

***Delissea rhytidosperra* H. Mann (Campanulaceae) and
Phyllostegia kahiliensis H. St. John (Lamiaceae)
possibly extinct on Kaua‘i, Hawaiian Islands¹**

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Of the estimated 1191 native flowering plant and fern species in Hawai‘i, ca. 10% have not been documented for many years and are presumed to be extinct. Two possible new plant extinctions on Kaua‘i are reported here, *Delissea rhytidosperra* H. Mann (Campanulaceae) and *Phyllostegia kahiliensis* H. St. John (Lamiaceae), bringing the total number of known or possible/probable plant extinctions in Hawai‘i to 112 taxa (Wood 2007, 2012, 2014). The pronouncement of extinction is potentially fallible and is here inferred from the absence of observation/collection records and the passing of all known wild individuals (Wood 2012). A current analysis of Hawai‘i’s plant extinctions by the author indicate that 44% involved birds for pollination services and 96% depended on birds for seed dispersal. It is relevant to note that the Hawaiian Islands have lost 79 native bird species to extinction and are left with only 32 (James & Olson 1991; Olson & James 1991; Burney *et al.* 2001; Boyer 2008). With two-thirds of the surviving forest bird species in Hawai‘i being critically endangered and a continued decline in native arthropods, there is grave concern for the endangered Hawaiian flora and for their unique insular relationships with biodiversity as a whole. Even today, little is known about the life cycles, breeding system variations, and habitat preferences found in the Hawaiian flora. The great majority of Hawaiian plant extinctions (i.e., 35 taxa) have occurred in the Hawaiian lobeliads (Campanulaceae), a family renowned for their co-evolution with Hawai‘i’s honeycreeper birds, in the endemic subfamily Drepanidinae of the Fringillidae or finch family (Wood 2014). The Lamiaceae or mint family falls second in Hawaiian plant extinctions with 16 members having no known wild individuals remaining. Besides the decline of native pollinators and seed dispersers (Kearns *et al.* 1998; Milberg & Tyrberg 1993; Wood 2012), an increase in endemic plant extinctions throughout the islands of Oceania is commonly associated with habitat deterioration from invasive non-native plants and animals, anthropogenic factors that further the loss and fragmentation of natural habitats, devastation by severe storms, and a weak regional conservation ethic with inadequate funding. Other prominent factors indicating plants are at risk of extinction are their low historic population densities, very narrow geographic range, and strict habitat requirements (Sakai *et al.* 2002; Wood 2007), all of which correlate closely to the possible extinction of *Delissea rhytidosperra* and *Phyllostegia kahiliensis*.

Campanulaceae

***Delissea rhytidosperra* H. Mann Possibly extinct**

The endemic Hawaiian genus *Delissea* Gaudich. was historically known from 15 species distributed across all the main Hawaiian Islands except Kaho‘olawe, with each endemic to a single island (Lammers 2005). Two taxa, *D. kauaiensis* (Lammers) Lammers and *D.*

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rhytidosperma, are recognized from Kauaʻi. *Delissea kauaiensis* is currently known from only six mature and two immature individuals and *D. rhytidosperma* is reported here as recently extinct in the wild, bringing the total number of extinct *Delissea* species to twelve, with the remaining three on the edge of extinction.

Specimens of *Delissea rhytidosperma* were historically collected in several Kauaʻi mesic forest locations, namely Hanakāpīʻai, Hanapēpē, Hāʻupu, Kēālia, Kīpū, Limahuli, Wahiawa, and Wainiha (HBMP 2011; Lammers 2005). In recent decades botanists have monitored relictual colonies in the Hanakāpīʻai, Hāʻupu, and Limahuli Valleys and the National Tropical Botanical Garden (NTBG) has successfully brought this species into cultivation. It is recommended that further careful efforts be made to rediscover *D. rhytidosperma* near previously known colonies around Hanakāpīʻai and Hāʻupu and new efforts be initiated to explore some of the mesic cliffs and steep slopes of Kēālia and Moloaʻa Forest Reserve.

Material examined. KAUAʻI: Mt. Hāʻupu (Hoary Head Range), below Queen Victoria profile, rock outcrop, north exposure, 980 ft elev., multi-branched shrub of 4 ft, 12 Jan 1984, *Flynn 737* (PTBG); *loc. cit.*, 12 Jan 1984, *Flynn 738* (PTBG); *loc. cit.*, 12 Jan 1984, *Flynn 739* (PTBG); *loc. cit.*, 12 plants, 2–10 ft height, with flower and fruit, 27 Feb 1992, *Perlman, Wood & Flynn 12611* (PTBG); *loc. cit.*, 4 plants, 9 seedlings, 2–3 ft height, with fruit, 900 ft elev., 20 Oct 1994, *Perlman & Wood 14478* (PTBG); *loc. cit.*, 12 plants, 1.5–2.5 m tall, plants scattered on cliff, 23 May 2001, *Perlman 17562* (PTBG); *loc. cit.*, 988 ft elev., 22 Jul 2004, *Tangalin 147* (PTBG); *loc. cit.*, 320 m elev., 19 Aug 2005, *Tangalin 426* (PTBG); Hanakāpīʻai Valley, east side of stream, 5 plants, 820 ft elev., 29 Dec 1999, *Perlman et al. 16918* (PTBG).

Lamiaceae

Phyllostegia kahiliensis H. St. John Possibly extinct

Phyllostegia Benth. is composed of 34 species, 32 of which occur in the Hawaiian Islands. Intriguingly there are two disjunct extra-Hawaiian species that include a single species from Tahiti and one from Tonga (Wagner 1999). Seven species are recognized on Kauaʻi, all are single island endemics, with four federally listed as endangered (USFWS 2010) and the remaining three deserving of endangered status. Wood (2012) recently reported the extinction of *P. knudsenii* Hillebr. and hereby reports the possible extinction of *P. kahiliensis*, a species that historically exhibited a very narrow geographic range along with a very low population density. Of the five remaining Kauaʻi species, *Phyllostegia electra* C.N. Forbes has no status, but should be listed as endangered as it is only observed on rare occasions. *Phyllostegia renovans* W.L. Wagner hovers in numbers of around 50 wild individuals, while *P. helleri* Sherff, *P. wawrana* Sherff, and *P. waimeae* Wawra have each diminished to less than ten. The Kauaʻi Plant Extinction Prevention Program (PEPP) and NTBG have prioritized such taxa and efforts are ongoing to search for new individuals and facilitate conservation collections. Kāhili Mountain, the holotype locality and only known location for *P. kahiliensis*, is characterized by steep jagged ridges and precipitous side slopes that drop into numerous small headwater drainages dominated by native plant taxa. *Phyllostegia kahiliensis* has not been successfully cultivated and it is highly possible that rough-terrain field surveys around the Kāhili region may lead to its rediscovery.

Material examined. KAUAʻI: steep, moist slope just below the summit of Kāhili Peak, to the south, 860 m, 4 Jan 1974, *Fay 156* (holotype, PTBG; isotype, BISH); Wahiawa Mountains (Kāhili region), along ridge north of microwave relay towers, 2800–3000 ft elev., 26 Jun 1987, *Flynn et al. 2228* (PTBG); above Wahiawa Bog, between TV relay station and first peak on W side of Mt. Kāhili, 855 m elev., 22 Dec 1983, *Wagner et al. 5217* (BISH).

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