, is a dense, rainy jungle. 2.) G.R. Ewart III & G.C. Munro 63. "W. Maui, Honokowai valley, Amalu branch, valley bottom, alt. 2500 ft. Dec. 21, 1928." This bears a typical diffuse inflorescence.

On the other hand, the members of the R. skottsbergii complex are 1.) C.N. Forbes 1067M. Crater of Haleakala, Maui. Aug. 6, 1919. It bears a compact, erect inflorescence. 2.) James Henrickson 3878. Haleakala Crater. In cindery soil, base of sliding sands. July 15, 1969. It has a compact inflorescence; but the plant is said to be a

seven foot high shrub, which is several feet taller than typical R. skottsbergii as we know it in and about Kilauea on the Island of Hawaii. It appears to have red flowers a feature, if true, being more typical of R. giganteus.

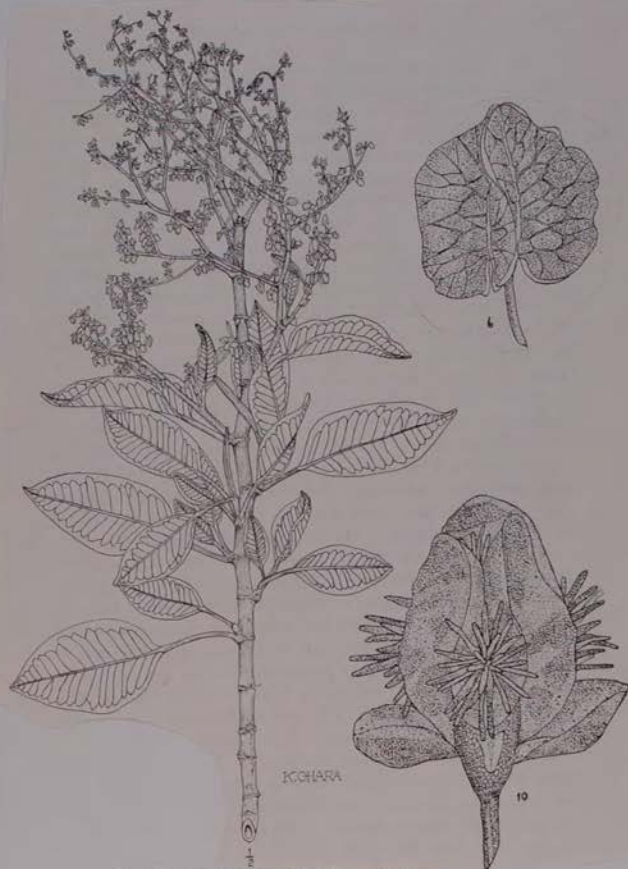
Even without special adaptations for flotation or for transport by animals, these native species of Rumex evidently traversed Alenuihaha Channel separating Hawaii and Maui, if they did not come from some third island such as Nihoa.

Maui, Kahoolawe, Lanai and Molokai in past ages were once a single island, before that time and after having been variously separated by narrow channels. These now have an average depth of not more than about 600 feet. Here Rumex need not have crossed any water to reach, for instance, from Maui to Molokai from which latter island Hillebrand reported "R. giganteus." He further states that the native name on Hawaii is pawale and on Molokai, uhauhako.

Uninhabited Nihoa, 400 to 500 miles west of Maui where some taxa of R. skottsbergii grow, has 895 foot high Miller's Peak and 852 foot high Tanager Peak. These two are the opposite rims of a large eroded crater. What plants clothed this high land in ages past? Was one of them a Rumex? In what we call the Marie C. Neal Herbarium of the Bernice Pauahi Museum are three sheets. They certainly belong, with their erect, compact, apparently green inflorescences, to the R. skottsbergii complex. Due to their condition, however, we are not prepared to state to which inferior taxon they may belong. They are 1.) E.L. Gaum 71. Alt. 300. Height ± 30 cm. "Shelves & holes in cliff n.w. near summit peak." June 18, 1923. 2.) E. Christophersen. "Nihoa, cliff under Miller's Peak, N. side, el. 250 - 300 meters." July 10, 1924. 3.) D. Yen 1015. "Devil's Slide, near Miller Peak. 600 ft. alt. May 1969."

It is intriguing to speculate whether the Nihoa Rumex is not a member of a very small relict flora, representing the genus which gradually disseminated eastward from the old, eroded islands to the new, now major, islands of the Hawaiian chain.

This is not all. We must yet consider Rumex on the islands of Oahu and Kauai. Oahu is separated from Molokai by the 2,300 foot deep and 30 mile wide Kaiwi Channel, and from Kauai by the 6,000 foot deep and 80 mile wide Kaieie Waho Channel. Formerly, Oahu consisted of two separate islands, the eastern one now dominated by the Koolau Range and the western one dominated by the Waianae Range. We know the Koolaus are more recent as well borings have shown that their lava flows overlie those of the Waianaes. No one has ever reported a native Rumex from the Koolaus, but along the precipitous sunny summit cliffs, ledges and slopes of the Waianaes grows the 5 - 8 cm. tall R. albescens Hillebr. It is an herb, rather than a shrub, with leaves crisped and erose-denticulate. Skottsberg, perhaps depending too much on herbarium material, had some difficulty in distinguishing this species from Hawaii plants; while our observations in the field



Rumex skottsbergii Deg. & Deg.

convince us of the correctness of Hillebrand's finding. Though not known from the Koolau Range of Oahu, this taxon, perhaps in several varieties and forms, appears on the Island of Kauai! It is significant that Skottsberg, mentioning Chromosome Numbers in Hawaiian Flowering Plants (Ark. f. Bot., Stockholm) 64. 1953, lists 36 as the 2N for a Kauai plant and 54 or 56 for plant 6,828 from Hawaii.

The more we become familiar with native taxa, the more do we realize how complicated the flora of the Hawaiian Islands is; Rumex is just one example. Although one of us has observed and collected the native taxa since 1922, we have solved just a few puzzles and drawn attention to many, many more. The new generation of botanists should concentrate on collecting more and better material, growing seeds under controlled conditions, making additional chromosome counts, and using newer and preciser methods unknown to workers of the past. The present fad to engage in a wealth of costly ecological experiments and studies without first untangling the taxonomy of our flora is placing the cart before the horse.