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On the identity of *Gahnia lanaiensis* O. Deg., I. Deg. & J. Kern (Cyperaceae) of Hawai'i[1]

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When Degener *et al.* (1964) described *Gahnia lanaiensis* as a new endemic species from the island of Lāna'i, the authors speculated that its closest taxonomic affinity was with *G. melanocarpa* R. Br. of eastern Australia, based mainly on the similarity of the color and grooved endocarp of the achenes and the spikelets bearing only four glumes. The first two authors (1965) even suggested that *G. lanaiensis* might actually represent plants of *G. melanocarpa* introduced into Lāna'i by George C. Munro. Wagner *et al.* (1999: 1410) accepted the species, while noting that its endemic status was in question.

Gahnia lanaiensis, however, clearly differs from *G. melanocarpa* in details of the spikelets and achenes. In *G. lanaiensis,* the oblanceolate spikelets are 6–7 mm long and usually bear 5 glumes, of which the outer 3, each bearing a ca 1 mm long awn, much surpass the subtending achene, whereas in *G. melanocarpa* the elliptic spikelets are only 4–5 mm long and invariably bear only 4 glumes, of which the short-awned outer 2 are slightly shorter than or barely overtopping the subtending achene. The achenes of *G. lanaiensis* are 3.5–4.0 mm x 1.5–1.8 mm and have a cuneate base (Fig. 1B), while those of *G. melanocarpa* are 3.0–3.5 mm x 1.7–2.0 mm, with a contracted base (Fig. 1D). Thus, *G. lanaiensis* is clearly not identical with *G. melanocarpa*, but is instead without doubt specifically distinct from the latter.

On the other hand, a close comparison of *G. lanaiensis* and *G. lacera* (A. Rich.) Steud. of New Zealand reveals a complete match between these two entities in the particular features of the spikelets and achenes just discussed above (Fig. 1A, 1B). In addition, the fact that the inner walls of the achene pericarp in *G. lanaiensis* (Fig. 1C) and *G. lacera* (Fig. 1A) are equally rugose with 3–5 wrinkles, and that the leaf sheaths of both species are dark purple-brown, almost blackish, in contrast to the rather light purplish brown leaf sheaths of *G. melanocarpa,* also substantiate the conclusion that these two species are one and the same.

Benl (1940), in his monograph of the genus *Gahnia,* placed *G. lacera* rather remotely from *G. melanocarpa*, stating that the achene pericarps of the former are hardly or indistinctly rugose, in contrast to the conspicuously rugose pericarps of the latter. However, our observations are that the achene pericarps of both *G. melanocarpa* and *G. lacera* are similarly rugose, and Benl's distinction does not hold true. Furthermore, we do not understand why the Degeners and Kern described the spikelets of *G. lanaiensis* as having only 4 glumes, when examination of type material and other named vouchers reveal that the spikelets normally bear 5 glumes. Such circumstantial evidence suggests

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that the Degeners and Kern may thus have been led astray from considering *G. lacera* as the correct identification for the species, instead describing it as a new Hawaiian endemic, *G. lanaiensis*.

Distribution of *Gahnia lacera*

Endemic to New Zealand's North Island, *G. lacera* is adapted to a variety of substrates that may be seasonally waterlogged, though otherwise dry (New Zealand Plant Conservation Network 2008). It is typically found in scrub or open forests near the coast, rarely extending up to 500 m elev in mountain ranges close to the sea (New Zealand Plant Conservation Network 2008; Moore & Edgar 1970: 212), although its elevational range can reach 760 m (Cheeseman 1925: 240).

Various botanists had collected on Lāna'i in the late 1800s and early 1900s, as described by G.C. Munro in *The Story of Lāna'i* (Munro 2007: 68–69): "Mann and Brigham botanized there in 1864, Hillebrand and Lydgate in 1870, Rock in 1910, Forbes in 1913. I made three nearly complete collections of the plants, one for the Bishop Museum, one for the Hawaiian Sugar Planters Association, and mounted one for myself. I worked on these until April 1926, when all my collections were disposed of to the Bishop Museum." Yet, while collections during this time were made of the native *Gahnia beecheyi* H. Mann and *G. gahniiformis* (Gaudich.) A. Heller [=*Morelotia gahniiformis* Gaudich.], no other *Gahnia* species were recorded on Lāna'i during this time. Even among Munro's extensive Lāna'i collections, the only *Gahnia* specimens at BISH are of *G. beecheyi (Munro 127, 159, 503)* and *G. gahniiformis (Munro 129, 160, 261),* nor is there mention of any other *Gahnia* species in Munro's field books stored at Bishop Museum's *Herbarium Pacificum* (BISH).

The earliest voucher specimen of *G. lacera* [as *G. lanaiensis*] at BISH was collected in 1938 (*H. St. John & E.Y. Hosaka 18866)* by the summit cabin atop Lāna'ihale, where it was described as "apparently introduced." Subsequently, *G. lanaiensis* was described in 1964 (Degener *et al.* 1964) from material collected in 1963 by the Degeners. The population was described as consisting of four or five clumps in open scrubby wet forest at ca 915 m elevation on and around the fog belt of Lāna'ihale (Degener & Degener 1965).

Born and raised in New Zealand, Munro was the Resident Manager of Lāna'i Ranch between 1911 and 1930 (Black 2001: 19). His brother, Hugh S. Munro, collected seed of the native plants of New Zealand for use by Munro on Lāna'i (Munro 2007: 74), and "Under Munro's environmentally focused stewardship, strenuous efforts were put forth to reforest the island's single volcanic mountain (Lanai Hale)" (Black 2001: 19). Degener & Degener (1965) conceded that "Though a copy of [G.C. Munro's] manuscript of introductions and plant observations in the authors' library does not mention any sedge of this sort, it is possible that a nutlet foreign to our flora may have been introduced inadvertently. We therefore surmise that if *G. lanaiensis* is not endemic to Lanai, it may be found growing native somewhere in Australia or possibly New Zealand." *Gahnia lacera* likely arrived on Lāna'i—intentionally or unintentionally—through Munro's environmental reforestation efforts, although no direct evidence has yet come to light to confirm it.

Nomenclature

Gahnia lacera (A. Rich.) Steud., 1855: 164. Hook. f., Handb., 1867: 306. Benl, 1937: 378; 1940: 187, f. 14A.

Lampocarya lacera A. Rich., 1832: 109. Hook. f., 1853: 277.

Gahnia lanaiensis O. Deg., I. Deg., & J.Kern, 1964: 349, f. 1; O. Degener & I. Degener, 1965: Fam. 48. Wagner, Herbst & Sohmer, 1999: 1410. **Syn**. **nov**.

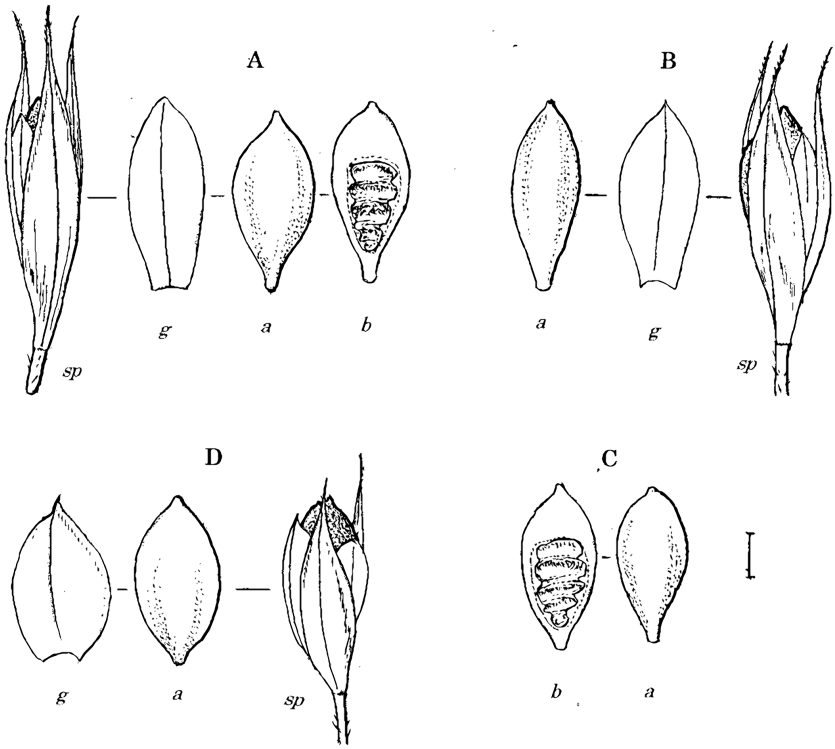

Fig. 1. Comparison of spicular details among *Gahnia lacera, G. lanaiensis, & G. melanocarpa*. **A**, *Gahnia lacera* from New Zealand, *Melville & Godly 6574* (BISH). **B**, *G. lanaiensis* from Lāna‘i, Hawai‘i, *St. John & Hosaka 18866* (BISH). **C**, *G. lanaiensis* from Lāna‘i, Hawai‘i, *Hobdy 389* (BISH). **D**, *G. melanocarpa* from Australia, *Convey et al. 7368* (NSW).—-a, achene; b, longitudinal section of achene; g, inner glume subtending achene; sp, spikelet. Scale bar = 1 mm. Drawn by T. Koyama.

Material examined. **LĀNA‘I**: E of Munro Trail and north of Lāna‘ihale, in shrubby rainforest, 915 m (3000 ft), 4 Sep 1963, *O. & I. Degener 28431* (L, type); Lāna‘ihale, Pālāwai, moist woods, tufts by summit cabin, apparently introduced, 1065 m (3500 ft), 15 Apr 1938, *H. St. John & E.Y. Hosaka 18866* (BISH); growing on the very summit of Lāna‘ihale, in a large spreading clump, 1027 m, 8 Nov 1978, *R. Hobdy 389* (BISH); Ha‘alelepa‘akai, east side of Munro Trail road, one of several clumps known from this area, all populations suspiciously located at trailheads or along road where G.C. Munro was known to plant introduced exotics, 1020 m (3340 ft), 13 Feb 1997, *K.R. Wood 6000* (BISH); Kehewai Gulch headwaters, single clump observed in small headwater drainage, 930 m, 15 Aug 2006, *H. Oppenheimer H80620* (BISH).

Conservation Implications

Because *Gahnia lanaiensis* was considered an endemic sedge known from only 15–16 plants restricted to a small area on a single Hawaiian Islands (Lāna‘i), it was regarded as rare and in danger of extinction due to random environmental perturbations. Thus, in 1991 the U.S. Fish and Wildlife Service officially designated it an endangered species (Herbst

1991). In light of the revelation that *G. lanaiensis* is actually synonymous with the introduced, naturalized *G. lacera,* its endangered status needs to be revoked and the species delisted.

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