———. **& LeGrande**, **M**. 2006. An annotated checklist and new island records of flowering plants from Lehua Islet, Ni‘ihau, Hawai‘i. *Bishop Museum Occasional Papers* **87**: 19–29.

Wysong, **M**., **Hughes**, **G**. **& Wood**, **K**.**R**. 2007. New Hawaiian plant records for the island of Moloka‘i. *Bishop Museum Occasional Papers* **96**: 1–8.

Notes on grasses (Poaceae) in Hawai‘i

Neil Snow (Hawaii Biological Survey, Bishop Museum, 1525 Bernice Street, Honolulu, Hawai‘i, 96817-2704, USA; email: neil.snow@bishopmuseum.org)

Recent collecting in Hawai‘i and curatorial activities involving grasses in the *Herbarium Pacificum* (BISH) have revealed three new naturalized state and five new island records, and one nonpersisting waif identified to species for the first time seventy years after its collection. Taxonomic and nomenclatural notes are indicated for some previously reported taxa. All identifications were made by the author; supporting voucher specimens are all deposited at BISH.

Agrostis exarata Trin. var. ***monolepis***
(Torr.) Hitchc. **Taxonomic note**

This infraspecific taxon and several others attributed to *A. exarata* are no longer recognized by many recent publications (e.g., Soreng. & Peterson 2003; Harvey 2007a). As such, BISH is no longer recognizing *A. exarata* var. *monolepis* (Torr.) Hitchc. but rather a single polymorphic species.

Bothriochloa bladhii (Retz.) S.T. Blake **New island record**

This is a widespread species in Australia and the Pacific. Prior to this record for O’ahu, *B. bladhii* was known from Kaua‘i, Moloka‘i, Maui, and Hawai‘i.

Material examined: **O‘AHU**: Ka‘ala Natural Area Reserve, ridge between Kaimuhola and Alaiheihe, gulches between access road, 396 m (1300 ft), 11 Feb 2008, *US Army 79.*

Bromus diandrus Roth **Taxonomic note**

Herbst and Clayton (1998) discussed the taxonomic disagreement over the status of *Bromus rigidus* Roth at the specific or infraspecific level, and whether that name should be placed in the generic segregate *Anisantha* K. Koch. Preliminary studies provide no cladistic support in favor of segregating *Anisantha* from *Bromus* (Pillay & Hilu 1995; Catalán *et al.* 1997) and few authors presently recognize *Anisantha* (e.g., Weber & Wittman 1992). However, a consensus has emerged that *B. rigidus* should be considered conspecific with *B. diandrus* Roth (Weber & Wittman 1992; Sales 1993; Wilken & Painter 1993; Liang *et al*. 2006; Pavlick & Anderton 2007; Snow 2007; but see Pavlick *et al*. 2003). Simon (1993: 80) maintained these taxa at the subspecific level, but his key to *Bromus* in Australia (where the taxa are nonnative), and studies carried out in their native ranges (Sales 1993), together reflect their (at best) tenuous morphological differences. As such, it seems best to reduce *B. rigidus* to synonymy under *B. diandrus*.

Bromus hordeaceus L. **Taxonomic note**

The *Herbarium Pacificum* previously has recognized *B. hordeaceus* subspp. *hordeaceus* and *molliformis* (J. Lloyd ex Billot) Maire & Weiller as occurring in Hawai‘i. European workers, where the putative taxa are native, have recognized four infraspecific taxa based on characters such as culm height, lemmatal length, lemmatal awn width at base and curvature, and spikelet pubescence (e.g., Smith 1980). However, population-based studies found no evidence of DNA sequence or allozyme differentiation among individuals of the putative *B. hordeaceus* subspecies collected from their native ranges in the eastern Mediterranean, and detected considerable overlap among morphological characters traditionally used to segregate intraspecific taxa (Ainouche *et al*. 1996, 1999). Since little is to be gained by partitioning Hawaiian specimens into infraspecific taxa, BISH now recognizes one polymorphic species.

Echinochloa esculenta (A. Braun) H. Scholz **Nomenclatural change**

This species was known in Hawai‘i previously as *E. utilis* Owhi & Yabuno, but recent authors are now including this name in synonymy under *E. esculenta* (e.g., Zuloaga & Morrone 2003).

Eragrostis tenuifolia (A. Rich.) Steud. **New island record**

In addition to its report here for the first time from Kaua’i, this species was first reported as naturalized in the Hawaiian Islands from O‘ahu and Hawai‘i (Herbst & Clayton 1998: 28), and later from Maui (Oppenheimer 2004: 15).

Material examined: **KAUA‘I**: Hanalei Dist, on rolling hills east of Pu‘u Ka ‘Ele Reservoir, ca 150 m, 27 Sep 2001, *C. Imada 2001-69.*

Glyceria notata Chevall. **Correction**

Herbst & Wagner (1999: 27) reported *Glyceria fluitans* (L.) R. Br. for Hawai’i based on three specimens housed at US. Unprocessed duplicates of each have been found at BISH. Because Derek Clayton (K) questioned the veracity of those identifications, I re-keyed the BISH specimens based on a key provided by Clayton and confirmed his suspicion that the specimens were *G. notata*. This species still represents the only known member of this genus in Hawai’i. It is native to Eurasia, although it has become widespread elsewhere, possibly because most species in the genus are palatable to livestock.

Material examined: **MAUI**: Haleakalā Crater, west side, altitude 2,000 meters, boggy place, 3 Oct 1916, *A. S. Hitchcock 14996*. **HAWAI‘I**: N. Kohala, Kahua Ranch, in swampy place in forest pasture, rare, local patch, 3700 ft, 9 June 1953, *Hosaka 3694*; same locality (*fide* Herbst & Clayton 1999), 15 Aug 1951, *Hosaka 3696*.

Lachnagrostis filiformis (G.Forst.) Trin. **Nomenclatural change**

This introduced species has been known previously in Hawai‘i as *Agrostis avenacea* J.F. Gmel. (Wagner *et al*. 1999; Imada *et al*. 2000). It has been recognized in *Lachnagrostis* recently in Harvey (2007b).

Nasella cernua (Stebbins & Loōve) Barkworth **Nomenclatural change**

Generic boundaries in the tribe *Stipeae* Dumort. have been in flux for some time. However, recent molecular data based on reasonably comprehensive sampling regimes are upholding many generic splits based initially on morphological data (e.g., Romaschenko

et al. 2007). I here follow the generic treatment of *Stipeae* in Barkworth (2007) for the species known formerly as *Stipa cernua* Stebbins & Löve by placing it in *Nasella*.

Piptatherum miliaceum (L.) Coss. **Nomenclatural change**

The reasoning indicated for *Nasella cernua* (see above) regarding generic boundaries in *Stipeae* also applies here for the transfer of *Oryzopsis miliacea* (L.) Benth. & Hook. ex Asch. & Schweinf. into *Piptatherum*.

Rytidosperma biannulare (Zotov) Connor & Edgar **New state record**

This naturalized species native to New Zealand and is reported here for the first time in Hawai'i. It also occurs on Maui. The native range of the species is Australia, but it has been introduced into North America and New Zealand. Among the three species now present in Hawai'i, *Rytidosperma biannulare* has a glabrous sheath, whereas the sheath of *R, pilosa* is pilose. The sheath of *R. semiannulare* is also glabrous, but this species differs from *R. biannulare* by its single row of long hairs arising on the back of the lemma arising just below the base of the central awn (illustration in Sharp & Simon 2002, as *Notodanthonia semiannularis* (Labill.) Zotov), whereas *R. biannulare* has a second row or series of tufts of long hairs below the uppermost row or line of hairs, the latter of which arise approximately at the midpoint of the lemma and decidedly below the base of the central awn.

Material examined: **MOLOKA'I**: 'Ōnini/Kūpā'ia divide, common grass along unpaved 4WD road in mesic shrubland, 21.119204°N, 156.929537°W, 1000 m, 16 May 2005, *H. Oppenheimer et al. H50635*

Schedonorus arundinaceus (Schreb.) Dumort. **Nomenclatural change**

This non-native species has been known widely taxonomically and horticulturally as *Festuca arundinacea* Schreb. (e.g., Wagner *et al*. 1999; Soreng *et al*. 2001), or much less frequently as *Lolium arundinaceum* (Schreb.) Darbysh. (Darbyshire 1993). Systematic work (Soreng & Terrell 1998) indicated the species belongs in *Schedonorus*. A proposal by Soreng *et al*. (2001) to conserve the name *S. arundinaceus* over a competing name, *S. phoenix* (Scop.) Holub (Holub 1998), was approved and is now incorporated into the ICBN Code (McNeill *et al*. 2006). The key character in many keys separating this species from *S. pratensis* (next entry) is the presence of a few hairs—sometimes as few as 1 or 2—on the auricles. Before a decision is made whether auricular hairs are lacking it is important to use high magnification with bright light and check several leaves. A further diagnostic trait of this species is the (normal) presence of prickles or short hairs over much of the lemma (especially the distal portion), whereas *S. pratensis* generally has a smooth lemma or is merely slightly scabrous (bearing short prickles) distally.

Schedonorus pratensis (Huds.) P. Beauv. **New state record**, **nomenclatural change**

Like its congener above, this species was commonly placed in *Festuca* but is now placed in *Schedonorus* by most recent workers. The native range of *S. pratensis* is Eurasia. It formerly was considered good forage and thus is found in many temperate areas.

Material examined: **MAUI**: East Maui, Makawao Dist, Kahakapao, Northing: 2302751.82, Easting: 784493.95, 1280 m (4200 ft), 29 May 2007, *H. Oppenheimer H50739*.

Sporobolus elongatus R.Br. **New island records**

Previously collected only on Lāna‘i in 1925 (Herbst & Clayton 1998), redeterminations of two *Sporobolus* vouchers held at BISH extend the range of *S. elongatus* to O‘ahu and Hawai‘i.

Material examined: **O'AHU**: Honolulu, University of Hawaii campus, in lawn by edge of University Drive, 12 Apr 1956, *B.C. Stone 1243*. **HAWAI‘I**: Captain Cook, Nokukano development site makai of the belt road, common along pasture roads, Nov 1991, *E.J. Funk s.n.* (BISH 614547).

Sporobolus piliferus (Trin.) Kunth **New island record, correction**

Previously naturalized only on Hawai‘i (Herbst & Clayton 1998:36), this specimen, incorrectly identified as *P. pyramidalis* (see next entry), extends its presence to O‘ahu..

Material examined: **O'AHU**: Pouhala Marsh, Waipahu, 21°21.643'N, 158° 0.324'W, growing in mucky, sticky, poorly drained soil, 24 Jan 2005, *L.M. Crago & T. Erickson 2005-028*.

Sporobolus pyramidalis P. Beauv. **Correction**

Herbst and Clayton (1998: 36) reported this species as a new state record. However, the specimen reported therein (*E. Funk s.n.*, BISH 614547, from the island of Hawai‘i) has been re-identified as *S. elongatus* R.Br.. There are no confirmed specimens of *S. pyramidalis* in Hawai‘i.

Additional grass note:

A non-persisting waif of *Eragrostis sessilispica* Buckley collected in 1938 has been identified to species for the first time, seventy years after its collection. It was growing in (or adjacent to) a research plot and has not been collected since in Hawai‘i. Since the specimen was unknown by the collector it probably was growing as a weed. In a recent treatment of *Eragrostis*, Peterson (2003) indicated the native range of this species as the southern Great Plains of the US mainland into northern Mexico. Its elevational range (0–1220 m), coupled with its apparent preference for sandy soils (Peterson 2003), suggests it could become reestablished in Hawai‘i. The sessile spikelets on the secondary panicle branches are atypical for *Eragrostis,* which normally has paniculate inflorescences. In contrast, sessile spikelets on secondary panicle branches is typical for *Leptochloa* P. Beauv., under which the specimen had been tentatively identified. The prominent tufts of pilose hairs at the base of each panicle branch is also partially diagnostic for this species.

Material examined: **O‘AHU**: Wahiawa, Poamoho plot, 14 Oct 1938, *R. Lyman s.n.* (BISH 118095).

Acknowledgments

I thank Clyde Imada (BISH), Jeff Saarela (CAN), Bryan Simon (BRI), Derek Clayton (K), Surrey Jacobs (NSW), Tim Flynn (PTBG), and Paul Peterson (US) for their comments and discussions. I also thank my other colleagues at BISH for their assistance, the Oahu Early Detection program, and Hank Oppenheimer (Maui Plant Extinction Prevention Program) for bringing some of these specimens to my attention.

Literature Cited

Ainouche, **M**., **Misset**, **M**.**T**. **& Huon**, **A**. 1996. Patterns of genetic differentiation in two annual bromegrasses, *Bromus lanceolatus* and *B. hordeaceus* (Poaceae). *Plant Systematics and Evolution* **199**: 65–78.

———., **Bayer**, **R.J.**, **Gourret**, **J.P.**, **Defontaine**, **A. & Misset**, **M.T**. 1999. The allotetraploid invasive weed *Bromus hordeaceus* L. (Poaceae): genetic diversity, origin and molecular evolution. *Folia Geobotanica* **34**: 405–419.

Barkworth, **M.E**. 2007. *Nasella* (Trin.) E. Desv., pp. 170–177. *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 Univerity Press, New York. 911 pp.

Catalán, **P.**, **Kellogg**, **E.A. & Olmstead**, **R.G**. 1997. Phylogeny of Poaceae subfamily Pooideae based on chloroplast *ndh*F gene sequences. *Molecular Phylogenetics and Evolution* **8**: 150–166.

Darbyshire, **S.J**. 1993. Realignment of *Festuca* subgenus *Schedonorus* with the genus *Lolium* (Poaceae). *Novon* **3**: 239–243.

Harvey, **M.J**. 2007a. *Agrostis* L., pp. 633–662. *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 Univerity Press, New York. 911 pp.

———. 2007b. *Lachnagrostis* Trin., pp. 694–696. *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 Univerity Press, New York. 911 pp.

Herbst, **D.**, **& Clayton**, **W.D**. 1998. Notes on the grasses of Hawai'i: new records, corrections, and name changes. *Bishop Museum Occasional Papers* **55**: 17–38.

———. **& Wagner**, **W.L**. 1999. Contributions to the flora of Hawai'i, VII. *Bishop Museum Occasional Papers* **58**: 12–36.

Holub, **J**. 1998. Reclassification and new names in vascular plants 1. *Preslia* **70**: 97–122.

Imada, **C.T.**, **Staples**, **G.W. & Herbst**, **D.R**. 2000. New Hawaiian plant records for 1999. *Bishop Museum Occasional Papers* **63**: 9–16.

Liang, **L.**, **Guanghua**, **Z. & Ammann**, **K.H**. 2006. *Bromus* L., pp. 371–386, *In*: Zhengyi, W, P.H. Raven & H. Deyuan (eds.), *Flora of China.* Vol. 22. Science Press, Beijing & Missouri Botanical Garden Press, St. Louis. 733 pp.

McNeill, **J.**, **Barrie**, **F.R.**, **Burdet**, **H.M.**, **Demoulin**, **V.**, **Hawksworth**, **D.L.**, **Harhold**, **K.**, **Nicolson**, **D.H.**, **Prado**, **J.**, **Silva**, **P.C.**, **Skog**, **J.E.**, **Wiersema**, **J.H. & Turland**, **N.J**. (**eds**.). 2006. *International Code of Botanical Nomenclature (Vienna Code).* A.R.G. Gantner Verlag: Ruggell, Liechtenstein. 568 pp.

Oppenheimer, **H.L**. 2004. New Hawaiian plant records for 2003. *Bishop Museum Occasional Papers* **79**: 8–20.

Pavlick, **L.E.**, **Planchuelo**, **A.M.**, **Peterson**, **P.M. & Soreng**, **R.J**. 2003. *Bromus* L., pp. 154–191. *In*: Soreng, R.J., P.M. Peterson, G. Davidse, E.J. Judziewicz, F.O. Zuloaga, T.S. Filgueiras & O. Morrone (eds.), Catalogue of New World Grasses (Poaceae): IV. Subfamily Pooideae. *Contributions from the United States National Herbarium* **48**: 1–730.

———. **& Anderton**, **L.K**. 2007. *Bromus* L., pp. 193–237, *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 Univerity Press, New York. 911 pp.

Peterson, **P.M**. 2003. Eragrostis Wolf, p. 65–105. *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 Univeristy Press, New York. 783 pp.

Pillay, **M**. **& Hilu**, **K**.**W**. 1995. Chloroplast-DNA restriction site analysis in the genus *Bromus* (Poaceae). *American Journal of Botany* **82**: 239–249.

Romaschenko, **K**., **Peterson**, **P**.**M**., **Garcia-Jacas**, **N**., **Soreng**, **R**.**J**. **& Alfonso**, **S**. 2007. A phylogeny of *Stipeae* (Poaceae) based on nuclear DNA (ITS) sequence data. Abstract 2734, BOTANY 2007. Chicago.

Sales, **F**. 1993. Taxonomy and nomenclature of *Bromus* sect. *Genea*. *Edinburgh Journal of Botany* **50**: 1–31.

Sharp, **D**. **& Simon**, **B**.**K**. 2002. *AusGrass. Grasses of Australia*. CD-ROM plus Users Guide. CSIRO Publishing, Collingwood, Victoria.

Simon, **B**.**K**. 1993. *A Key to Australian Grasses*. Second edition. Queensland Department of Primary Industries, Brisbane.

Smith, **P**.**M**. 1980. *Bromus* L., pp. 182–189. *In*: Tutin, T.G., V.H. Heywood, N.A. Burges, D.M. Moore, D.H. Valentine, S.M. Walters & D.A. Webb (eds.), *Flora Europaea. Vol. 5. Alismataceae to Orchidaceae (Monocotyledons)*. Cambridge University Press, Cambridge. 452 pp.

Snow, **N**. 2007. *Checklist of Vascular Plants of the Southern Rocky Mountain Region* (Version 2). 308 pp. Available at: http://www.southernrockiesflora.org/checklist/SRMRChecklist_2007_Version2_Final.pdf

Soreng, **R**.**J**. **& Peterson**, **P**.**M**. 2003. *Agrostis* L., pp. 42–89. *In*: Soreng, R.J., P.M. Peterson, G. Davidse, E.J. Judziewicz, F.O. Zuloaga, T.S. Filgueiras & O. Morrone (eds.), Catalogue of New World Grasses (Poaceae): IV. Subfamily Pooideae. *Contributions from the United States National Herbarium* **48**: 1–730.

———. **& Terrell**, **E**.**E**. 1998 [1997]. Taxonomic notes on *Schedonorus*, a segregate genus from *Festuca* or *Lolium*, with a new nothogenus, x*Schedololium,* and new combinations*. Phytologia* **83**: 85–88.

———., **Terrell**, **E**.**E**., **Wiersema**, **J**. **& Darbyshire**, **S**.**J**. 2001. (1488) Proposal to conserve the name *Schedonorus arundinaceus* (Schreb.) Dumort. against *Schedonorus arundinaceus* Roem. & Schult. (Poaceae: Poeae). *Taxon* **50**: 915–917.

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. 1918 pp.

Weber, **W**.**A**. **& Wittmann**, **R**.**A**. 1992. *Catalog of the Colorado flora: a biodiversity baseline*. University Press of Colorado, Niwot, Colorado.

Wilken, **D**.**H**. **& Painter**, **E**.**L**. 1993. *Bromus*, pp. 1239–1243. *In*: J. C. Hickman (ed.), *The Jepson manual: higher plants of California*. University of California Press, Berkeley. 1400 pp.

Zuloaga, **F**.**O**. **& Morrone**, **O**. 2003. *Echinochloa* P. Beauv., pp. 215–224. *In*: Zuloaga, F.O., Morrone, O., Davidse, G., Filgueiras, T.S. Peterson, P.M., Soreng, R.J. & Judziewicz, E. (eds.), Catalogue of New World Grasses (Poaceae): III. Subfamilies Panicoideae, Aristidoideae, Arundinoideae, and Danthonioideae. *Contributions from the United States National Herbarium* **46**: 1–662.