

Putative Generic Hybrids of Haleakala's Silversword and Kupaoa (*Argyroxiphium sandwicense* × *Dubautia menziesii*) Compositae¹

HERBERT K. KOBAYASHI²

HYBRIDS of the endemic Hawaiian genera *Argyroxiphium* and *Dubautia* (= *Railliardia*) have been recorded for some time (see Stone, 1967) in the taxonomic literature. However, little information is available for relocating and studying individual plants relatively free from unnatural disturbances. It is the purposes of this note to call attention to a previously unreported putative hybrid (*Argyroxiphium sandwicense* DC. × *Dubautia menziesii* [A. Gray] Keck) and to encourage studies aimed at clarifying the uncertain relationships among the Hawaiian *Madinae*.

During the summer of 1969, while examining the silverswords of cinder cone Ka-Moa-o-Pele within Haleakala Crater, Park Naturalist Ralph Harris and I discovered plants intermediate in appearance between the silversword and the kupaoa. A thorough survey of western Haleakala National Park uncovered similar plants in three other locations (Table 1). Flowering individuals, three in number, were found only at the Sliding Sands location.

There are four qualitative reasons for believing that the plants are putative hybrids.

1. The plants do not fit the description of any species in the only known list of flowering plants of western Haleakala National Park (Mitchell, 1945).
2. Comparisons of leaves, stems, and inflorescences during many field trips from 1969 to 1972 substantiate the "hybrid's" intermediate gross appearance. The reader should compare Fig. 1 with illustrations and descriptions of its purported parents in Keck (1936) and Sherff (1935).
3. Distribution (Table 1) is well within the wide range of the kupaoa and the narrower range of the silversword. Plants are always

found on the periphery or within silversword clusters at least 50 feet from the nearest kupaoa.

4. Purported parents are usually found on windswept bare cinder, whereas other *Madinae* with the exception of *Madia sativa* Molina (Degener, 1940) are found at least 1 mile from the "hybrids" in scrub or forest vegetation.

The major quantitative reasons for believing that the plants are putative hybrids were obtained from data on the ratio of length to maximum width of mature leaves, and the length of mature floral racemes. These were chosen because they are distinctive field characters entailing nondestructive measurements. In Table 2, each entry for leaf ratio is the arithmetic mean of 10 samples (two leaves × five plants). Each entry for raceme length is the mean of five samples because only this number of "hybrid" racemes was found from 1969 to 1972. The null hypothesis was rejected with $P \leq 0.01$ for all six possible sets of unpaired measurements ranked by the Mann-Whitney nonparametric method (Snedecor and Cochran, 1967). Therefore, leaf ratios and raceme lengths differ significantly among the "hybrid" and its purported parents.

To be certain that these are truly hybrids, additional characters must be analyzed and chromosome number compared with those of its purported parents listed in Carlquist (1959).

ACKNOWLEDGMENTS

Mr. Ralph Harris, former park naturalist, Haleakala National Park, alerted me to the Ka-Moa-o-Pele and crater rim plants. Drs. Charles Lamoureux and Douglas Friend, Department of Botany, University of Hawaii, offered valuable suggestions and encouragement.

¹ Manuscript received 6 July 1972.

² Department of Botany, University of Hawaii, Honolulu, Hawaii 96822.

TABLE 1

LOCATION, NUMBER, AND SIZE OF PUTATIVE HYBRIDS OF *Argyroxiphium* × *Dubautia*

LOCATION	MAP COORDINATES	ELEVATION (feet)	NUMBER	HEIGHT (cm)	
				MIN	MAX
Ka-Moa-o-Pele	156°12'30" W 20°43'00" N	7,400	15	5	28
Puu-o-Maui	156°13'00" W 20°43'14" N	7,490	3	9	20
Sliding Sands	156°13'55" W 20°42'48" N	8,160	5	12	30
Crater Rim	156°14'59" W 20°43'13" N	9,640	1	—	40

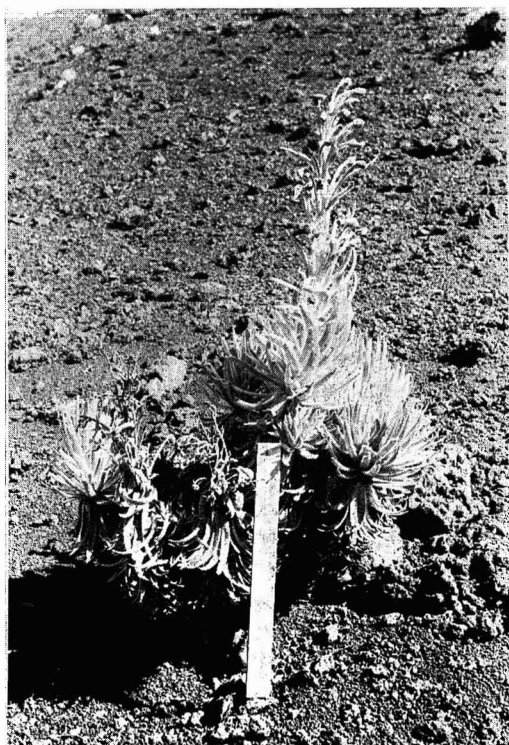


FIG. 1. Largest putative hybrid, *Argyroxiphium sandwicense* × *Dubautia menziesii*. Photograph taken 1 November 1969 on Sliding Sands Trail, Haleakala. Stick length 12 inches.

LITERATURE CITED

CARLQUIST, S. 1959. Studies on *Madinae*: anatomy, cytology, and evolutionary relationships. *Aliso* 4(2): 171-236.

TABLE 2

MEASURED CHARACTERISTICS
PUTATIVE HYBRIDS AND PURPORTED PARENTS

PART	ARITHMETIC MEAN		
	KUPAOA	"HYBRID"	SILVER-SWORD
Mature Leaf, Length/ Width	4	9	20
Mature Raceme, in Centimeters	2	20	60

- DEGENER, O. 1940. *Flora Hawaiiensis*. Book 4. Privately published by the author, Honolulu.
- KECK, D. D. 1936. The Hawaiian silverswords: systematics, affinities, and phytogeographic problems of the genus *Argyroxiphium*. Occ. Pap. Bishop Mus. 11(19): 1-38.
- MITCHELL, A. L. 1945. Checklist of higher flowering plants, grasses, sedges, rushes and ferns of the Haleakala Section, Hawaii National Park with lists of plants growing in several specific localities. Mimeographed. Haleakala National Park, Maui, Hawaii. 44 p.
- SHERFF, E. E. 1935. Revision of *Tetramolopium*, *Lipochaeta*, *Dubautia*, and *Railliardia*. Bull. Bishop Mus., Honolulu 135: 1-136.
- SNEDECOR, G. W., and W. G. COCHRAN. 1967. Statistical methods. Iowa State Univ. Press, Ames. 593 p.
- STONE, B. C. 1967. A review of the endemic genera of Hawaiian plants. *Bot. Rev.* 33(3): 216-259.