

Notes on grasses (Poaceae) in Hawai‘i: 2¹

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This is the second article (see Snow 2008 for the first) of an anticipated series that reports on the distribution and nomenclature of grass species in Hawai‘i, which continue to arrive steadily into the State and which are still incompletely known (e.g., Catalán *et al.* 2009) (see Imada 2008 and Wagner *et al.* 2005 for more current lists). It may be of interest to botanists and public lands managers that a key to grasses of the Pacific will be available soon (Clayton & Snow, in press).

Reported here for Hawai‘i are 10 extant state records and 2 additional species identified tentatively, 1 historical state record from experimental plots, 1 extirpated state record, 8 island records, 2 name changes, and a few taxonomic notes and corrections. Keys to species of *Paspalum* and *Andropogon* in Hawai‘i are presented in light of new additions to our flora. Some comments about the native species of *Eragrostis* are included, as for example the overlooked occurrence of short rhizomes on some species. A reminder concluding this article emphasizes the critical importance of sampling the entire grass plant (particularly the base and roots) for making correct identifications. All vouchers were identified by the first author, except where noted, and are housed at the *Herbarium Pacificum* (BISH).

Agrostis hyemalis (Walter)

Britton, Sterns & Poggenb.

New state record

This non-native species is widespread in North America from South Dakota and Texas east through Maine, and south into Central America and the Caribbean (Harvey 2007). This is its first report from the Pacific Basin.

Material examined. O‘AHU: Wai‘anae Range, Mākua rim, on 3 Points trail, towards west Makaleha, ca 400–600 m W Ka‘ala Rd, 3 Apr 2007, USARMY 54; outside front gate near Mt Ka‘ala parking area, 3 May 2007, USARMY 56.

Andropogon bicornis L.

New state record

Andropogon bicornis is a widespread species native to the neotropics (Campbell 2003). The specimens cited below had been identified previously as *Andropogon glomeratus*, *A. virginicus*, or *Schizachyrium scoparium*. Using various keys (e.g., Pohl 1980; Renvoize 1984; Campbell 2003), and after consulting comparative material of *A. bicornis* at BISH from its native range that has been identified reliably by A. L. Hitchcock or G. Davidse, we believe these specimens compare well to *Andropogon bicornis*. Two character states differ slightly from typical specimens of the species [see Barkworth (2003: 602–608) for terminology and illustrations of spikelet and inflorescence morphology for tribe Andropogoneae]. First, some of our specimens (e.g., Imada 99-10 *et al.*) have a relatively high number of well-developed pedicellate spikelets, which contrasts with the more typical situation wherein only the terminal pedicellate spikelet of a rame is well-devel-

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oped (Pohl 1980: 42). Second, the length of the anthers can be somewhat less than the 1.0–1.4 mm reported by Campbell (2003). However, the lack of awns on the sessile (fertile) spikelets accords well with descriptions of *A. bicornis* in Renvoize (1984: 275), which is atypical for most species of the genus, and other characters of our material generally compare well with the specimens seen by Hitchcock or Davidse. At the time the collections were made, specimens on Kauaʻi were reportedly occasional (Flynn *et al.* 2079 Wagner & Hanford 6278) to common (e.g., Flynn *et al.* 2717, Imada 2001-58), and ranged from ca 30–910 m. Based on our revised analysis, *A. bicornis* has been collected on Kauaʻi near pond margins, along roadsides, disturbed areas in low elevation rainforests, on ridges at ca 450 m, in stunted forests at ca 655 m, and from dry shrubland at ca 910 m. We believe that the additional specimens cited below represent the same taxon. However, we recommend that additional fertile material be collected in duplicate so that it can be sent to other specialists for confirmation.

Material examined: **KAUAʻI:** Wainiha Valley Road, 18 Sep 1987, *L. Ishii s.n.* (BISH 635082); Hanalei Distr, Limahuli Valley, west side of ridge separating Limahuli and Hanakāpīʻai Valleys, above waterfall, 1600–2060 ft [ca 490–630 m], 10 Dec 1987, *T. Flynn et al.* 2679; Waimea Canyon State Park, Hwy 550 near hunter check-in station, ca mile 7.2, ca 2500 ft [ca 760 m], 27 Jan 1988, *T. Flynn et al.* 2717; along the border of Hanalei and Kawaihau Districts, Forest Reserve lands, summit camp area of the Powerline trail, ca 2150 ft [ca 655 m], 3 Oct 1989, *T. Flynn et al.* 3547; Hanalei District, Hanalei National Wildlife Refuge, above primary taro field, *W.L. Wagner & R. Hanford* 6278, 20 Nov 1989; Waimea Distr, Kahelu Ridge, 22°2′N, 159°43′W, 1400 ft [ca 425 m], 4 Apr 1996, *D.R. Herbst* 9773; Waimea Canyon State Park, Iliau Nature Loop, 22°2′N, 159°39′W, ca 2980 ft [ca 910 m], 7 Mar 1999, *C. Imada et al.* 99-10; Hanalei Distr, Kāhili ahupuaʻa, small excavated pond along feeder stream on east side of Puʻu Ka Ele Reservoir, 22°11′N, 159°23′W, 480 ft [ca 145 m], 27 Sep 2001, *C. Imada* 2001-58.

***Andropogon glomeratus* (Walter)**

Britton, Sterns & Poggenb. var. *pumilus*
(Vasey) L. H. Dewey

Island records and taxonomic note

The specimens of this taxon cited below were annotated for the Oahu Invasive Species Committee by Chris Campbell (1983, 1986, 2003), who has studied the species complex over many years. *Andropogon glomeratus* comprises at least 5 currently recognized varieties in North America (Campbell 2003), but this is the first confirmed identification at the varietal level for Hawaiian material, although it was previously misidentified from Kauaʻi (Herbst & Clayton 1998: 18). In its native range, variety *pumilus* occurs in disturbed and wet sites from the southern United States through Central America into northern South America (Campbell 2003).

Andropogon glomeratus var. *pumilus* is known from Midway, Oʻahu, and Hawaiʻi islands. It was first collected on Midway on 5 January 1979, though it was misidentified as *A. virginicus* (see *A. virginicus* discussion below). According to the specimen label data it had been recently established near the runway. It was first collected in the main islands on Oʻahu in 2002, from Hālawā Valley along the newly constructed H-3 freeway, occasionally growing in dense thickets. After it was originally identified as *Schizachyrium condensatum* an eradication program was started by the Oʻahu Invasive Species Committee (but see note below about confirmed distribution of *S. condensatum* in Hawaiʻi). It was next collected from the Big Island in 2003 in the Kahuku unit of Hawaii Volcanoes National park, where it was a common grass in pastures at 700 m.

In Hawaiʻi, *A. glomeratus* var. *pumilus* grows in a wide range of habitats, such as in ditches and disturbed areas of an atoll, mesic to wet areas of disturbed lowland sites, secondary

forests from sea level to 700 m, and the windward Ko'olau Pali on O'ahu. It has been reported but not confirmed from native forest slopes on the leeward side of the Ko'olau summit.

Material examined: **MIDWAY ATOLL:** Sand Island, inland from West Beach, 28°13'N, 177°26'W, 23 Oct 1998, *J.T. Duncan s.n.* (BISH 661392); Sand Island, west Beach trail-cart path, 28°13'N, 177°26'E, 7 Sep 1999, *F. Starr & K. Martz 990407-1*; edge of runway, 5 Jan 1979, *C. Corn s.n.* (BISH 667024); Sand Island, Jan 1993, *K. McDermond s.n.* (BISH 634271). **O'AHU:** Hālawa Valley, 840 ft [ca 255 m], 28 Sep 2005, *A. Lau OISC 002*; 'Āhuimanu, 1030 ft [ca 315 m], 25 May 2006, *K. Metzler A004*; H-3 Fwy on Honolulu side near entrance, ca 1/3 of way down declining section of road, 21°24'N, 157°50'W, ca 1000 ft [ca 305 m], 8 May 2002, *K. Kawelo s.n.* (BISH 687841); Temple Valley residence, 47-464 Hui Kulu St, 19 Jan 2005, *J. Fisher OISC s.n.* (BISH 718772). **HAWAII:** Hawaii Volcanoes National Park, Kahuku Unit, Ka'ū District, ca 700 m [ca 2295 ft], 21 Jul 2003, *T. Tunison s.n.* (BISH 734261).

Andropogon virginicus* L. var. *virginicus

Taxonomic notes

Andropogon virginicus was first collected in Hawai'i on the Big Island in 1924, where it can be abundant and dominate roadsides and disturbed dry to mesic areas, particularly on ridges (Wagner *et al.* 1999). The species also occurs on Kaua'i, O'ahu, Moloka'i, and Maui, although the varietal status of many collections has not been determined. It was reported previously from Midway Atoll, but all collections at BISH were misidentified. Variety *virginicus* is one of three varieties in the species complex (Campbell 1986). In its native range it occurs from Kansas to southern New England south through Colombia (Campbell 2003). The species also is known to hybridize with *A. glomeratus*. The specimens cited below were annotated by Campbell to the varietal level.

Material examined: **KAUAI:** Kōloa Distr, Līhu'e-Kōloa For Res, Wahiawa Mtns, S. of Kapalaoa, along main Wahiawa Strm, 21°59'00"N, 159°30'30"W, 660 m [ca 2165 ft], 8 Sept 1998, *D.H. Lorence & A. Stone 8384* (dups at PTBG, K, US). **O'AHU:** Peacock Flat, Wai'anae Mtns, 1600 ft [ca 490 m], 6 Sep 1973, *G. Spence 210*; Maunawili, naturalized grass in backyard, 28 Sep 1995, *G. Tam s.n.* (BISH 641686).

Excerpting in part from the key provided by Campbell (2003: 651–652), the 3 species of *Andropogon* in Hawai'i can be separated based as such:

1. Sessile (fertile) spikelet of pair awnless; anthers 3 *A. bicornis*
1. Sessile (fertile) spikelet of pair awned; anthers 1 (rarely 3) (2).
- 2(1). Inflorescence in the field appearing somewhat diffuse, distributed somewhat along the culm but not resembling a broom; leaf blades 11–52 cm long; sheaths smooth, rarely somewhat scabrous; ligules 0.2–1 mm long; keels of the lower glumes usually smooth below mid-length, scabrous distally *A. virginicus* var. *virginicus*
2. Inflorescence in the field appearing dense, located at or near the top of the culms and somewhat resembling a broom; leaf blades 13–109 cm long; sheaths usually scabrous; ligules 0.6–2.2 mm long; keels of the lower glumes sometimes scabrous below midlength *A. glomeratus* var. *pumilus*

To summarize the distributions in Hawai'i of the above three species and 2 others from the morphologically similar genus *Schizachyrium*: 1) *Andropogon bicornis* is known from Kaua'i; 2) *Andropogon glomeratus* var. *pumilus* is newly reported here for Midway, O'ahu and Hawai'i but previously was reported incorrectly from Kaua'i; 3) *Andropogon virginicus* is known from Kaua'i, O'ahu, Moloka'i, Maui, and Hawai'i; it was reported incorrectly from Midway and Lāna'i; 4) *Schizachyrium condensatum* was reported previously but incorrectly

from O'ahu (Herbst & Clayton 1998) but is confirmed from the Big Island (Lorence & Flynn 1995); and 5) *Schizachyrium scoparium* is known from Kaua'i, O'ahu, and Maui.

***Brachiaria decumbens* (Stapf) Webster** **New state record**

This species, also known as *Urochloa decumbens* (Stapf) R.D. Webster, is native to Central Africa and has been introduced in various areas as a pasture grass (see comments below regarding *Brachiaria* and related genera). In the Pacific Basin it is also known from the Solomon Islands (Clayton & Snow, in press). In Clayton & Snow (in press) it keys adjacent to, and resembles closely, *B. brizantha* (Hochst. ex Rich.) Stapf. However, *B. decumbens* differs from *B. brizantha* by its flatter and wider (1.0–1.7 mm) raceme branches and somewhat prostrate to stoloniferous growth form (Sharp & Simon 2002). Several specimens in Hawai'i formerly treated as *B. brizantha* are re-determined below. Based on current holdings at BISH, *B. brizantha* appears to be limited to a single collection from Maui (Oppenheimer 2008: 31) collected from the Hāna District, apart from an experimental planting from 1940 on O'ahu (*Hosaka 2553*).

Material examined. **KAUAI:** Kōloa Distr, Kalāheo, roadside bank along Ikala Rd, 21°55'48"N, 159°30'57"W, 249 m [ca 815 ft], 15 Oct 2007, *C. Trauernicht 208 & M. Clark*; Kōloa Distr, Kalāheo, vacant lot near junction of Kikala and Wawe roads, 224 m [ca 735 ft], 15 Oct 2007, *T. Flynn 7371*. **MOLOKA'I:** Hawai'i Plant Materials Center, extremely vigorous growth, probably introduced as a contaminant from seed shipment from Australia, Apr 1993, *R. Joy s.n.* (BISH 634161). **KAHO'OLAWA:** Moa'ulanui, near K1 where it heads into the crater, 5 m mauka of rd. (20°33'N, 156°34'W), 395 m [ca 1295 ft], 7 Jun 2004, *F. Starr & K. Starr 040607-4*. **HAWAII:** South Hilo Distr, Hwy 11 near Hilo, 90 m [ca 295 ft], 17 Jun 2003, *L.W. Pratt 3341*.

***Brachiaria plantaginea* (Link.) Hitchc.** **New island record**

This naturalized species has been known previously on O'ahu, Moloka'i, and Maui (Imada 2008).

Material examined. **HAWAII:** Ka'ū Distr, Hwy 11, 49–50 mile marker, 4 Jun 2001, *K.F. Bio 01-0028-01*.

***Brachiaria* (Trin.) Griseb. and *Urochloa* P. Beauv. Taxonomic note**

Some workers have asked the senior author about the nomenclature and generic relationships of *Brachiaria*, *Urochloa*, and related genera, given that some taxonomists have transferred many species from *Brachiaria* into *Urochloa* or *Moorochloa* Veldkamp (Webster 1987; Morrone & Zuloaga 1992; Veldkamp 1996; Simon & Jacobs 2003; Wipff & Thompson 2003; Reinheimer *et al.* 2005). In brief, the morphological, developmental, and molecular data do provide strong cladistic support for generic boundaries. For example, a recent study focusing on spikelet development over a much wider sampling of the tribe Paniceae (Bess *et al.* 2005, Fig. 1) showed *Urochloa* sensu lato (*i.e.*, including elements of *Brachiaria*, *Eriochloa*, *Melinis* P. Beauv., and *Chaetium* Nees) to be polyphyletic. A similar developmental study uncovered eleven developmental traits that are not discernable on mature inflorescences, which (when better understood) might help understand generic relationships (Reinheimer *et al.* 2005). Studies of DNA sequencing using *ndhF* (Aliscioni *et al.* 2003) and nuclear ribosomal markers (Torres González & Morton 2005) found no support for the generic separation of *Brachiaria*, *Megathyrus* (as *Urochloa maximum*), *Urochloa*, *Melinis*, and *Eriochloa* Kunth. Although the earlier insights of Webster (1987) and Veldkamp (1996) ultimately may be upheld with additional data such that all members of

the “*Urochloa* clade” (Aliscioni *et al.* 2003, Fig. 5) are transferred into an enlarged *Urochloa*, additional studies are warranted. Until then, it seems better to follow Imada (2008), who has maintained Hawaiian species in *Brachiaria*. A more traditional view of these genera can be found in Clayton & Renvoize (1986).

***Digitaria bicornis* (Lam.) Roem. & Schult. New state record**

This species is native from the coastal plain of the southeastern United States to the West Indies and northern South America (Wipff 2003), although it is widespread elsewhere (Sharp & Simon 2002). It is easily distinguished in Hawai‘i from congeners by the slightly ciliate, short-pedicillate spikelet of a spikelet pair, which is coupled with a long-pedicellate spikelet having appressed to widely divergent, often wavy hairs that may be 1–2 mm long. The collection label indicates the species was locally common in an old pasture.

Material examined. MAUI: West Maui, Wailuku Distr, Waikapū, Kaunoahua (20.822128°N, 156.517394°W), 590 ft [ca 180 m], 22 Feb 2008, *H. Oppenheimer H20816*.

***Eragrostis deflexa* Hitchc. New island record**

The specimen cited was collected in the understory of scrubby mesic *Metrosideros* forest. Previous reports are from Lāna‘i, Maui, and Hawai‘i (Imada 2008).

Material examined. MOLOKA‘I: Kamakou Preserve, land section Makakupa‘ia, confluence of the Kūpā‘ia and Kaunakakai streams, 823 m [ca 2700 ft], 13 Jun 1990, *J. Lau & J. Obata 3289* (2 sheets).

***Eragrostis dielsii* Pilger ex Diels & Pritz. New state record**

This species is widespread across the interior of Australia, where it closely resembles another (mostly) inland species, *E. pergracilis* S.T. Blake (Sharp & Simon 2002). In Hawai‘i, *E. dielsii* most closely resembles *Eragrostis paupera* Jedw. by virtue of its linear spikelets. The latter is native to the equatorial region of the Pacific (Clayton & Snow, in press) and in Hawai‘i occurs in the Northwestern Hawaiian Islands on coral sands or gravel, often as a pioneer species (Wagner *et al.* 1999; Wagner *et al.* 2005). The following key should separate most specimens of *E. dielsii* and *E. paupera*:

Plants annual or perennial; culms prostrate to geniculate or ascending (only sometimes erect), up to 55 cm tall; panicles exerted completely, the apex somewhat to considerably exceeding uppermost leaves; second glume ca 1.5 mm long *E. dielsii*

Plants perennial; culms mostly stiffly erect, up to 20 cm tall; panicles usually partially inserted near the base, the apex shorter than or only slightly exceeding tips of uppermost leaves; second glume ca 2 mm long *E. paupera*

The habit of the specimen of *E. dielsii* from Moloka‘i cited below is reported as “flat starburst, not at all upright”, whereas that of *E. paupera* is said to be “strictly erect” (Wagner *et al.* 1999: 1543). According to the collection label the species was growing in sand near the coast and was locally common.

Material examined. MOLOKA‘I: Kalama‘ula, west of Kaunakakai, ‘Ōhi‘apilo wetland (N21.10267, W157.05107), ca 5 m [17 ft], 24 Feb 2008, *A. Dibben-Young s.n* (BISH 731529).

***Eragrostis variabilis* (Gaud.) Steud. Taxonomic note**

Eragrostis hobdyi H. St. John was overlooked as a synonym for this species in Wagner *et al.* (1999).

Eragrostis pectinacea (Michx.) Nees
var. *miserrima* (E. Fourn.) Reeder

**Historical state record and
taxonomic note**

The typical subspecies is known from all the larger islands of Hawai‘i. The specimen cited below is the first report of var. *miserrima* for Hawai‘i. However, since it appears to be extirpated in Hawai‘i, it probably should not be tabulated as an element of our flora unless it is recollected. More generally, Clayton & Snow (in press) discuss how species lists that include non-native taxa that have been extirpated long ago overinflate true estimates of extant biodiversity.

Material examined. KAUA‘I: Hanapēpē, in pasture, local patch, dry place, 75 m [ca 250 ft], 31 Oct 1936, E.Y. Hosaka 1647.

Eragrostis pilosa (L.) P. Beauv.

New island record

This naturalized species has been collected previously from Kaua‘i and Lāna‘i (Imada 2008).

Material examined. O‘AHU: Near Weed Junction, Waialua, common along sterile roadside, 22 Jan 1958, O. & I. Degener 25648.

Eragrostis trichophora Coss. & Durieu

New state record

This species is native to Africa, where it is said to typically occupy moist, disturbed, or overgrazed areas (Peterson 2003). The specimen is a good match overall to the description provided in Peterson (2003), although some synonymize it under *Eragrostis cylindriflora* Hochst. (D. Clayton, pers. comm., 2008). The species can be distinguished from others in Hawai‘i by the whorled branches at the base of the panicle and the subtending glandular band, the papillose-based hairs over most of the leaf sheaths, subequal glumes, membranous lemmas with inconspicuous lateral nerves, and the light brown, translucent caryopsis, which has a greenish hue at the base.

Material examined. MAUI: Kanahā Pond on causeway, dry hard soil, 17 Jan 1981, R. Hobdy 976.

Notes on Hawaiian species of *Eragrostis*

Species boundaries can be difficult to consistently quantify or qualify in *Eragrostis* using morphological characters (e.g., Lazarides 1997). During the recent preparation of a key to *Eragrostis* (Clayton & Snow, in press) several noteworthy pieces of information emerged for the genus in Hawai‘i. First, the genus is badly in need of revision in Hawai‘i, particularly with regards to the specific boundaries of the highly polymorphic but widespread (in Hawai‘i) *Eragrostis variabilis* (Gaudich.) Steud. Second, Wagner *et al.* (1999) explicitly mention rhizomes only for *E. atropioides* Hillebr., but four other Hawaiian species also may have shorter, less prominent rhizomes, including *E. fosbergii* Whitney, *E. grandis* Hillebr., *E. leptophylla* Hitchc., and *E. variabilis*. The rhizomes of the latter two species appear short and knotted on herbarium specimens, and *E. fosbergii* is known only from the type specimen. Third, the specimen (Hitchcock 14493) used to illustrate *E. atropioides* in Wagner *et al.* (1999; pl. 227, p. 1727) is appears to be a specimen of *E. variabilis*. Hitchcock (1922: 129) himself identified the specimen as *E. atropioides*, but it lacks the erose, obtuse lemmatal apices characteristic of that species (Hillebrand 1888: 532; Hitchcock 1922: 129). In contrast, the specimen illustrated for *E. atropioides* in Hitchcock (1922: 128) does have obtuse, erose lemmatal apices and in the opinion of the first author is correctly identified. Fourth, whereas Wagner *et al.* (1999) report 8–12(–14) florets per spikelet for *E. variabilis*, some specimens (as the species is presently construed) have up to 36 florets (e.g., Hitchcock 14493 [BISH]).

Eriochloa procera* (Retz.) C.E. Hubb.*New island record**

Oppenheimer (2008) first reported this species for Hawai'i from the island of Moloka'i. The record below represents its first occurrence in the Northwestern Hawaiian Islands. Its native range is from tropical Asia through Australia, although it is also widespread in the western Pacific Basin (Clayton & Snow, in press).

Material examined. **MIDWAY ATOLL:** Sand Island, sector 26, near fuel farm-seal ramp, 20 Jun 1999, *Starr 990620-1 & Martz.*

Ischaemum ciliare* Retz.*Name change**

This species is known in Hawai'i from a single collection from Maui and was reported previously (Herbst & Clayton 1998) using the name *I. indicum* (Houtt.) Merr. (e.g., Imada 2008) The species is native to and widespread in tropical Asia. Bixing & Phillips (2006: 611) indicate why the newer name is correct.

Oplismenus hirtellus* (L.) P. Beauv.*New state record**

subsp. *undulatifolius* U. Scholz

Scholz (1981) monographed the genus *Oplismenus* and recognized *O. hirtellus* subsp. *hirtellus* as occurring in Hawai'i. Although Wagner *et al.* (1999) did not recognize taxa at the infraspecific level, other authors (Zuloaga & Morrone 2003; Morales 2003) have followed Scholz (1981) by recognizing at least some infraspecific taxa. Recent review of Hawaiian material at BISH indicates a majority of collections represent the nominate subspecies; however, subsp. *undulatifolius* is now known from most of the large islands. Subspecies *undulatifolius* is separable from the typical subspecies by the presence of papillose-pilose hairs on the leaf sheaths (check younger sheaths) and (less frequently) the culms. The collections of Remy from the Big Island, and that of Andersson from O'ahu, suggest that this subspecies has been present in Hawai'i for over 150 years. The collections from Maui indicate the native name for this plant as *honohono* (or *honohono maoli*), which is used medicinally for cuts.

Material examined. **KAUA'I:** Kanaele Swamp (Wahiawa Bog), ca 640 m [ca 2100 ft], 27 Aug 1983, *W.L. Wagner et al. 4993*; 3.2 mi. northwest of Wailua Experiment Station, Līhu'e-Kōloa Forest Reserve, 150 m [ca 500 ft], 20 Aug 1973, *S. Ishikawa & D. Herbst 278*. **O'AHU:** Lyon Arboretum, sect. 21, 14 Oct 1967, *D. Herbst 654*; without locality or date, *H. Mann & W.T. Brigham 328*; Honolulu, Jul 1852, *Andersson s.n.* (BISH 119697); Waikāne-Schofield Trail, Ko'olau Mts, 270 m [ca 885 ft], 16 Oct 1932, *F.R. Fosberg & K. Duker 8782*; trail from Maunauna to Kolekole Pass, Wai'anae Range (150.05W, 21.28N), ca 490 m [ca 1600 ft], 9 July 1964, *M.R. Crosby & W.R. Anderson 1716*; valley bottom, Pu'u Ka'ala, Wai'anae Mts, 425 m [ca 1400 ft], 23 Oct 1932, *E.H. Bryan s.n.* (BISH 19677). **MOLOKA'I:** Wailau Valley, north coast of east Moloka'i, 100 m [ca 320 ft.], 3 Jul 1933, *F.R. Fosberg 9632*; bog, upper Monroe Ranch above Kinalu, 1065 m [ca 3500 ft], 5 Sep 1936, *Whitney s.n.* (BISH 119665). **MAUI:** Hāna [without collector or date (BISH 406025) and most likely a duplicate of the next cited specimen]; Hāna, 600 m [ca 1970 ft], Jun 1933, *E.S. Handy 33-15*. **HAWAII:** Koa Kīpuka between Pāhala Road and Cone Peak, 1160 m [ca 3800 ft], 3 Jun 1943, *G.O. Fagerlund & A.L. Mitchell 613*; Hawai'i [no further data], [Voyage of] *M.J. Remy 104*.

Panicum virgatum* L.*Correction**

Wagner *et al.* (1999, 2005) list this taxon from one (putatively) naturalized collection from O'ahu in 1938. The specimen (without collector) is from Poamoho and was almost certainly collected from the Agricultural Experimental Station by that name in Wailua.

The label also indicates “Volunteer with *Andropogon furcatis*” further suggesting that the latter was under experimental trials. As such, there is no evidence that this species was ever naturalized in Hawai‘i, and the species probably should not be considered a part our flora (e.g., Clayton & Snow, in press).

***Paspalum* aff. *laxum* Lam.**

Taxonomic note

The specimen cited below was initially identified as *P. paniculatum* L. and reported (Oppenheimer 2007) as a range extension for that species from West to East Maui. However, the specimen does not match *P. paniculatum* in many respects nor other congeneric species known from Hawai‘i. The specimen appears to most closely resemble a specimen at BISH of *Paspalum laxum* (Hiram s.n. [BISH 126409]) from Puerto Rico. However, the Hiram specimen has not been confirmed against additional specimens of *P. laxum* or confirmed by another specialist. Moreover, it does not compare well in some respects to the species description in *Flora of North America* (Allen & Hall 2003). In some treatments (e.g., Smith *et al.* 1983) the specimen keys most closely to *P. millegrana* Schrad., but it does not compare well with the one specimen of that taxon presently housed at BISH (*León & Hiram 4364*). Until additional material can be collected and sent out for confirmation by other specialists, it seems best to merely note the affinities of the specimen with *P. laxum*, which otherwise is unknown for Hawai‘i or the Pacific Basin region (Clayton & Snow, in press).

Material examined. MAUI: East Maui, Hāna Distr, Kīpahulu, between Kaukou‘ai and Opelu, Ma‘ulili ahupua‘a. 20.660187°N, 156.067674°W, 207 m [ca 680 ft], 16 Oct 2005, H.L. Oppenheimer H100509.

***Paspalum pilosum* Lam.**

New state record

The native range of this species is Central America to Bolivia and Brazil (Renvoize 1984), and its report here appears to be the first for the Pacific Basin. Among species growing in Hawai‘i it most closely resembles *P. setaceum* Michx. However, it can be distinguished from *P. setaceum* by the triangular first glume present on the lower spikelet of a spikelet pair and the upper spikelet pair bearing only the rudiment of a first glume. The spikelet morphology just mentioned is well illustrated in Pohl (1980: 439), who reports the species as being “rather weedy” in Central America from ca 400–1200 m in savannas, roadsides, disturbed areas, and pastures.

Material examined. MOLOKA‘I: Keōpukaloa, between Honoko‘i and Pāpio Gulches (21.146321°N 156.743091°W), common in pastures and waste areas, 295 m [ca 965 ft], 6 Nov 2007, H.L. Oppenheimer H110708.

***Paspalum* aff. *thunbergii* Kunth ex Steud.**

Taxonomic note

A specimen recently sent from Maui by Hank Oppenheimer led to a re-examination of all material at BISH previously identified as *Paspalum scrobiculatum* L. The *Herbarium Pacificum* has several dozen records of *P. scrobiculatum* from most of the larger Hawaiian islands (Imada 2008: 87) and most material appears to be correctly identified. The earliest collections of *P. scrobiculatum* from the early 1850s were from O‘ahu and made (separately) by Andersson, Remy, and Mann and Brigham.

Apart from the Oppenheimer specimen, the specimens cited below were identified

initially as *P. scrobiculatum*. Further analysis reveals that they differ from that species by virtue of their greenish (not brownish) upper floret, pubescence on the nodes and upper and lower surfaces of the leaf blades, and sparse hairs along the margin of the upper glumes. Morphologically, the specimens seem to resemble *P. thunbergii* most closely, although they may have leaf blades up to ca 21 mm wide (e.g., *Hobdy 2913*). The differences between *P. thunbergii* and *P. scrobiculatum* are summarized in Chen & Phillips (2006: 530), the former of which is said to have leaf blades only 5–8 mm wide (Chen & Phillips 2006). Derek Clayton (pers. comm., 2008) indicated that some specimens of *P. thunbergii* from Japan and housed at Kew (K) have leaf blades considerably broader than 8 mm. The specimens cited below, apart from the wider leaf blades, are a fair match for the description provided in Chen & Phillips (2006), and in general resemble the single specimen at BISH of *P. thunbergii* from its native range in southern Asia (*Walken et al. 6288*, from Okinawa). The nearest reported occurrence of *P. thunbergii* to Hawai‘i is Niue (Sykes 1970), but the senior author has seen no specimens from Niue.

Paspalum is a large genus, and the first author has not been able to test the specimens below against recent keys from northern South America, nor been able to compare them to many species native to the neotropics. The most advisable course of action at this time seems to be to simply point out that these specimens resemble *P. thunbergii* closely, so that additional material may be secured and analyzed, but without any formal declaration herein that the species occurs in Hawai‘i.

Material examined. **O‘AHU:** Ko‘olau Mts, Pūpūkea-Paumalū, Ko‘olau Loa, common along open trails through *Casuarina* forests, ca 150 m [ca 500 ft], 6 Dec 1987, *K.M. Nagata & W. Takeuchi 3750*. **MAUI:** East Maui, Hāna Distr, Keōpuka, locally common grass with *P. urvillei* along Hāna Hwy, 195 m [ca 640 ft], 23 Aug 2007, *H. Oppenheimer H80703*; Kūhiwa Road, 28 Jul 1987, *R. Hobdy 2913 & 2914*; Keōpuka; occasional, scattered patches, 5 Apr 2005, *F. Starr et al. 050405-50*.

Paspalum virgatum L.

New state record

This introduced species is native to Central and South America. It is well established locally in the Kahuku Training area and the East Range in Schofield Barracks in degraded lowland forests and in roadside vegetation. The culms are tall (to ca 1.5 m) and thick at the base, and the leaves are stiff and sharp on the edges. The spikelets occur in four rows along the flattened panicle branches (racemes), or may occur in two rows with one-half of each spikelet pair being rudimentary. The raceme margins are ciliate with shorter (and more common) stiff hairs and much longer (but less frequent) hairs. Although the species is covered in *Flora of North America* (Allen & Hall 2003), where its description matches well with the specimens cited below, the accompanying illustration therein appears to omit important details of indumentum of the spikelet branches and florets. The specimens cited below all are a good match with the single specimen housed at BISH of this species (*A.H. Curtiss 501*, from Isla de Pinos, West Indies), a duplicate of which exists at Kew (K) and which was annotated as such by Agnes Chase of the Smithsonian Institution (D. Clayton, pers. comm., 2008). The nearest known naturalized occurrences are from the Atherton Tablelands in northeastern Queensland (B. Simon, pers. comm., 2008), but it is otherwise unknown from the Pacific Basin (Clayton & Snow, in press). Relatively recent descriptions of the species (Renvoize 1984; Pohl & Davidse 2001; Sharp & Simon 2002; Allen & Hall 2003; Morales 2003) indicate a caespitose growth form for *P. virgatum*. However, after the initial material was identified, large amounts of additional fresh mate-

rial were brought to the senior author for further examination after his request to extract as much of the root system as possible. The fresh specimens all had a thick rhizome that equaled or exceeded the diameter of bases of the culms, and which evidently grew downward for several centimeters before adopting a more horizontal growth orientation. Although the descriptions (just cited above) for the species lack any mention of rhizomes, the illustration in *FNA* (Allen & Hall 2003: 582) captures the rhizomatous basal portion of the culm, as evidenced by at least seven greatly shortened internodes below the lowermost leaf sheath. The presence of the deep-seated rhizome suggests this will not be an easy species to eradicate mechanically when it becomes established. Finally, a color plate in Morales (2003: both sides opposite of p. 177) indicates that the spikelets may be dark pink to maroon in fresh material, which may aid in its initial identification in the field.

Material examined. O'AHU: Kahuku Training Area, ridge between 'Ōhi'a and 'Ō'io gulches, Water Tank Hill landing zone, 275 m [ca 900 ft], 4 Jun 2003, K. Kawelo s.n. (BISH 695054); Schofield Barracks East Range (UTM 2377674, 603043), 27 Feb 2008, K. Kawelo USARMY 83; Schofield Barracks East Range, 490–550 m [ca 1600–1800 ft], K. Kawelo s.n. (BISH 704706).

Updated key to the species of *Paspalum* in the Hawaiian Islands

Some 15 to 17 species of *Paspalum* are now known in Hawai'i, an increase of at least 9 species over that reported in Wagner *et al.* (1999). The following key should reliably separate material in Hawai'i:

1. Glumes both absent *P. malacophyllum*
1. Glumes, or at least the upper, present (2).
- 2(1). Upper glume fringed with a ragged papery wing *P. fimbriatum*
2. Upper glume wingless (3).
- 3(2). Margin of upper glume with a ciliate fringe (4).
3. Margin of upper glume glabrous or with sparse, short, appressed hairs (7).
- 4(3). Upper floret dark brown; plants robust, rhizomatous (easily overlooked unless the complete rootstock is examined) *P. virgatum*
4. Upper floret greenish to light brown (5).
- 5(4). Racemes 2, arising opposite; plant stoloniferous *P. conjugatum*
5. Racemes 3–20; plants caespitose (6).
- 6(5). Racemes mostly 3–7; spikelets 2.8–4 mm long *P. dilatatum*
6. Racemes mostly 10–20; spikelets 2–2.8 mm long *P. urvillei*
- 7(3). Mature upper floret brown (8).
7. Mature upper floret yellow, greenish, or light brown (9).
- 8(7). Spikelets borne singly in 2 rows (often rust-colored) *P. scrobiculatum*
8. Spikelets borne in 4 rows *P. longifolium*
- 9(7). Spikelets borne singly (10).
9. Spikelets paired (13).
- 10(9). Leaf blades pilose on both sides; plants caespitose; racemes 2–5 *P. aff. thunbergii*
10. Leaf blades glabrous; plants caespitose or rhizomatous; racemes paired or rarely 3–5 (11).
- 11(10). Plant rhizomatous; upper glume and lower lemma cartilaginous, glabrous; spikelets broadly elliptic, plumply plano-convex *P. notatum*
11. Plant stoloniferous; spikelet parts with a thinner texture, hairy or glabrous; spikelets flattened or plump (12).
- 12(11). Spikelets ovate, plump; upper glume obscurely hairy, thinly coriaceous *P. distichum*
12. Spikelets ovate-elliptic, flattened; upper glume glabrous, papery *P. vaginatum*

- 13(9). Upper glumes occurring on each member of spikelet pair highly dimorphic; upper glume of lower spikelet in pair triangular and at least triple the length of upper glume of upper spikelet; upper glume of upper member of spikelet pair much broader than long, less than 1/8 length of spikelet *P. pilosum*
13. Upper glumes of members of spikelet pairs not highly dimorphic (14).
- 14(13). Upper glume glabrous (15).
14. Upper glume hairy (16).
- 15(14). Panicles terminal and axillary, the axillary ones partially to completely inserted in subtending leaf sheath *P. setaceum*
15. Panicles terminal *P. aff. laxum*
- 16(14). Spikelets 1.3–1.4 mm long, suborbicular; racemes (10–)15–60 *P. paniculatum*
16. Spikelets 2.0–2.7 mm long, elliptic; racemes 5–10(–15) *P. macrophyllum*

Rytidosperma biannulare* (Zotov)*Correction**

Connor & Edgar

A proofreading oversight by the senior author of the recent report of this species in Hawai'i (Snow 2008) resulted in contradictory information about its native range. The correct native range for the species is New Zealand (Edgar & Connor 2000). It is introduced in Hawai'i, Australia (Sharpe & Simon 2002), and North America (Darbyshire & Connor 2003).

Sorghum arundinaceum* (Desv.) Stapf*New state record**

This newly naturalized species is native to the paleotropics but widespread elsewhere (Sharp & Simon 2002; Clayton & Snow, in press). The specimens cited were collected at elevation between ca 1000–1250 ft [ca 305–380 m] along roads with other non-native species. It can be distinguished from other species of *Sorghum* in Hawai'i by its relatively thin (i.e., not stout) panicle branches and the absence of rhizomes (see note at end regarding collecting grasses).

Material examined. **HAWAI'I:** Puna Distr, Hwy 130, 14–15 mile marker, 19 May 2005, *K.F. Bio 05-0002*; Ka'ū Distr, Hwy 11, 49–50 mile marker, 4 Jun 2001, *K.F. Bio 01-0029-01*.

Sporobolus pyramidatus* (Lam.) Hitchc.*Correction and new island record**

The specimen below was cited previously (Herbst & Clayton 1998) as a new island record for the Big Island under the name *Sporobolus piliferus* (Trin.) Kunth. Thus, the only documented vouchers of *S. piliferus* are from Midway Atoll (Starr *et al.* 2010) and O'ahu (Snow 2008). The range of *S. pyramidatus* now extends from Midway Atoll (Starr *et al.* 2010), Kure Atoll, Laysan, French Frigate Shoals, Kaua'i, O'ahu, Moloka'i (Imada 2008), and Hawai'i.

Material examined. **HAWAI'I:** Hāpuna Beach State Park, 25 Feb 1994, *C. Imada et al. 94-3*.

Thysanolaena latifolia* (Roxb. ex Hornem.)*Nomenclatural change and notes**

Honda

Collections of this species have been made on Kaua'i, O'ahu, and Hawai'i, and have been filed at BISH under the name *T. maxima* (Roxb.) Kuntze. However, Baaijens & Veldkamp (1991: 451) outlined the reasons why the correct name is *T. latifolia*. Although it is known along a hiking trail on O'ahu where it was planted long ago, Clyde Imada (pers. comm., 2008) believes the species is not yet truly naturalized.

Important note regarding the collection of grass specimens for identification: The base of the culms and at least a part of the root system should always be collected, as most dichotomous and interactive keys rely heavily on whether plants are annual or perennial, and whether stolons or rhizomes are present. “Top-snatching”, in which the lower portions of the culms and root systems are not collected, should always be avoided. In the opinion of the first author, the best collecting tool to effectively and quickly dig up herbaceous plants with their root systems is a mason’s hammer, which is highly effective even in heavy clay soils. When workers know or suspect that they have a specimen that represents a new island or new state record, and/or one that will be sent to the Herbarium Pacificum for identification, it is requested that adequate material is collected for preparation of 3 or 4 complete herbarium specimens. This will enable the Bishop Museum to send duplicate specimens out for verification by specialists at other herbaria.

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