

## Notes on grasses (Poaceae) in Hawai‘i: 3<sup>1</sup>.

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Additional new records for the grass family (Poaceae) are reported for Hawai‘i, including five state records, three island records, one corrected island report, and one cultivated species showing signs of naturalization. We also point out minor oversights in need of correction in the *Flora of North America* Vol. 25 regarding an illustration of the spikelet for *Paspalum unispicatum*. Herbarium acronyms follow Thiers (2010). All cited specimens are housed at the *Herbarium Pacificum* (BISH) apart from one cited from the Missouri Botanical Garden (MO) for *Paspalum mandiocanum*, and another from the University of Hawai‘i at Mānoa (HAW) for *Leptochloa dubia*.

### *Anthoxanthum odoratum* L.

### New island record

This perennial species, which is known by the common name vernalgrass, occurs naturally in southern Europe but has become widespread elsewhere (Allred & Barkworth 2007). Of potential concern in Hawai‘i is the aggressive weedy tendency the species has shown along the coast of British Columbia, Canada, where it is said to be rapidly invading moss-covered bedrock of coastal bluffs, evidently to the exclusion of native species (Allred & Barkworth 2007). The species has been recorded previously on Kaua‘i, Moloka‘i, Maui, and Hawai‘i (Imada 2008).

*Material examined.* O‘AHU: Mt Ka‘ala Road, west mesic roadside, without date, *US Army 123* (BISH 738557).

### *Deschampsia caespitosa* (L.) P. Beauv.

### New state record

subsp. *beringensis* (Hultén) W. E. Lawr.

As treated by many recent authors, *Deschampsia caespitosa* is widespread and ecologically common across much of the boreal and north-temperate zones (Wu & Phillips 2006; Barkworth 2007). This circumboreal species, known as Beringian hairgrass or tufted hairgrass, occurs on the American mainland at higher elevations into southern California east through New Mexico, and in the Appalachian Mountains south through Alabama. The native distribution of subspecies *beringensis* is said to be the “northwest coast of North America” (Barkworth 2007). The taxonomy of *D. caespitosa* is complicated, and it has not been studied adequately across its range (Barkworth 2007; Wu & Phillips 2006). Wagner *et al.* (1999) discussed the differences of taxonomic opinion in Hawai‘i regarding *D. caespitosa* and the Hawai‘ian endemic *D. nubigena* Hillebr. As presently understood, *Deschampsia caespitosa* subsp. *beringensis* can be diagnosed from *D. nubigena* by its wider leaves (2–4 mm, versus 0.5–1.5 mm in *D. nubigena*), longer spikelets (4.5–8.0 mm, versus 3.5–5.5 mm in *D. n.*), longer first glume (4.3–7 mm, versus ca 3.5 mm in *D. n.*), longer second glumes (4.4–7.5 mm, versus ca 4 mm in *D. n.*), longer lemmas (3–5(–7) mm, versus ca 4 mm in *D. n.*), and shorter caryopsis (0.5–1.0 mm, versus ca 1.6 mm in

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*D. n.*) The specimen cited below was said to be common in subalpine shrubland where it was collected. The subspecies is not considered to have weedy tendencies.

*Material examined.* MAUI: East Maui, Makawao Distr, Kula Forest Reserve, Waiakoa Ahupua'a, 6220 ft [ca 1895 m], 20.725713°N, 156.292432°W, 15 Jun 2009, *H. Oppenheimer H60916* & *E. Molina*.

***Dichelachne micrantha* (Cav.) Domin**

**New island record and correction**

Lorence and Flynn (1999) reported *Garnotia acutigluma* (Steud.) Ohwi as an island record for Kaua'i. While reviewing duplicate material at K, Dr. JeF Veldkamp (L) suggested that I compare the specimen cited below to the genus *Dichelachne*. The specimen keys easily to *D. micrantha* (Clayton & Snow 2010) and compares well to other material at the *Herbarium Pacificum*. The changed identification means that *G. acutigluma* is not known from Kaua'i. In contrast, this report is the first for *D. micrantha* from Kaua'i, which has been reported previously for Lāna'i (Imada 2008).

*Material examined.* KAUA'I: Waimea District, Waimea Canyon State Park, Hwy 550 near mile 12, elev. ca 1030 m, ca 22°6'N, 159°40'W [coordinates added *post facto*], 28 Apr 1997, *T. Flynn* & *D.H. Lorence 6145*.

***Leptochloa dubia* (Kunth) Nees**

**New state record**

The native range of this perennial species includes the southwestern USA and northern Mexico, southern Florida, and portions of the Caribbean and South America (Snow 2003). Unlike some annual taxa in the genus (Snow & Simon 1999; Snow 2004), *L. dubia* lacks invasive or weedy tendencies and its potential to spread or become aggressively weedy in Hawai'i probably is low. Its occurrence in Hawai'i also represents the first report for the Pacific (Clayton & Snow 2010). The first specimen cited was collected from open, mixed scrub. The second was collected in enclosure plots where re-vegetation studies are being conducted by the U.S. Geological Survey, probably within 3 km from the first collection.

*Material examined.* MOLOKA'I: Moloka'i Project – Transect 9, Makakupa'ia Ridge, 1900 ft [ca 580 m], 28 Nov 1982, *Char et al. 82.046* (HAW). Kawela, east of road TRA, A-1300 plot, 27 Apr 2010, *J.D. Jacobi s.n.* (BISH 745611).

***Paspalum arundinaceum* Poir.**

**New state record**

Snow and Lau (2010) reported on the uncertain identity of the specimen cited below and suggested affinities to *Paspalum laxum* Lam. The second author has compared the specimen to material at MO and is confident of its identity as *P. arundinaceum*. The species ranges from Belize and Mexico and the Caribbean south to Colombia and Brazil (Zuloaga et al. 2005; Pohl & Davidse 2001). This report is the first for Hawai'i (Imada 2008) and the Pacific (Clayton & Snow 2010), and the absence of reports elsewhere (Koyama 1987; Sharp & Simon 2002; Chen & Phillips 2006) suggests the species does not have invasive tendencies. Users of the key to species of *Paspalum* for Hawai'i (Snow & Lau 2010) can substitute *P. arundinaceum* in the second half of couplet 15 for *P. aff. laxum*.

*Material examined.* MAUI: East Maui, Hāna Distr., Kīpahulu, between Koukouai and 'Ōpelu, Ma'uili ahupua'a, 20.660187°N, 156.067674°W, 207 m [ca 680 ft], 16 Oct 2005, *H.L. Oppenheimer H100509*.

***Paspalum mandiocanum* Trin. var. *mandiocanum***

**New state record**

Despite having been collected as early as 1987, specimens of this taxon in Hawai'i have

remained unidentified confidently until now. The typical variety of *Panicum mandiocanum* is now widely distributed in Hawai‘i, and has been confirmed for Maui, O‘ahu, and Moloka‘i. The native range of the species is Brazil, Uruguay, Paraguay and Argentina. Zuloaga & Morrone (2005) included it in their informal subgeneric group *Corcovadensia*, and recognized also *P. mandiocanum* var. *subaequiglume* Barreto. The latter variety differs from *P. mandiocanum* var. *mandiocanum* by its shorter and narrower leaves, and especially by its upper glume, which is noticeably shorter than the spikelet. Surprisingly, in our effort to identify this species, a previously unidentified collection from Hong Kong (see below) also was discovered to be this species, which evidently also represents the first record for China (Chen & Phillips 2006). Users of the key to species of *Paspalum* for Hawai‘i (Snow & Lau 2010) can substitute *P. mandiocanum* in the first half of couplet 10 in place of *P. aff. thunbergii*.

*Material examined.* HAWAIIAN ISLANDS: **MAUI:** Kuhiwa Rd, 28 Jul 1987, *R.W. Hobdy* 2913, *R.W. Hobdy* 2914. East Maui, lower Waikamoi along pipeline, Dec 2006, *R.W. Hobdy* 4281. Keopuka, UTM NAD 83 Zone 4, 2310977 N, 794198E, 5 Apr 2005, *F. Starr* 050405-50. East Maui, Makawao District, Honokala, 20°47'N, 156°04'W, 540 ft, 14 Jul 2002, *H.L. Oppenheimer* H70202. E. Amui, Hana District, Keopuka, 2310574N, 793587W, 640 ft, 23 Aug 2007, *H.L. Oppenheimer* H80703. **MOLOKA‘I:** Moloka‘i FR, junction of Forestry Rd and rd to Pu‘u Kauwa, 21.137779°N, 156.948179°W, 25 Sep 2008, *H.L. Oppenheimer* H90820. **O‘AHU:** Pupukea-Paumalu, Ko‘olauloa, Ko‘olau Mountains, ca 500 ft, 6 Dec 1987, *K.M. Nagata & W. Takeuchi* 3750. CHINA: **Hong Kong:** Sheung Shui Government Agr. Exp. Sta., 21 Jul 1993, *Hu & But* 22518 (MO).

***Paspalum unispicatum* (Scribn. & Merr.) Nash New state record**

The specimen cited below was sent to the first author by Matt Stevenson, who tentatively identified the species correctly. The native range of the species is from Texas southwards through Central America, parts of the Caribbean, to Argentina, typically in sandy soils (Allen & Hall 2003). This record also appears to be the first from the Pacific region (Clayton & Snow 2010). The vegetative and reproductive characters of the specimen generally matched well with descriptions (Hitchcock 1951; Gould 1975; Allen & Hall 2003), although its rhizomes are somewhat less scaly and prominent compared to images on TROPICOS® (2010) [*Stanford et al.* 2315; *Pringle* 6717 [an isotype]]. In most cases *Paspalum unispicatum* should be distinguishable from congeners in Hawai‘i (Snow & Lau 2010) by the combination of rhizomes, culms less than 1 meter tall, and its prominent terminal inflorescence, which consists of a single branch that bears a spikelet at the tip. In addition, the leaf margins are conspicuously papillose-ciliate and the upper leaf surface is conspicuously hairy. The rachis (central axis of the inflorescence) is flattened but also somewhat curved around the two rows of spikelets. The spikelet illustrated for *P. unispicatum* in *Flora of North America* (Allen & Hall 2003: 600; right-center of the illustration for the species overall) is labeled incorrectly: “lower glume” should read “upper glume”, and the drawing should include two lateral nerves to the right of the midnerve (similar to the two nerves left of the midnerve).

According to Stevenson (pers. comm., 2009), the area from which the specimen was collected has had extensive erosion control measures applied to help stabilize the trail, and that *Paspalum unispicatum* has been effective in this regard. Seed mixtures for re-vegetation were obtained from Koolau Seed and Supply of Kane‘ohe. At the time of the collection the population of *P. unispicatum* was restricted to the trailside, along the upper third of the half-mile long area that had been treated.

*Material examined.* **KAUA'I:** Hanalei, 'Ökolehao Trail, ca 22°11.992'N, 159°28.566'W, 175-325 ft, 30 Jun 2009, *M. Stevenson* & *M. Rosener* 35 (BISH 746803).

**Tragus berteronianus** Schult.

**New island record**

This non-native species has stout hooked prickles arising from the upper glume. In Hawai'i it also has been collected on Kaua'i, Moloka'i, and Maui, but it otherwise has not spread across the Pacific (Clayton & Snow 2010). The label lacks a collection date. *SESP* is an abbreviation for *State Endangered Species Program*, and *SESP* collections at the *Herbarium Pacificum* were made from July 1977 to January 1997. Since the Bishop Museum accession number for this collection label is from 2000, and since two collections of *Eragrostis* also were made by *SESP* on the northern rim of Diamond Head on 30 January 1997, this specimen likely was collected about 14 years ago.

*Material examined.* **O'AHU:** Diamond Head, northern rim, 21°15'N, 157°48'W, no collection date, *SESP* s.n. (BISH 667204).

**Cultivated but with potential to naturalize**

*Melinis nerviglumis* (Franch.) Zizka

This species recently has been observed in cultivation in Wailupe area, Waipi'o, and Hawai'i Kai on O'ahu. At the Wailupe and Waipi'o localities it was reseeding itself in the areas immediately adjacent to where it was being cultivated. In Hawai'i Kai there was no evidence that it was reseeding itself in the one yard where it was found growing along the sidewalk (Snow, pers. obs., 2009). These plants were removed later by the homeowners after having been contacted about their potential to spread (Snow, pers. obs., 2010). The species has not been documented elsewhere in the state, but clearly has shown the ability to self-perpetuate from seed on O'ahu, and as such is a potential weed in Hawai'i. Future reports for Hawai'i are encouraged to follow the terminological recommendations regarding the process of naturalization as summarized by Pyšek *et al.* (2004). The native distribution of *M. nerviglumis* is Madagascar and southern Africa (South Africa, Lesotho, and Swaziland), where it can be locally abundant (Gibbs-Russell *et al.* 1990). The species closely resembles the widespread weedy species *M. repens* (Willd.) Zizka, but can be distinguished from that species by its tightly overlapping basal leaf sheaths, strongly involute leaves, and awns mostly  $\leq 2$  mm long. The panicles on specimens from O'ahu were somewhat more contracted than that typically seen for the weedy *M. repens*, although Lyn Fish (pers. comm., 2009) in Pretoria indicated this is a subtle and not always reliable character for separating *M. nerviglumis* and *M. repens*. Vouchers were not pressed for the plants found at Waipio and Hawai'i Kai. However, they were an excellent match for the voucher cited below, and compared favorably to specimens housed at MO, seen by the first author in May 2010.

*Material examined.* **O'AHU:** Wailupe, at 1132 Waianiani, sparingly adventive, 24 Mar 2009, *Oahu Early Detection* 2009032402.

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**Literature Cited**

- Allen, C.M. & Hall, D.W.** 2003. *Paspalum* L., pp. 566–600. *In*: Barkworth, M.E., K.M. Capels, S. Long, & M.B. Piep (eds.), *Flora of North America* Vol. 25: Magnoliophyta: Commelinidae (in part): *Poaceae*, part 2. Oxford University Press, New York. xxv + 783 pp.
- Allred, K.W. & Barkworth, M.E.** 2007. *Anthoxanthum* L., p. 758–764. *In*: Barkworth, M.E., K.M. Capels, S. Long, L.K. Anderton, & M.B. Piep (eds.), *Flora of North America*, Vol. 24: Magnoliophyta: Commelinidae (in part): *Poaceae*, part 1. Oxford University Press, New York. xxviii + 911 pp.
- Barkworth, M.E.** 2007. *Deschampsia* P. Beauv., pp. 624–633. *In*: Barkworth, M.E., K.M. Capels, S. Long, L.K. Anderton & M.B. Piep (eds.), *Flora of North America*, Vol. 24: Magnoliophyta: Commelinidae (in part): *Poaceae*, part 1. Oxford University Press, New York. xxviii + 911 pp.
- Chen, S.-L. & Phillips, S.M.** 2006. *Paspalum*, pp. 526–530. *In*: Wu, Z.-Y, Raven, P.H. & Hing, D.-Y. (eds.), *Flora of China* Vol. 22: *Poaceae*. Missouri Botanical Press, St. Louis. xii + 733 pp.
- Clayton, D.W. & Snow, N.** 2010. *A key to Pacific grasses*. Royal Botanic Gardens, Kew. 107 pp.
- Gibbs Russell, G. E., Watson, L., Koekemoer, M., Smook, L., Barker, N.P., Anderson, H.M., & Dallwitz, M.E.** 1990. *Grasses of Southern Africa*. Memoirs of the Botanical Survey of South Africa No. 58.
- Gould, F.W.** 1975. *The grasses of Texas*. Texas A & M University Press, College Station. viii + 683 pp.
- Hitchcock, A.S.** 1951. *Manual of the grasses of the United States*. Second edition (revised). Government Printing Office, Washington. 1051 pp.
- Imada, C.** 2008. Hawaiian flowering plants checklist: “Main Hawaiian Islands”. Unpublished, available at: <http://www.bishopmuseum.org/research/natsci/botany/dbandkeys/Main%20Islands%20Report.pdf>
- Koyama, T.** 1987. *Grasses of Japan and its neighboring regions: An identification manual*. Kodansha, Tokyo. x + 570 pp.
- Lorence, D. & Flynn, T.** 1999. New naturalized plant records for the Hawaiian Islands. *Bishop Museum Occasional Papers* 59: 3–6.
- Pohl, R.W. & Davidse, G.** 2001. *Paspalum* L., pp. 2099–2114, and *Oplismenus* P. Beauv., pp. 2080–2081. *In*: Stevens, W.D., C.U., Ulloa, A. Pool, & O.O. Montiel (eds.), *Flora de Nicaragua: Angiospermas (Pandanaeae–Zygophyllaceae)*. *Monographs in Systematic Botany from the Missouri Botanical Garden* 85.
- Pyšek, P., Richardson, D.M., Rejmánek, M., Webster, G.L., Williamson, M. & Kirschner, J.** 2004. Alien plants in checklists and floras: towards better communication between taxonomists and ecologists. *Taxon* 53: 131–143.
- Sharp, D. & Simon, B.K.** 2002. *AusGrass. Grasses of Australia*. CD-ROM plus Users Guide. CSIRO Publishing, Collingwood, Victoria
- Snow, N.** 2003. *Leptochloa* P. Beauv., pp. 51–60. *In*: Barkworth, M.E., K.M. Capels, S. Long, & M.B. Piep (eds.), *Flora of North America* Vol. 25: Magnoliophyta: Commelinidae (in part): *Poaceae*, part 2. Oxford University Press, New York. xxv + 783 pp.
- . 2004. A first report of *Leptochloa panicea* subsp. *brachiata* (Poaceae) from Western Australia. *Nuytsia* 15: 169–170.
- . & Simon, B.K. 1999. Australian distribution of the weedy neotropical grass

- Leptochloa fusca* subsp. *uninervia*, with an updated key to Australian *Leptochloa* (Poaceae). *Austrobaileya* **5**: 299–305.
- . & **Lau, A.** 2010. Notes on grasses (Poaceae) in Hawai'i: 2. *Bishop Museum Occasional Papers* **107**: 46–60.
- Thiers, B.** 2010 (and continuously updated). *Index Herbariorum: A global directory of public herbaria and associated staff*. New York Botanical Garden's Virtual Herbarium. <http://sweetgum.nybg.org/ih/>.
- TROPICOS®** 2010. Missouri Botanical Garden. Accessed: 25 March 2010. <http://www.tropicos.org/>.
- Wagner, W.L., Herbst, D.R. & Sohmer, S.H.** 1999. *Manual of the flowering plants of Hawai'i*. Rev. ed. 2 vols. University of Hawaii Press, Honolulu. xviii + 1918 pp.
- Wu, Z. & Phillips, S.M.** 2006. *Deschampsia* P. Beauv., pp. 332–334. In: Wu, Z.-Y., Raven, P.H. & Hing, D.-Y. (eds.), *Flora of China* Vol. **22**: *Poaceae*. Missouri Botanical Press, St. Louis. xii + 733 pp.
- Zuloaga, F. & Morrone, O.** 2005. Revisión de las especies de *Paspalum* para América del Sur austral (Argentina, Bolivia, sur del Brasil, Chile, Paraguay y Uruguay). *Monographs in Systematic Botany from the Missouri Botanical Garden* **102**: 1–297.