

(2332) Proposal to conserve the name *Sporobolus* against *Spartina*, *Crypsis*, *Poncelletia*, and *Heleochloa* (Poaceae: Chloridoideae: Sporobolinae)

Paul M. Peterson,¹ Konstantin Romaschenko,^{1,2} Yolanda Herrera Arrieta³ & Jeffery M. Saarela⁴

1 Department of Botany, National Museum of Natural History, Smithsonian Institution, Washington, D.C., 20013, U.S.A.

2 M.G. Kholodny Institute of Botany, National Academy of Sciences of Ukraine, 01601 Kiev, Ukraine

3 Instituto Politécnico Nacional, CIIDIR Unidad Durango-COFAA, Durango, C.P. 34220, Mexico

4 Botany Section, Research and Collections, Canadian Museum of Nature, Ottawa, Ontario K1P 6P4, Canada

Author for correspondence: Paul M. Peterson, peterston@si.edu

DOI <http://dx.doi.org/10.12705/636.23>

- (2332) *Sporobolus* R. Br., Prodr.: 169. 27 Mar 1810 [*Gram.*], nom. cons. prop.
 Typus: *S. indicus* (L.) R. Br. (*Agrostis indica* L.).
- (=) *Spartina* Schreb., Gen. Pl.: 43. Apr 1789, nom. rej. prop.
 Typus (vide Moberley in Iowa State Coll. J. Sci. 30: 477. 1956): *S. cynosuroides* (L.) Roth (*Dactylis cynosuroides* L.).
- (=) *Crypsis* Aiton, Hort. Kew. 1: 48. 7 Aug–1 Oct 1789 (nom. cons.), nom. rej. prop.
 Typus: *C. aculeata* (L.) Aiton (*Schoenus aculeatus* L.).
- (=) *Poncelletia* Thouars, Esquisse Fl. Tristan D'Acugna: 36. Oct 1808, nom. rej. prop.
 Typus: *Poncelletia arundinacea* Thouars.
- (=) *Heleochloa* Host ex Roem., Collectanea: 233. 1809, nom. rej. prop.
 Typus (vide Nash in Britton & Brown, Ill. Fl. N. U.S., ed. 2, 1: 190. 1913): *H. alopecuroides* (Piller & Mitterp.) Host ex Roem. (*Phleum alopecuroides* Piller & Mitterp.).

A recent DNA-based phylogeny performed on 144 species in the grass subtribe *Sporobolinae* Benth. depicts *Sporobolus* (1810) as paraphyletic with *Calamovilfa* (A. Gray) Hack. (1890), *Crypsis* (1789), *Spartina* (1789), and *Thellungia* Stapf (1920) embedded within (Peterson & al. in Taxon 63: 1212–1243. 2014). Earlier molecular studies also corroborate this result (Ortiz-Diaz & Culham in Soderstrom & al., Grass Syst. Evol.: 184–188. 2000; Hilu & Alice in Syst. Bot. 26: 386–405. 2001; Columbus & al. in Aliso 23: 565–579. 2007; Bouchenak-Khelladi & al. in Molec. Phylogen. Evol. 47: 488–505. 2008; Peterson & al. in Molec. Phylogen. Evol. 55: 580–598. 2010). Peterson & al. (l.c. 2010) recommended future expansion of *Sporobolus* to include all of these genera, including the monophyletic *Crypsis* and *Spartina*, reflecting their origins from within the *Sporobolus* lineage.

Although *Spartina* (as well as *Poncelletia* (1808), a name placed in its synonymy by Carmichael in Trans. Linn. Soc. London 12: 504. 1819) and *Crypsis* (as well as *Heleochloa* (1809), a name placed in its synonymy and not widely used since Hackel in Lamson-Scribner & Southworth, The True Grasses: 105. 1896) have nomenclatural priority, we are proposing that *Sporobolus* be conserved against these names. *Sporobolus* is much more widely distributed, has 11–20 times more species than either *Crypsis* or *Spartina*, and has a significantly more complex nomenclatural history, i.e., 10 generic synonyms versus 7 each in *Crypsis* and *Spartina*, many names originally published in other genera, and 578 synonyms versus 107 and 56 for *Spartina* and *Crypsis*, respectively (Clayton & al. in GrassBase – The Online World Grass Flora [<http://www.kew.org/data/grasses-db.html>, accessed 15 Sep 2014]. 2006). Within Tropicos.org (Missouri Botanical Garden,

<http://www.tropicos.org/Home.aspx>, accessed 15 Sep 2014) there are 657 names listed in *Sporobolus*, 115 for *Spartina*, and 37 for *Crypsis*. Changing all *Sporobolinae* species to *Spartina* would require 203–216 nomenclatural changes (186–199 *Sporobolus* species + 17 species in *Calamovilfa*, *Crypsis*, and *Thellungia* = 203–216). In addition to the large number of new combinations required, another major obstacle in shifting all names to *Crypsis* or *Spartina* would be sorting out the synonymy for individual species that have heterotypic names with epithets blocked in *Sporobolus* that would be acceptable in *Crypsis* or *Spartina*.

Comparisons of literature databases for *Crypsis/Spartina/Sporobolus* indicate that the name *Crypsis* is much less commonly used than *Spartina* or *Sporobolus*, whereas the frequency of usage of the names *Spartina* and *Sporobolus* is very similar: Google Scholar (<http://scholar.google.com/schhp?hl=en&tab=ws>, accessed 15 Sep 2014) returns 532/5010/5030 results when searching “*Crypsis Poaceae*”, “*Spartina Poaceae*”, or “*Sporobolus Poaceae*” each as a separate search, whereas the Biodiversity Heritage Library (<http://www.biodiversitylibrary.org/>, accessed 15 Sep 2014) returns 1898/6712/6172 recorded instances of these scientific names in publications. Comparisons of exemplar specimen databases indicate there are 6–7 times more *Sporobolus* than *Spartina* herbarium specimens, and 14–67 times fewer herbarium specimens of *Crypsis* than *Sporobolus*. The Missouri Botanical Garden (Tropicos, accessed 15 Sep 2014) returns 92/1006/6180 herbarium specimens housed at MO. In the Global Biodiversity Information Facility (<http://www.gbif.org/>, accessed 16 Sep 2014) searches of “Scientific Name=*Spartina* Schreber, 1789” and “Basis of record=Specimen” returns 5690 results, “Scientific Name=*Sporobolus* R. Br., 1810” and “Basis of Record=Specimen” returns 40,740 results, and “Scientific Name=*Crypsis* W. Aiton, 1789” and “Basis of Record=Specimen” returns 2819 results. Although only about one tenth the size of *Sporobolus* in terms of species diversity, it is apparent that *Spartina* dominates the literature while there is a much greater number of collection records for *Sporobolus*, a function of its higher species diversity and broad geographic distribution worldwide compared to *Spartina*.

Sporobolus (dropseed), lectotypified by Pfeiffer (Nomencl. Bot. 2: 1247. 1874) on *S. indicus* (L.) R. Br., is a genus of at least 186 (Clayton & al., l.c.) or 199 species (Simon & al. in GrassWorld [<http://grassworld.myspecies.info/>, accessed 30 Jan 2014]), and is characterized in having single-flowered spikelets, 1(3)-veined lemmas, fruits with free pericarps or “modified caryopses”, and ligules a ciliate membrane or line of hairs (Peterson & al. in Smithsonian Contr. Bot. 87: 1–50. 1997; Peterson & al. in Barkworth & al., Fl. N. Amer. 25: 115–139. 2003; Peterson & al. in Sida 21: 553–589. 2004; Giraldo-Cañas & Peterson

in *Caldasia* 31: 41–76. 2009). Species of *Sporobolus* generally inhabit dry or stony soils to saline or alkaline sandy to clay loam soils in prairies, savannahs, and along disturbed roadsides where numerous species are weedy and invasive (Clayton & Renvoize in Kew Bull. Addit. Ser. 13: 224. 1986; Peterson & al., l.c. 1997, 2003, 2004; Simon & Jacobs in Austral. Syst. Bot. 12: 375–448. 1999; Ferrell & Mullahey in Weed Sci. 20: 90–94. 2006).

Spartina (cordgrass) is a small genus of 17 species characterized in having panicles with spikelike branches that bear two rows of spikelets on two sides of a somewhat flattened, triangular rachis (that superficially appears to be one-sided or pectinate); spikelets that are 1-flowered with unawned, 1-veined lemmas, and without lodicules, and caryopses with loosely adherent (free) pericarps (Watson & Dallwitz in Grass Gen. World: 852–853. 1992). The cordgrasses have been used for studying allopolyploid speciation, hybridization, polyploidy, and invasion, and there is a broad body of ecological knowledge on this genus (Ainouche in Biol. Invas. 11: 1159–1173. 2009; Cheloufi & al. in Molec. Ecol. 19: 2050–2063. 2010; Saarela in PhytoKeys 10: 25–82. 2012).

Crypsis (pricklegrass) is also a small genus of 9 species characterized in having a line of hairs for ligules, narrow spikelike panicles with 1-flowered spikelets, 1-veined lemmas with acute to mucronate apices, no lodicules, and caryopses with free pericarps (Watson & Dallwitz, l.c.: 256, 257; Peterson & al., l.c. 2014). *Crypsis* was originally conserved over *Pallasia* Scopoli (Harms in Notizbl. Königl. Bot. Gart. Berlin Append. 13: 9. 1904) but this conservation was later determined to be superfluous since it was concluded that *Pallasia* should be treated as a later homonym of *Pallasia* Houtt. (Rickett & Stafleu in Taxon 8: 225. 1959).

In a deeply nested, strongly supported clade within *Sporobolus*, all species of *Spartina* are sister to the *Calamovilfa*–*Sporobolus floridanus* Chapm. clade (Peterson & al., l.c. 2014). In their new classification of *Sporobolus*, including all species previously recognized in *Calamovilfa*, *Crypsis*, *Thellungia*, and *Spartina*, the authors of this study place 161 species in 11 sections (including 11 subsections), and 13 species in incertae sedis; *Spartina* is placed in *Sporobolus* sect. *Spartina*. Thus far 64%–68% [127/186–199] of the species traditionally included in *Sporobolus* have been placed in one of the 11 sections. Expansion of the circumscription of *Sporobolus* to include *Calamovilfa*, *Crypsis*, *Spartina*, and *Thellungia* required only 34 nomenclatural changes (see Peterson & al., l.c. 2014) while still allowing the recognition of a monophyletic and morphologically cohesive unit. Nearly all species included in this expanded circumscription have the salient morphological features that delimit *Sporobolus* such as: 1-flowered spikelets (*Thellungia* is an exception with 1–5-flowered spikelets with long-curved rachillas, each floret readily disarticulating with a persistent rachilla joint), 1(3)-veined lemmas, and

caryopses with free pericarps (Palmer & al. in Mallet, Fl. Australia 44B: 346–409. 2005; Peterson & al., l.c. 2014). *Spartina* only differs in having panicles arranged into spikes; *Calamovilfa* differs in having long callus hairs 1/4 to 7/8 as long as the lemma and disarticulation of the entire spikelet with intact caryopses; and *Crypsis* differs in having spiciform or capitate panicles that are often enclosed in the sheath and strongly laterally compressed spikelets (Peterson & al. in Aliso 23: 580–594. 2007; Peterson & al., l.c. 2014).

Alternatively, if *Spartina*, as well as *Calamovilfa*, *Crypsis*, and *Thellungia* were to be retained as separate genera, a minimum of six or seven new genera would need to be erected to accommodate the 160–173 remaining species apart from the 26 species currently placed in *Sporobolus* sect. *Sporobolus* (186–199 – 26 = 160–173). These alternative name changes would destabilize the taxonomy of this group, since there are very few morphological characters to circumscribe the six or seven new genera.

Sporobolus is a worldwide genus, nearly equally distributed between the Western and Eastern Hemispheres, and is found in tropical, subtropical to temperate regions throughout the world (43 of 81 geographic regions in GrassBase, Clayton & al., l.c.). *Sporobolus* is a firmly founded, long-established name well known to many biologists, conservationists, and land managers. *Spartina* is of North American origin where it is most speciose, and has colonized coastal intertidal mud flats, estuaries, salt marshes, and inland marshes in South America and the Atlantic coasts of Europe and Africa (27 regions in GrassBase, Clayton & al., l.c.; Saarela & al., l.c.; Peterson & al., l.c. 2014). *Crypsis* is of Mediterranean and SW Asian origins where it is commonly found on periodically flooded or saline soils (28 regions in GrassBase, Clayton & al., l.c.; Clayton in Polhill, Gramineae, part 2, Fl. Trop. E. Africa: 353. 1974). Even though *Spartina* is ecologically important in salt marsh and estuary ecosystems with a large and broad body of biological, genetic, and ecological knowledge, we believe conservation of *Sporobolus* R. Br. (1810) over *Spartina* Schreb. (1789) and *Crypsis* Aiton (1789) and their two synonyms *Ponzeletia* Thouars (1808) and *Heleochoa* Host ex Roem. (1809) is the most parsimonious and least disruptive nomenclatural solution for recognizing species of the *Sporobolinae* in a single natural genus.

Acknowledgements

We thank Robert Soreng and John Wiersema for suggestions and comments on our original draft; National Geographic Society Committee for Research and Exploration (Grant No. 8848-10, 8087-06) for field and laboratory support; the Smithsonian Institution's Restricted Endowments Fund, the Scholarly Studies Program, Research Opportunities, Atherton Seidell Foundation, Biodiversity Surveys and Inventories Program, Small Grants Program, and the Laboratory of Analytical Biology, all for financial support.