

NEW COMBINATIONS IN *CENCHROPSIS*, *DICHANTHELIUM*, AND *STAPFOCHLOA* (POACEAE)

JOSEPH K. WIPFF
3512 25th Court SE
Albany, Oregon 97322
jkwipff@gmail.com

ROBERT B. SHAW
Department of Ecosystem Science and Management
Texas A&M University
College Station, Texas 77842
rbshaw10@gmail.com

ABSTRACT

As part of ongoing work on the grasses of Texas, we propose the following taxonomic changes and nomenclatural updates — ***Cenchropsis myosuroides*** (Kunth) Nash var. ***longiseta*** (Caro & E.A. Sánchez) Wipff & Shaw, **comb. nov.**; ***Cenchropsis ekmaniana*** (A.S. Hitchcock) Wipff & Shaw, **comb. nov.**; ***Dichantherium ovinum*** (Scribn. & J.G. Sm.) Wipff & Shaw, **comb. nov.**; ***Stapfochloa parodiana*** (Roseng. & Izag.) Wipff & Shaw, **comb. nov.**; and ***Stapfochloa grandiflora*** (Roseng. & Izag.) Wipff & Shaw, **comb. nov.**

As part of ongoing work on the *Guide to Texas Grasses* (Shaw & Wipff, in prep.) and on the grasses of Texas in general, it is necessary to discuss aspects of the taxonomy that we are adopting — changes in rank, generic transfers to allow for the use of generic concepts, new or old, reinstatement of genera and species previously lost to synonymy, and clarification of characters used to delineate difficult genera or species complexes.

Chemisquy & al. (2010) proposed the unification of *Cenchrus* and *Pennisetum* based on their phylogenetic analysis of morphological, plastid, and nuclear data. Respectfully, we find this very broad interpretation to be a difficult taxonomic tool. We are in congruence with Pohl (1980), Wipff (2001), and Denadío et al. (2009) that the morphological, cytological, cytogenetic and molecular data (Denadío et al. 2009) does support the delimitation of *Cenchrus*, in a strict sense, from *Pennisetum*, and the recognition of *Cenchrus myosuroides* in *Cenchropsis*. As stated, “*We use all techniques and types of evidence we can to make the best decisions we can now. Ecology, biogeography, phenology, cytology, and other information, as available, pertains to the task. Molecular evidence is no silver bullet, and still requires just as much interpretation from all available evidence in order to make best possible taxonomic decisions*” Weakley et al. (2017).

Delisle (1963) published a broad circumscription and taxonomy of the genus *Cenchrus* and its species. This taxonomy included species that were traditionally treated in *Pennisetum*. The broad treatment, however, was found to be a difficult and confusing taxonomic tool. Pohl (1980) and Wipff (2001) published a taxonomic treatment recognizing *Cenchrus sensu stricto*, from *Pennisetum*. Denadío et al. (2009) published a preliminary molecular phylogeny of *Pennisetum* and *Cenchrus*. In their discussion they state,

“If *Cenchrus ciliaris* and *C. setigerus* are treated under *Pennisetum*, based on a common basic chromosome number $x = 9$, and the presence of antrorsely scabrous and not spiny bristles (Wipff 2003), the name *Cenchrus s. str.* could be restricted to a core group of species (clades A5 + A6; Fig. 2). Monophyly of *Cenchrus s. str.* is neither confirmed nor rejected by our results, but optimization of non-molecular characters such as the geographic origin (America), basic number of

chromosomes ($x = 17$, except in *C. myosuroides* with $x = 9$; Brown, 1950; Morrone & et al. 2006), the degree of fusion of bristles (up to the middle of the bristles, except in *C. myosuroides*), the stiffness of internal bristles (stiff bristles) and the presence of retrorsely barbed bristles (except in *C. pilosus*) all could be used to support the delimitation of *Cenchrus* in a strict sense ..." (p. 400).

Link (1827) was the first to treat *Cenchrus ciliaris* in *Pennisetum* and followed by Chase (1921), Hitchcock (1931, 1935), Hitchcock and Chase (1951), Pohl (1980), and Wipff (2001, 2003). Based on chromosomal and morphological characteristics, Wipff (2001) transferred the entire *C. ciliaris* complex to *Pennisetum*. The chromosomal and genomic characteristics combined with phylogenetic relationship favor the inclusion of *C. ciliaris* within the genus *Pennisetum* (Martel & al. 2004; Robert & al. 2010).

The unique and distinct fascicle morphology, and basic chromosome number [$x=(9),10$] place *Cenchrus myosuroides* and related taxa outside of the generic limits of *Cenchrus* sensu stricto and warrant their recognition within *Cenchropsis* Nash.

- 1. CENCHROPSIS** Nash, in J.K. Small, Fl. S.E. U.S. 109, 1327. 1903 (22 Jul 1903). **TYPE:** *Cenchropsis myosuroides* (Kunth) Nash. *Cenchrus myosuroides* Kunth, Nov. Gen. Sp. (quarto ed.) 1 (pts. 1-2): 115–116, t. 35. 1816 (29 Jan 1816). *Pennisetum myosuroides* (Kunth) Spreng., Sys. Veg. ed. 16. 1: 303. 1824 "1825." **LECTOTYPE** (McVaugh 14: 113. 1983): **CUBA.** Cayo Flamingo, 1801, *Humboldt & Bonpland 1361* (P-image!; isolectotypes: B-W-1480-image!; US-865730-image! -fragm. ex P-Bonpl.).

Coarse perennials in large clumps. Culms (50) 70–200 cm long, more or less woody. Inflorescences 8–25 cm long, 6–15 mm wide, 60–150 fascicles densely arranged on the central axis. Primary panicle branches accrescent to a central axis; with sessile scars on axis. Panicle axis angular; puberulous; bearing deciduous fascicles. Fascicles and spikelets disarticulate as a unit. Bristles of the fascicle are all terete, free, connate only on an obconical base, not fused forming a cupule. The bristles of the fascicle are stiff, flexible, not rigid or spine-like, retrorsely scabrous. The terete bristles are 3–8 mm long, 0.2–0.6 mm wide, in 2–4 rows around the spikelet(s), shorter to longer than the spikelet(s), increasing in size towards the center, the inner bristles glabrous or short pubescent on the lower 1/2–2/3. The axis of the fascicles terminates in a spikelet (no primary bristle subtending the terminal spikelet). Spikelets per fascicle 1 (–3). Chromosome numbers $2n=54$ (Brown 1950), ~68 (Bowden & Senn 1962), =70 (Avdulov 1931; Parodi 1946, Delisle 1964, Gould 1965, Reeder 1968), ~72 (Morrone & et al. 2006); most records, $2n=70$. Basic chromosome number, $x=(9),10$

- Cenchropsis myosuroides** (Kunth) Nash var. **longiseta** (Caro & E.A. Sánchez) J.K. Wipff & R.B. Shaw, **comb. nov.** *Cenchrus myosuroides* Kunth var. *longisetus* Caro & E.A. Sánchez, Kurtziana 4: 112. 1967. **TYPE: ARGENTINA. Prov. Entre Ríos:** Paraná, Pueblo Brugo. 1 Nov 1962, A. Burkart 23603 (holotype: SI-image!).

- Cenchropsis ekmaniana** (A.S. Hitchcock) J.K. Wipff & R.B. Shaw, **comb. nov.** *Cenchrus ekmanianus* A.S. Hitchcock, Man. Grasses W. Ind., 361. 1936. **TYPE: DOMINICAN REPUBLIC. Monte Cristi:** Monte Chico, Los Siete, sandy open soil, 14 Jul 1929, E.L. Ekman 13172 (holotype: US-1502107- image!; isotype: US-1538622-image!)

- 2. DICHANTHELIUM sect. ANGUSTIFOLIA** (Hitchc.) Freckmann & Lelong, Sida 20(1):166. 2002 (19 Jul 2002). *Panicum* [unranked] *angustifolia* Hitchc., in B.L. Rob & Fernald, Manual (Gray), ed. 7, 106. 1908 (as *angustifolia*). **TYPE:** *Panicum angustifolium* Elliott

- Dichanthelium ovinum** (Scribn. & J.G. Sm.) Wipff & Shaw, **comb. nov.** *Panicum ovinum* Scribn. & J.G. Sm., Circ. Div. Agrostol. U.S.D.A. 16: 3. 1899. **TYPE: TEXAS.** Waller Co.: 25 May 1898, F.W. Thurow s.n. (holotype: US-2808967-image!).

Described by Lamson-Scribner (1899) from a Waller Co., Texas collection, *Panicum ovinum* was recognized by Hitchcock and Chase (1910, 1915, 1951) and Silveus (1933, 1942). *Panicum ovinum* was treated as a synonym of *Dichantheium aciculare* in the broad interpretation of *Dichantheium* sect. *Angustifolia* by Gould and Clark (1978). In recent years, taxa in this section have again been recognized at the species rank (Weakley & al. 2011, 2017; LeBlond 2016), closely reflecting the taxonomy of Hitchcock and Chase (1910, 1915, 1951) and Silveus (1933, 1942). In contrast, LeBlond (in Weakley & al. 2011) reinstated *D. neuranthum* at specific rank and treated *P. ovinum* as a synonym of *D. neuranthum*. We, however, agree with Hitchcock and Chase (1910, 1915, 1951) and Silveus (1933, 1942) in treating *P. ovinum* as distinct from *P. neuranthum*. Our assessment is supported by our examination of the type specimens of *P. neuranthum* and *P. ovinum*, which revealed that the two taxa are distinct and readily separated from one another, as in the following couplet.

- a. Vernal panicles open, branches flexuous spreading 45–90° from panicle axis; panicle 3–6 cm wide; the spikelets not subsecund, pedicels short to long; spikelets 2.1–2.2 mm long
 **Dichantheium ovinum**
- a. Vernal panicles with branches strongly erect-ascending to appressed; panicles less than 2 cm wide; the spikelets subsecund (appearing 1-sided), pedicels short; spikelets 1.8–2 mm long
 **Dichantheium neuranthum**

Freckmann (1967) reported that *Dichantheium ovinum* occurs inland in dry to moist open areas, prairies, and swales from southern Arkansas and Louisiana west to eastern Texas and south along the Gulf coast into Mexico to about Veracruz. A few specimens with the diagnostic features of this species have been collected in Florida. Whereas *D. neuranthum* is found chiefly in southern Florida and the West Indies, and specimens from Louisiana, Arkansas, and Texas are rare. It is found in open pinelands on very dry, sandy ground and on wet ground in glades of the Everglades.

Weakley & al. (2011) reported *Dichantheium neuranthum* as occurring in savannas and open areas from North Carolina to Florida (south to the Bahamas, Cuba and Belize), west to east Texas and Arkansas. Along the Atlantic and Gulf coasts it is found primarily in maritime wet grasslands and wet pinelands savannas near the coast, especially those with a calcareous influences. Thomas (2017) reported *D. neuranthum* from prairies in southwestern Missouri in Newton County.

3. STAPFOCHLOA H. Scholz, Willdenowia 34: 131. 2004 (25 Aug 2004). **TYPE:** *Stapfochloa lamproparia* (Stapf) H. Scholz, Willdenowia 34: 131. 2004. *Chloris lamproparia* Stapf, Bull. Soc. Bot. France 58 (Mém. 8d): 220. 1912.

Peterson & al. (2015), based on molecular data and morphological characters, proposed that the five taxa treated in the *Chloris ciliata* complex (Anderson 1974) should be placed in *Stapfochloa*, viz., *S. berroi* (Arechav.) P.M. Peterson, *S. canterae* (Arechav.) P.M. Peterson, *S. ciliata* (Sw.) P.M. Peterson, *S. elata* (Desv.) P.M. Peterson, and *S. parvispicula* (Caro & E.A. Sánchez) P.M. Peterson.

Molina and Rúgolo De Agrasar (2004), in their taxonomic revision of the genus *Chloris* in South America, recognized two additional species in the *C. ciliata* complex that had either been previously synonymized under *C. canterae* Arechav. or recognized at infraspecific rank: *C. parodiana* Roseng. & Izag. and *C. grandiflora* Roseng. & Izag. As in the case of Peterson & al. (2015), we assign the two South American *Chloris* to *Stapfochloa* and make two new combinations.

Stapfochloa parodiana (Roseng. & Izag.) Wipff & Shaw, **comb. nov.** *Chloris parodiana* Roseng. & Izag., Bol. Soc. Argent. Bot. 12: 128 (f. 4). 1968. **Type:** PARAGUAY. **Dpto. Paraguari:** costado de la vía férrea y cruce carretera, 7 Apr 1950, *Rosengurtt B-5979* (holotype: MVFA-image!; isotype: BAA).

Stapfochloa grandiflora (Roseng. & Izag.) Wipff & Shaw, **comb. nov.** *Chloris grandiflora* Roseng. & Izag., Bol. Soc. Argent. Bot. 12: 124 (f. 3). 1968. *Chloris canterae* var. *grandiflora* (Roseng. & Izag.) D.E. Anderson, Brigham Young Univ. Sci. Bull., Biol. Ser. 19: 32. 1974. **TYPE: URUGUAY. Dpto. Florida:** Estancia Rincón de Santa Elena, Picada de Castro, Arroyo Mansavillagra, Nov 1946, *Gallinal & Rosengurtt PE- 5790* (holotype: MVFA-image!).

ACKNOWLEDGEMENTS

We are grateful for reviews of the manuscript by Kanchi Gandhi, David Rosen, and Guy Nesom, which significantly improved it.

LITERATURE CITED

- Anderson, D.E. 1974. Taxonomy of the genus *Chloris* (Gramineae). Sci. Bull. Brigham Young Univ., Biol. Ser. 19: 1–133.
- Avdulov, N.P. 1931. Karyo-systematische Untersuchung der Familie Gramineen. Bull. Appl. Bot., Gen. and Plant Breed. 44(suppl.): 119–123.
- Bowden, W.M. and H.A. Senn. 1962. Chromosome numbers in 28 grass genera from South America. Canad. J. Bot. 40: 1115–1124.
- Brown, W.V. 1950. A cytological study of some Texas Gramineae. Bull. Torrey Bot. Club 77: 63–76.
- Chase, A. 1921. The North American species of *Pennisetum*. Contr. U.S. Natl. Herb. 22(4): 209–234.
- Chemisquy, S, L.M. Giussani, M.A. Scataglini, E.A. Kellogg, and O. Morrone. 2010. Phylogenetic studies favour the unification of *Pennisetum*, *Cenchrus* and *Odontelytrum* (Poaceae): A combined nuclear, plastid and morphological analysis, and nomenclatural combinations in *Cenchrus*. Ann. Bot. 106: 107–130.
- Delisle, D.G. 1963. Taxonomy and distribution of the genus *Cenchrus*. Iowa State J. Sci. 34: 259–351.
- Delisle, D.G. 1964. Chromosome numbers in *Cenchrus* (Poaceae). Amer. J. Bot. 51: 1133–1134.
- Denadío, S., L.M. Giussani, E.A. Kellogg, F.O. Zuloaga, and O. Morrone. 2009. A preliminary molecular phylogeny of *Pennisetum* and *Cenchrus* (Poaceae–Paniceae) based on the trnL-F, rpl16 chloroplast markers. Taxon 58: 392–404.
- Freckmann, R.W. 1967. Taxonomic studies in *Panicum* subgenus *Dichantherium*. Ph.D. dissertation. Iowa State University, Ames.
- Gould, F.W. 1965. Chromosome numbers in some Mexican grasses. Bol. Soc. Bot. México 29: 49–62.
- Gould, F.W. and C.A. Clark. 1978. *Dichantherium* (Poaceae) in the United States and Canada. Ann. Missouri Bot. Gard. 65: 1088–1132.
- Hitchcock, A.S. and A. Chase. 1910. The North American species of *Panicum*. Contr. U.S. Natl. Herb. 15: 1–396.
- Hitchcock, A.S. and A. Chase. 1915. Tropical North American species of *Panicum*. Contr. U.S. Natl. Herb. 17: 459–539.
- Hitchcock, A.S. 1931. Poaceae, part 4. Pp. 1–354, in Vol. 17, North American Flora. New York Botanical Garden, Bronx.
- Hitchcock, A.S. 1935. Manual of the Grasses of the United States. USDA Misc. Publ. 200. Government Printing Office, Washington, D.C.
- Hitchcock, A.S. and A. Chase. 1951. Manual of the Grasses of the United States, 2nd ed. Revised by A. Chase. USDA Misc. Publ. 200. Government Printing Office, Washington, D.C.
- Lamson-Scribner, F. 1899. New species of North American grasses. Circ. Div. Agrostol. U.S.D.A. 16: 1–6.
- LeBlond, R.J. 2016. New combinations in *Dichantherium* (Poaceae). J. Bot. Res. Inst. Texas 10: 33–43.

- Link, J.H.F. 1827. Hortus Regius Botanicus Berolinensis. Vol 1. Berlin.
- Martel, E., V. Poncet, F. Lamy, S. Siljak-Yakovlev, B. Lejeune, and A. Sarr. 2004. Chromosome evolution of *Pennisetum* species (Poaceae): Implications of ITS phylogeny. *Pl. Syst. Evol.* 249: 139–149.
- Molina, A.M. and Z.E. Rúgolo de Agrasar. 2004. Taxonomic revision the species of the genus *Chloris* (Poaceae: Chloridoideae) in South America. *Candollea* 59: 347–428.
- Morrone, O., Escobar, A., and Zuloaga, F.O. 2006. Chromosome studies in American Panicoideae (Paniceae). *Ann. Missouri Bot. Gard.* 93: 647–657.
- Nash, G.V. 1903. Poaceae. Pp. 48–161, in J.K. Small, *Flora of the Southeastern United States*. Published by the author (Small), New York.
- Parodi, L.R. 1946. Gramíneas Bonarienses. Clave para la determinación de los géneros y enumeración de las especies, 4th ed. Acme Agency, Buenos Aires.
- Pohl, R. 1980. *Cenchrus* Linnaeus. In: *Flora Costaricensis*, Family #15 Gramineae. Fieldiana Botany, New Series, No. 4., Field Museum of Natural History, Chicago, Illinois.
- Reeder, J.R. 1968. Notes on Mexican grasses. VIII. Miscellaneous chromosome numbers—2. *Bull. Torr. Bot. Club* 95: 69–86.
- Robert, T., N. Khalfallah, E. Martel, F. Lamy, V. Poncet, C. Allinne, M. Remigereau, S. Rekima, M. Leveugle, G. Lakis, S. Siljak-Yakovlev, and A. Sarr. 2010. *Pennisetum*. Chapter 13, pp. 217–255, in C. Kole (ed.). *Wild Crop Relatives: Genomic and Breeding Resources, Millets and Grasses*. Springer-Verlag, Berlin, Heidelberg
- Shaw, R.B. and J.K. Wipff. In Prep. Guide to Texas Grasses, 2nd Revision.
- Silveus, W.A. 1933. *Texas Grasses; Classification and Description of Grasses; Descriptive Systematic Agrostology*. Published by the author, San Antonio, Texas.
- Silveus, W.A. 1942. *Grasses; classification and description of species of Paspalum and Panicum in the United States*. Published by the author, San Antonio, Texas.
- Thomas, J.R. 2017. New additions, vouchers of old additions, and a new combination (*Dichanthelium inflatum*) for the Missouri flora. *Missouriensis* 34: 4–19. <<https://monativeplants.org/publications/missouriensis/>>.
- Weakly, A.S., R.J. LeBlond, B.A. Sorrie, C.T. Witsell, L.D. Estes, K.G. Mathews, A. Ebihara, and K. Gandhi. 2011. New combinations, rank changes, and nomenclatural and taxonomic comments in the vascular flora of the southeastern United States. *J. Bot. Res. Inst. Texas* 5: 437–455.
- Weakley, A.S., D.B. Poindexter, R.J. LeBlond, B.A. Sorrie, C.H. Karlsson, P.J. Williams, E.L. Bridges, S.L. Orzell, B.R. Keener, A. Weeks, R.D. Noyes, M. Flores-Cruz, J.T. Diggs, G.D. Gann, and A.J. Floden. 2017. New combinations, rank changes, and nomenclatural and taxonomic comments in the vascular flora of the southeastern United States. II. *J. Bot. Res. Inst. Texas* 11: 291–325.
- Wipff, J.K. 2001. Nomenclature changes in *Pennisetum* (Poaceae: Paniceae). *Sida* 19: 523–530.
- Wipff, J.K. 2003. *Pennisetum* Rich. Pp. 515–529, in M.E. Barkworth, K.M. Capel, S. Long, and M.B. Piep (eds.). *Flora of North America North of Mexico*, Vol. 25. Magnoliophyta: Commelinidae (in part): Poaceae, part 2. Oxford Univ. Press, New York.