Monograph of Diplachne
(Poaceae, Chloridoideae, Cynodonteae)

by
Neil Snow, Paul M. Peterson,
Konstantin Romaschenko, Bryan K. Simon

PENSOFT
PhytoKeys 93 (Special Issue)

Monograph of Diplachne (Poaceae, Chloridoideae, Cynodonteae)

by Neil Snow, Paul M. Peterson, Konstantin Romaschenko, Bryan K. Simon

First published 2018

Pensoft Publishers
12 Prof. Georgi Zlatarski Street, 1700 Sofia, Bulgaria
Fax: +359-2-870-42-82
info@pensoft.net
www.pensoft.net

Printed in Bulgaria, January 2018
Monograph of *Diplachne* (Poaceae, Chloridoideae, Cynodonteae)

Neil Snow¹, Paul M. Peterson², Konstantin Romaschenko², Bryan K. Simon³, †

¹ Department of Biology, T.M. Sperry Herbarium, Pittsburg State University, Pittsburg, KS 66762, USA
² Department of Botany MRC-166, National Museum of Natural History, Smithsonian Institution, Washington, DC 20013-7012, USA
³ Queensland Herbarium, Mt Coot-tha Road, Toowong, Brisbane, QLD 4066 Australia (†)

Corresponding author: Neil Snow (nsnow@pittstate.edu)

Academic editor: C. Morden | Received 19 September 2017 | Accepted 28 December 2017 | Published 25 January 2018


Abstract

*Diplachne* P. Beauv. comprises two species with C₄ (NAD-ME) photosynthesis. *Diplachne fusca* has a nearly pantropical-pantemperate distribution with four subspecies: *D. fusca* subsp. *fusca* is Paleotropical with native distributions in Africa, southern Asia and Australia; the widespread Australian endemic *D. f. subsp. muelleri*; and *D. f. subsp. fascicularis* and *D. f. subsp. uninervia* occurring in the New World. *Diplachne gigantea* is known from a few widely scattered, older collections in east-central and southern Africa, and although Data Deficient clearly is of conservation concern. A discussion of previous taxonomic treatments is provided, including molecular data supporting *Diplachne* in its newer, restricted sense. Many populations of *Diplachne fusca* are highly tolerant of saline substrates and most prefer seasonally moist to saturated soils, often in disturbed areas. Some populations of *Diplachne fusca* in southern Asia combine nitrogen-fixation, high salinity tolerance and palatability to livestock, which should be pursued with further research for purposes of soil reclamation. *Diplachne fusca* subsp. *uninervia* is the most invasive of the subspecies and is becoming weedy in some non-native areas, including in the Old World. This monograph provides detailed descriptions of all taxa, a key to the species and subspecies, geographic distributions and information on the anatomy of leaves, stems, lemma-micromorphology and discussions of the chromosome numbers. Lectotypes are designated for: *Atropis carinata* Grisb.; *Diplachne acuminata* Nash; *Diplachne capensis* (Nees) Nees var. *concinna* Nees; *Diplachne capensis* (Nees) Nees var. *obscura* Nees, *Diplachne capensis* (Nees) Nees var. *prolifera* subvar. *minor* Nees, *Diplachne halei* Nash, *Diplachne maritima* E.P. Bicknel, *Diplachne muelleri* Benth., *Diplachne reverchonii* Vasey, *Diplachne tectoneticola* Backer, *Leptochloa imbricata* Thurb., *Leptochloa neuroglossa* Peter, *Leptochloa uninervia* var. *typica* fo. *abbreviata* Parodi, *Triodia ambigua* R. Br. and *Triodia parviflora* R. Br.

Copyright Neil Snow et al. This is an open access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.
Keywords
Azoarcus, cleistogamy, conservation, leaf anatomy, lectotypification, Leptochloa, NAD-ME photosynthesis, nitrogen fixation, plastid DNA sequences, phylogeny, reclamation, stem anatomy, stellate aerenchyma, systematics, typification, weediness

Introduction


The first species now included in Diplachne was described by Linnaeus (1762) as Festuca fusca L. (= D. fusca (L.) P. Beauv. ex Roem. & Schult.). Diplachne itself was established by Palisot de Beauvois (1812) in the same publication that he established Leptochloa P. Beauv. (type species: L. virgata (L.) P. Beauv.) and Rhabodchloa P. Beauv., the latter of which has been reduced to synonymy (e.g. Snow 1997a; Peterson et al. 2001; Soreng et al. 2012). Gray (1848), who first reduced Diplachne to synonymy under Leptochloa, initially did not indicate a taxonomic rank, but later specified its rank as subgenus (Gray 1857). Diplachne fusca was transferred to Uralepis by Steudel (1855). Hackel (1887, 1900, 1902) was an early advocate of maintaining Diplachne as a genus distinct from Leptochloa, but his concept of Diplachne was broad and included species presently placed by most workers in Beusia Goossens, Gouinia E. Fourn. ex Bentham & Hook. f., Cleistogenes Keng (=Kengia Packer), Odyssea Stapf, Pogonarthria Stapf and Trichoneura Andersson (e.g. Fig. 1 in Valls [1978]). The generic name Diplachne R. Br. ex Desf. also once was applied to a species now placed in Verticordia DC., an Australian genus of Myrtaceae (Snow 1997a). After Hackel, the generic boundaries of Diplachne remained highly unstable (Parodi 1927; McNeill 1979; Phillips 1974, 1982; Clayton and Renvoize 1986; Watson and Dallwitz 1992; Jacobs 1987; Snow 1997a). Synonymy within Diplachne fusca is complex and summarised mostly under the subspecies of D. fusca.

This paper is the third in an anticipated series of five monographic treatments (see Snow and Peterson 2012a, 2013) for species formerly placed in Leptochloa P. Beauv. s.l. Subsequent papers will treat Leptochloa and Dinebra Jacq. The objectives of this monograph are to provide a detailed systematic treatment of Diplachne in its newer and more restricted sense; provide complete synonymy (as currently understood); propose many lectotypifications; include a key to species and subspecies; and suggest IUCN recommendations based on current knowledge from herbarium specimens.
Materials and methods

Phylogenetic analyses. Detailed methods for DNA extraction, amplification, sequencing and phylogenetic analysis are given in Peterson et al. (2010, 2012, 2014, 2015, 2016). In brief, the phylogeny was estimated among members of Diplachne based on the analysis of five molecular markers (nuclear ITS 1&2 and plastid rpL32-trnL, ndhA intron, rps16 intron, and rps16-trnK DNA sequences). For this study, a sampling of species was included within subtribe Eleusininae, including the outgroups Aeluropus Trin. (Aeluropodinae), Allolepis Soderstr. & H.F. Decker (Allolepiinae, see Peterson et al. [2017]), Dactyloctenium Willd., Neobouteloua Gould (Dactylocteniinae) and Sporobolus R. Br. (Sporobolinae). The backbone of this phylogram (Fig. 1) was generated with existing data from Peterson et al. (2010, 2012, 2015, 2016) and the addition of sixteen new samples: thirteen of Diplachne fusca, two of Dinebra divaricatissima (one of which initially was misidentified as D. fusca) and one of Diplachne gigantea. Voucher information and GenBank numbers for all samples (including the new ones) are given in Table 1.

Morphology. Morphological characters from approximately 2200 specimens from over 80 herbaria were examined by the first author between 1986 and 2017, representing the entire geographic range of Diplachne (see Acknowledgements; abbreviations of herbaria following Thiers [2017]). Given the wide distribution of Diplachne fusca and its representation in virtually every herbarium the first author has visited, it is estimated that less than half of the specimens of D. fusca globally are cited here, particularly those from eastern Asia, middle eastern and west African herbaria, as well as more regionally-focused herbaria worldwide. The first author has collected specimens of D. fusca from North America (including Mexico), southern Africa (Botswana, South Africa, Namibia) and Australia (New South Wales and Queensland) and grown specimens from these continents in a greenhouse. The second author has collected members of Diplachne from North America, South America and Africa. The fourth author collected specimens from Africa and Australia, including the rare Diplachne gigantea. Geocoordinates are excluded in specimens examined given that most lacked such data at the time of study or were examined before reliable geocoordinates had been added or updated.

Type specimens. Details of types are indicated for those that have been confirmed (including also in Excluded Names); those that merely indicate “type” have not been confirmed or seen. Barcode numbers are enclosed by square brackets; accession numbers are indicated with a hyphen (–) following the herbarium’s acronym.

Species concept. A general lineage species concept (de Queiroz 1998) a diagnosability criterion were used based primarily on gross morphology (Snow 1997b; Snow et al. 2003). However, the molecular data also tested the monophyly of each taxon (Peterson et al. 2014, 2015; Fig. 1).

Anatomy. Numerous fresh samples of leaves and stems were collected in the field for Diplachne fusca, including samples of all subspecies. Samples were placed in 70% ethanol with a trace of glycerin to soften tissues. No specimens of D. gigantea were
located in the field during this project (see comments under that species). Leaves were sectioned by a rotary microtome at Rancho Santa Ana Botanic Garden in the laboratory of Dr. J. Travis Columbus or by hand by the first author at the Missouri Botanical Garden. Data from lemmatal micromorphology (Snow 1996) and caryopsis morphology (Snow 1998b) are included from those publications.

Descriptive terminology for leaf anatomy largely follows Ellis (1976) and includes information from Snow (1997a). This includes *keel* to refer to the proliferation of parenchyma (abaxially, but usually more prominent adaxially) that surrounds the central-most (median) vascular bundle, which typically extends laterally to at least the first vascular bundle on either side of the median bundle. *Lacunae* in the keel refer to areas

---

**Figure 1.** Maximum likelihood tree inferred from nuclear analysis of combined plastid (*rpL32-trnL, ndhA* intron, *rps16* intron, and *rps16-trnK*) and ITS sequences. Numbers above branches are bootstrap values; numbers below branches are posterior probabilities from Bayesian analysis; color indicates native distribution (see legend) of *Diplachne* species. Scale bar: substitutions per site.
<table>
<thead>
<tr>
<th>Taxon</th>
<th>Voucher</th>
<th>Country</th>
<th>rps16-trnK</th>
<th>rps16 intron</th>
<th>rpl32-trnL</th>
<th>ndhA intron</th>
<th>ITS</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Aeluropus lagopoides</em> (L.) Trin. ex Thwaites</td>
<td>Weinert s.n. &amp; Mosawi (US)</td>
<td>Iraq</td>
<td>GU360576</td>
<td>GU360284</td>
<td>GU360013</td>
<td>GU359391</td>
<td>GU359261</td>
</tr>
<tr>
<td><em>Afrotrichloris martini</em> Chiov.</td>
<td>Hemming 3407 (FT)</td>
<td>Somalia, Mudug</td>
<td>KP873645</td>
<td>KP873962</td>
<td>KP873428</td>
<td>KP873827</td>
<td>KP873212</td>
</tr>
<tr>
<td><em>Allelopis texana</em> (Vasey) Soderstr. &amp; H.F. Decker</td>
<td>Hitchcock 7541 (US)</td>
<td>Mexico, Durango</td>
<td>GU360573</td>
<td>GU360318</td>
<td>GU360015</td>
<td>GU359388</td>
<td>GU359264</td>
</tr>
<tr>
<td><em>Apochiton burtii</em> C.E. Hubb.</td>
<td>Peterson 24163, Soreng,</td>
<td>Tanzania, Dodoma</td>
<td>KP873646</td>
<td>KP873963</td>
<td>KP873429</td>
<td>KP873828</td>
<td>KP873214</td>
</tr>
<tr>
<td><em>Astrebla lappacea</em> (Lindl.) Domin</td>
<td>McKinlay s.n. (US)</td>
<td>Australia</td>
<td>GU360568</td>
<td>GU360312</td>
<td>GU360009</td>
<td>GU359395</td>
<td>GU359270</td>
</tr>
<tr>
<td><em>Austrochlorella dichanthoides</em> (Everist) Lazarides</td>
<td>Anson s.n. (US)</td>
<td>Australia, Queensland</td>
<td>GU360566</td>
<td>GU360310</td>
<td>GU359860</td>
<td>GU359420</td>
<td>GU359272</td>
</tr>
<tr>
<td><em>Chloris barbata</em> Sw.</td>
<td>Saarela 1830, Peterson,</td>
<td>Australia, Northern</td>
<td>KP873659</td>
<td>KP873977</td>
<td>KP873443</td>
<td>KP873838</td>
<td>KP873228</td>
</tr>
<tr>
<td><em>Coelachyrum poiformis</em> Chiov.</td>
<td>Burger 2915 (US)</td>
<td>Ethiopia</td>
<td>GU360601</td>
<td>GU360457</td>
<td>GU359843</td>
<td>–</td>
<td>GU359236</td>
</tr>
<tr>
<td><em>Cynodon nlemfuensis</em> Vanderyst</td>
<td>Peterson 24058, Soreng,</td>
<td>Tanzania, Mbeya</td>
<td>KP873742</td>
<td>KP874024</td>
<td>KP873542</td>
<td>KP873900</td>
<td>KP873324</td>
</tr>
<tr>
<td><em>Dactyloctenium aegyptium</em> (L.) Willd.</td>
<td>Peterson 24110, Soreng,</td>
<td>Tanzania, Rukwa</td>
<td>KX582953</td>
<td>KX582889</td>
<td>KX582601</td>
<td>KX582462</td>
<td>KX582328</td>
</tr>
<tr>
<td><em>Dinebra decipiens</em> subsp. <em>decipiens</em> (R. Br.) P. M. Peterson &amp; N. Snow</td>
<td>Snow 7328 &amp; Simon (MO)</td>
<td>Australia, Queensland</td>
<td>JQ345242</td>
<td>JQ345285</td>
<td>JQ345327</td>
<td>JQ345211</td>
<td>JQ345174</td>
</tr>
<tr>
<td><em>Dinebra decipiens</em> subsp. <em>peacockii</em> (Maiden &amp; Betchte) P. M. Peterson &amp; N. Snow</td>
<td>Snow 7361 &amp; Simon (MO)</td>
<td>Australia, Queensland</td>
<td>JQ345244</td>
<td>JQ345287</td>
<td>JQ345329</td>
<td>MF353842</td>
<td>JQ345176</td>
</tr>
<tr>
<td><em>Dinebra disarticulata</em> S.T. Blake P. M. Peterson &amp; N. Snow</td>
<td>Snow 7248, Jacobs &amp; Snow (NSW)</td>
<td>Australia, Queensland</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>MF353850</td>
<td>–</td>
</tr>
<tr>
<td><em>Dinebra disarticulata</em> S.T. Blake P. M. Peterson &amp; N. Snow</td>
<td>Snow 7337 &amp; Simon (BRI)</td>
<td>Australia, Queensland</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>MF353851</td>
<td>–</td>
</tr>
<tr>
<td><em>Dinebra neesii</em> (Thwaites) P. M. Peterson &amp; N. Snow</td>
<td>Snow 7380 &amp; Simon (BRI)</td>
<td>Australia, Queensland</td>
<td>JQ345254</td>
<td>JQ345297</td>
<td>JQ345339</td>
<td>JQ345221</td>
<td>JQ345186</td>
</tr>
<tr>
<td><em>Diplachne fusca</em> (L.) P. Beauv. ex Roem. &amp; Schult.</td>
<td>Han s.n. (HCCN)</td>
<td>Korea (South), Siheung-si</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td><em>Diplachne fusca</em> (L.) P. Beauv. ex Roem. &amp; Schult.</td>
<td>Han s.n. &amp; Kim (HCCN)</td>
<td>Korea (South), Goosan</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Taxon</td>
<td>Voucher</td>
<td>Country</td>
<td>rps16-trnK</td>
<td>atp6-trnL</td>
<td>ndhA intron</td>
<td>rpl32-trnL</td>
<td>ITS</td>
</tr>
<tr>
<td>-------</td>
<td>---------</td>
<td>---------</td>
<td>------------</td>
<td>-----------</td>
<td>-------------</td>
<td>------------</td>
<td>-----</td>
</tr>
<tr>
<td>Diplachne fusca (L.) P. Beauv. ex Roem. &amp; Schult.</td>
<td>Kim s.n. &amp; Sen-Yu Kim (HCCN)</td>
<td>Korea (South), Gangwon-do</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>Davidse 39599 (US)</td>
<td>USA, Missouri</td>
<td>MF353870</td>
<td>MF353863</td>
<td>MF353853</td>
<td>MF353844</td>
<td>MF353833</td>
</tr>
<tr>
<td></td>
<td>Felger 96-51, Schneider, Gillan, &amp; Chavez (US)</td>
<td>Mexico, Sonora</td>
<td>MF353874</td>
<td>MF353867</td>
<td>MF353854</td>
<td>MF353845</td>
<td>MF353834</td>
</tr>
<tr>
<td></td>
<td>Peterson 95/54 (US)</td>
<td>USA, Missouri</td>
<td>MF353872</td>
<td>MF353869</td>
<td>MF353856</td>
<td>MF353846</td>
<td>MF353835</td>
</tr>
<tr>
<td></td>
<td>Snow 5996 (KSP)</td>
<td>USA, Missouri</td>
<td>MF353873</td>
<td>MF353870</td>
<td>MF353866</td>
<td>MF353857</td>
<td>MF353847</td>
</tr>
<tr>
<td></td>
<td>Weber 15/508 (US)</td>
<td>USA, Colorado</td>
<td>MF353875</td>
<td>MF353868</td>
<td>MF353860</td>
<td>MF353849</td>
<td>MF353836</td>
</tr>
<tr>
<td></td>
<td>Brown 25/3 (ME)</td>
<td>USA, Missouri</td>
<td>MF353877</td>
<td>MF353872</td>
<td>MF353858</td>
<td>MF353847</td>
<td>MF353837</td>
</tr>
<tr>
<td></td>
<td>Peterson 24/32, Sorenson, Remsen, &amp; Mabry (US)</td>
<td>USA, Missouri</td>
<td>MF353879</td>
<td>MF353872</td>
<td>MF353859</td>
<td>MF353848</td>
<td>MF353838</td>
</tr>
<tr>
<td>Diplachne fusca subsp. fusca (L.) P. Beauv. ex Roem. &amp; Schult.</td>
<td>Snow 72-49 (KSP)</td>
<td>Canada, Quebec</td>
<td>MF353874</td>
<td>MF353867</td>
<td>MF353859</td>
<td>MF353848</td>
<td>MF353839</td>
</tr>
<tr>
<td></td>
<td>Walsh 69/58 (MEL)</td>
<td>Australia, Western Australia</td>
<td>MF353881</td>
<td>MF353869</td>
<td>MF353856</td>
<td>MF353847</td>
<td>MF353838</td>
</tr>
<tr>
<td></td>
<td>Spies 76/22 (B1FU)</td>
<td>South Africa, Free State</td>
<td>MF353854</td>
<td>MF353857</td>
<td>MF353854</td>
<td>MF353847</td>
<td>MF353838</td>
</tr>
<tr>
<td></td>
<td>Badman 1282 (MO)</td>
<td>Australia, Queensland</td>
<td>MF353855</td>
<td>MF353862</td>
<td>MF353854</td>
<td>MF353847</td>
<td>MF353838</td>
</tr>
<tr>
<td></td>
<td>Jensen 2572 (BRI)</td>
<td>Argentina, Mendoza</td>
<td>MF353856</td>
<td>MF353862</td>
<td>MF353854</td>
<td>MF353847</td>
<td>MF353838</td>
</tr>
<tr>
<td></td>
<td>Columbus 3111 (RSA)</td>
<td>South Africa, Free State</td>
<td>MF353857</td>
<td>MF353863</td>
<td>MF353855</td>
<td>MF353848</td>
<td>MF353839</td>
</tr>
<tr>
<td></td>
<td>Argentina, Mendoza</td>
<td>MF353858</td>
<td>MF353855</td>
<td>MF353849</td>
<td>MF353838</td>
<td>MF353839</td>
<td></td>
</tr>
</tbody>
</table>

* = GenBank accession number.
<table>
<thead>
<tr>
<th>Taxon</th>
<th>Voucher</th>
<th>Country</th>
<th>rps16-trnK</th>
<th>rps16 intron</th>
<th>rpl32-trnL</th>
<th>ndhA intron</th>
<th>ITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diplachne fusca subsp. uninervia (J. Presl) P. M. Peterson &amp; N. Snow</td>
<td>Peterson 20786, Soreng, Romaschenko &amp; Gonzalez-Elizondo (US)</td>
<td>Peru, Arequipa</td>
<td>JQ345250</td>
<td>JQ345293</td>
<td>JQ345335</td>
<td>JQ345217</td>
<td>JQ345182</td>
</tr>
<tr>
<td>Diplachne fusca subsp. uninervia (J. Presl) P. M. Peterson &amp; N. Snow</td>
<td>Peterson 21305, Saarela &amp; Flores Villegas (US)</td>
<td>Mexico, Queretaro</td>
<td>GU360694</td>
<td>GU360391</td>
<td>GU359809</td>
<td>GU359461</td>
<td>GU359147</td>
</tr>
<tr>
<td>Diplachne gigantea Launert</td>
<td>Browning 8 (P)</td>
<td>Botswana</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>MF353861</td>
<td>MF353841</td>
</tr>
<tr>
<td>Disakisperma dubium (Kunth) P. M. Peterson &amp; N. Snow</td>
<td>Peterson 22334 &amp; Saarela (US)</td>
<td>Mexico, Oaxaca</td>
<td>GU360695</td>
<td>GU360416</td>
<td>GU359811</td>
<td>GU359442</td>
<td>GU359145</td>
</tr>
<tr>
<td>Disakisperma eleusine (Nees) P. M. Peterson &amp; N. Snow</td>
<td>Snow 6982 (MO)</td>
<td>South Africa</td>
<td>JQ345248</td>
<td>JQ345291</td>
<td>JQ345333</td>
<td>JQ345215</td>
<td>JQ345180</td>
</tr>
<tr>
<td>Eleusine africana Kenn.-O’Byrne</td>
<td>Peterson 24072, Soreng, Romaschenko &amp; Abeck (US)</td>
<td>Tanzania, Rukwa</td>
<td>KP873757</td>
<td>KP874038</td>
<td>KP873563</td>
<td>KP873914</td>
<td>KP873347</td>
</tr>
<tr>
<td>Eleusine jaegeri Pilg.</td>
<td>Peterson 24299, Soreng, Romaschenko &amp; Mbago (US)</td>
<td>Tanzania, Arusha</td>
<td>KP873762</td>
<td>KP874043</td>
<td>KP873574</td>
<td>KP873918</td>
<td>KP873358</td>
</tr>
<tr>
<td>Eleusine multiflora Hochst. ex A. Rich.</td>
<td>Peterson 24272, Soreng, Romaschenko &amp; Mbago (US)</td>
<td>Tanzania, Shinyanga</td>
<td>KP873763</td>
<td>KP874044</td>
<td>KP873576</td>
<td>KP873919</td>
<td>KP873360</td>
</tr>
<tr>
<td>Enteropogon sechellensis (Baker) T. Durand &amp; Schinz</td>
<td>Peterson 23815, Soreng &amp; Romaschenko (US)</td>
<td>Tanzania, Dar Es Salaam</td>
<td>KP873787</td>
<td>KP874064</td>
<td>KP873602</td>
<td>KP873934</td>
<td>KP873386</td>
</tr>
<tr>
<td>Leptochloa anisopoda (Scribn. ex B.L. Rob.) P.M. Peterson</td>
<td>Proosdij 813, van de Riet &amp; Zauder (US)</td>
<td>Aruba</td>
<td>KP873777</td>
<td>–</td>
<td>KP873593</td>
<td>KP873928</td>
<td>KP873377</td>
</tr>
<tr>
<td>Leptochloa digitata (R.Br.) Domin</td>
<td>Risler 476, Kerrigan (MO)</td>
<td>Australia, Northern Territory</td>
<td>JQ345246</td>
<td>JQ345289</td>
<td>JQ345331</td>
<td>JQ345213</td>
<td>JQ345178</td>
</tr>
<tr>
<td>Leptochloa ecalis (Renvoize) P.M. Peterson</td>
<td>Anderson 37049, Stieber &amp; Kirkbride (US)</td>
<td>Brazil, Bahia State</td>
<td>KP873676</td>
<td>–</td>
<td>KP873464</td>
<td>–</td>
<td>KP873250</td>
</tr>
<tr>
<td>Leptochloa pluriflora (E. Fourn.) P. M. Peterson &amp; N. Snow</td>
<td>Peterson 15048 &amp; Refulio-Rodriguez (US)</td>
<td>Peru, Cajamarca</td>
<td>GU360623</td>
<td>GU360334</td>
<td>GU359905</td>
<td>GU359554</td>
<td>GU359212</td>
</tr>
<tr>
<td>Neobouteloua lophostachya (Griseb.) Gould</td>
<td>Peterson 11515 &amp; Annable (US)</td>
<td>Argentina, San Juan</td>
<td>GU360725</td>
<td>GU360273</td>
<td>GU360004</td>
<td>GU359396</td>
<td>GU359123</td>
</tr>
<tr>
<td>Schoenefeldia transiens (Pilg.) Chiov.</td>
<td>Peterson 24216, Soreng, Romaschenko &amp; Mbago (US)</td>
<td>Tanzania, Tanga</td>
<td>KP873815</td>
<td>KP874088</td>
<td>KP873632</td>
<td>KP873954</td>
<td>KP873415</td>
</tr>
<tr>
<td>Sporobolus indicus (L.) R. Br.</td>
<td>Peterson 22025 &amp; Saarela (US)</td>
<td>Mexico, Chihuahua</td>
<td>GU360630</td>
<td>GU360355</td>
<td>GU359913</td>
<td>GU359504</td>
<td>GU359209</td>
</tr>
</tbody>
</table>
of the keel in which parenchyma disintegrates during laminar ontogeny. Projection, in association with primary and secondary vascular bundles, is a term relative to the horizontal level of adjacent adjacent intercostal zones.

**Geographical distributions.** Abbreviations follow Brummit (2001) for both native and non-native distributions. Given the large number of specimens cited and to assist readers, countries are offset in bold and first-level divisions (states, provinces etc.) are underlined.

**Results and discussion**

**Phylogeny.** A total of 46 new sequences from four species are newly reported in GenBank (Table 1). The total aligned characters for individual regions and other parameters are noted in Table 2. The plastid–ITS sequences were combined in the analysis since there was little incongruence among between these data sets (Figure 1).

The maximum-likelihood tree from the combined analysis of ITS and four plastid regions (rpL32-trnL, ndhA intron, rps16 intron and rps16-trnK) is well resolved with strong support for the monophyly of *Diplachne* (Fig. 1; posterior probability (PP) = 1, bootstrap (BS) = 100].

Within *Diplachne*, *D. gigantea* is sister to the numerous accessions of *D. fusca*. Among the accessions of *D. fusca*, the most strongly supported clade is an east Asian-Australian clade (PP = 99; BS = 68). However, genetic variation among DNA sequences separates only some of accessions of *D. fusca* unequivocally. The basal-most accession of *D. fusca* subsp. *fusca* (Snow 6908 from Botswana) has strong support (PP = 1, BS = 80) and the remaining accessions of *D. fusca* also are well supported (PP = 1, BS = 98). The three earliest-arising accessions of *D. fusca* are African (Snow 6908; Peterson 24322; Spies 7622 [Table 1]) which, with the basal-most (and African) *D. gigantea*, suggest an African origin of the genus.

None of the accessions of *D. fusca* cluster exclusively by subspecies or broad geographical area (e.g. continents or Asia+Pacific). For example, one of the three accessions from South Korea (Han s.n.) forms a polytomy with North American accessions of subsp. *fascicularis* (Davidse 39599 and Snow 5996, both from Missouri; Weber 15508, from Colorado), which collectively are part of a larger clade that includes another polytomy with two North America accessions of subsp. *fusca* (Felger 96–51 from Sonora, Mexico; Peterson 9554 from Louisiana), an accession of subsp. *uninervia* from Australia (Peterson 21305) and another accession of subsp. *fusca* from Australia (Brown 253). Two other accessions of subsp. *fusca* from South Korea (Han s.n. & Kim; Kim s.n. & Sun-yu Kim) form a clade embedded with two accessions of subsp. *muelleri* (Badman 1282; Bean 28735). A similar pattern exists for a subclade within the *fusca* clade overall, wherein an accession of subsp. *muelleri* (Jensen 2572) is sister to two accessions of subsp. *fusca* from Australia (Snow 7249; Walsh 6558). The polyphyletic nature of accessions of *Diplachne fusca* subsp. *fusca* is not surprising, as it is the most geographically widespread and morphologically diverse of the four subspecies.
Table 2. Characteristics of the five regions, \textit{rpL32-trnL}, \textit{ndhA} intron, \textit{rps16} intron, \textit{rps16-trnK} and ITS, and parameters used in Bayesian analyses indicated by Akaike Information Criterion (AIC).

<table>
<thead>
<tr>
<th>characteristic</th>
<th>\textit{rpL32-trnL}</th>
<th>\textit{ndhA} intron</th>
<th>\textit{rps16} intron</th>
<th>\textit{rps16-trnK}</th>
<th>Combined plastid data</th>
<th>ITS</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total aligned characters</td>
<td>813</td>
<td>1088</td>
<td>812</td>
<td>771</td>
<td>3484</td>
<td>718</td>
<td>4202</td>
</tr>
<tr>
<td>Sequencing success (%)</td>
<td>89.8</td>
<td>79.6</td>
<td>77.6</td>
<td>83.7</td>
<td>82.7</td>
<td>95.9</td>
<td>85.3</td>
</tr>
<tr>
<td>Number of new sequences</td>
<td>12 (27.3%)</td>
<td>10 (25.6%)</td>
<td>9 (23.7%)</td>
<td>9 (22%)</td>
<td>40 (24.7%)</td>
<td>10 (21.3%)</td>
<td>50 (23.9%)</td>
</tr>
<tr>
<td>Likelihood score (-lnL)</td>
<td>2537.68</td>
<td>2878.00</td>
<td>2086.42</td>
<td>2311.14</td>
<td>5378.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of substitution types</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>-</td>
<td>6</td>
<td>-</td>
</tr>
<tr>
<td>Model for among-site rate variation</td>
<td>gamma</td>
<td>gamma</td>
<td>gamma</td>
<td>gamma</td>
<td>-</td>
<td>gamma</td>
<td>-</td>
</tr>
<tr>
<td>Substitution rates</td>
<td>0.8794</td>
<td>1.1091</td>
<td>1.3551</td>
<td>1.1364</td>
<td>-</td>
<td>0.8345</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.8895</td>
<td>3.1362</td>
<td>1.2588</td>
<td>3.1297</td>
<td>-</td>
<td>2.1975</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.2840</td>
<td>0.6149</td>
<td>0.1754</td>
<td>0.4521</td>
<td>-</td>
<td>1.8367</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.8677</td>
<td>2.9448</td>
<td>0.7767</td>
<td>1.7450</td>
<td>-</td>
<td>0.5972</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.74818</td>
<td>2.8808</td>
<td>1.7467</td>
<td>2.7943</td>
<td>-</td>
<td>4.1384</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.0000</td>
<td>1.0000</td>
<td>1.0000</td>
<td>1.0000</td>
<td>-</td>
<td>1.0000</td>
<td></td>
</tr>
<tr>
<td>Character state frequencies</td>
<td>0.3663</td>
<td>0.3609</td>
<td>0.3776</td>
<td>0.3050</td>
<td>-</td>
<td>0.2325</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.1354</td>
<td>0.1401</td>
<td>0.1157</td>
<td>0.1555</td>
<td>-</td>
<td>0.2574</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.1359</td>
<td>0.1482</td>
<td>0.1740</td>
<td>0.1470</td>
<td>-</td>
<td>0.2626</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.3623</td>
<td>0.3507</td>
<td>0.3325</td>
<td>0.3923</td>
<td>-</td>
<td>0.2474</td>
<td></td>
</tr>
<tr>
<td>Proportion of invariable sites</td>
<td>0.2868</td>
<td>0.3418</td>
<td>1.0051</td>
<td>0.1261</td>
<td>-</td>
<td>0.2326</td>
<td></td>
</tr>
<tr>
<td>Substitution model</td>
<td>TVM+G</td>
<td>TVM+G</td>
<td>TVM+G</td>
<td>TVM+I</td>
<td>GTR+I+G</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Gamma shape parameter (α)</td>
<td>0.8078</td>
<td>1.1794</td>
<td>0.2996</td>
<td>1.5741</td>
<td>-</td>
<td>0.8378</td>
<td></td>
</tr>
</tbody>
</table>

The location of some accessions (Peterson 20786, Columbus 3111) of the amphitropical (Snow 2003, 2012) \textit{D. fusca} subsp. \textit{uninervia} near the base of the \textit{fusca} clade suggests the possibility of a South American origin of this subspecies, but that interpretation needs further testing and does not explain the presence of one accession from Estado de México, México (Peterson 21305) in a large polytomy elsewhere. Of all subspecies, \textit{D. f. subsp. uninervia} has the greatest weedy tendencies and is now distributed across many non-native areas (e.g. Snow and Simon 1999; Pérez et al. 2010). The significant separation of the Mexican accession from the South American accessions also suggests that subsp. \textit{uninervia} may not have had a singular origin.

The three accessions of the exclusively Australian \textit{D. f. subsp. muelleri} likewise are not monophyletic, given that one (Badman 1282 from South Australia) forms a clade containing two accessions of \textit{D. f. subsp. fusca} from Korea and another clade includes an accession (Jensen 2527) with two accessions of subsp. \textit{fusca} (Snow 7249; Walsh 6558). The Korean sequences were obtained from GenBank, but vouchers have not been seen.

The molecular data may accurately reflect the true evolutionary relationships of the specimens sampled and thus support the lack of monophyly among the subspecies. Given the widespread geographical distribution of \textit{D. fusca} and of subsp. \textit{fusca} in particular, the lack of monophyly would not be surprising. If accurately reflecting the actual history,
then the molecular data suggest that the morphological characters used to separate the subspecies may be inadequate. The frequent inability of morphological characters, by themselves, to accurately recover genera within Poaceae, is well known (Kellogg 2015). In contrast, if the subspecies are monophyletic as recognised herein (largely) by morphological data, then any of several factors may have contributed to the incongruity of geographical region of origin and clade placement among subspecies of *D. fusca*, including: multiple mutational hits among base pairs, lineage sorting, hybridisation and long-distance dispersal. Among long-distance dispersal events, some of these might include human-mediated dispersal events within the last few millennia. In the authors’ view, a more in-depth sampling of populations is necessary to test further hypotheses of monophyly among the subspecies. Another possibility, of course, is that the taxonomy at the subspecific level needs adjusting, but that would require extensive re-analysis of the thousands of herbarium specimens that underlie the morphologically-based taxa. A high sampling priority in the authors’ view is to obtain DNA samples of *D. fusca* subsp. *fusca* from South America, to see where they fit into the phylogenetic framework.

Elsewhere in Figure 1, two accessions of *Dinebra divaricatissima* formed a clade that rendered *D. decipiens* paraphyletic. If further sampling upholds this arrangement, then *D. divaricatissima* might be better treated as a subspecies of *D. decipiens*. An earlier placement (Peterson et al. 2015) of *Dinebra divaricatissima* within *Diplachne* was based on a misidentified individual of *Diplachne fusca*.

**Morphology.** The elongate, broadly to narrowly acute membranous ligule of *Diplachne* and numerous, dorsally rounded or flattened florets (before seed development), most consistently diagnose the genus from species formerly placed in *Leptochloa* sensu lato (Snow 1997a, 2003). As reported previously (Peterson et al. 2012), banding patterns from chloroplast DNA restriction site analysis of populations of *D. fusca* subsp. *fascicularis* and *uninervia* were virtually identical, but consistently different from other North American members of *Leptochloa* s.l. (Snow unpublished, 1991). More recently, Peterson et al. (2014) demonstrated that DNA barcoding generally can separate members of *Leptochloa* s.l. with relatively high levels of confidence.

Geographically localised morphological variation among populations of *Diplachne fusca* is widespread, which has led to numerous heterotypic synonyms. After observing this variation globally, particularly with regards to taxa here included in *Diplachne fusca* subsp. *fusca*, Snow (1997a) concluded that only four infraspecific taxa could be consistently diagnosed morphologically following a phylogenetic species concept or (later) a general lineage concept using a diagnosability criterion (Snow 1997b; Snow et al. 2003). Although some authors might choose to re-elevate the subspecies of *D. fusca* to the specific level, it should be stressed that the nominative taxon, which is the most widespread and exhibits the highest levels of morphological variation, intergrades into each of the other three to some degree with virtually all morphological characters. Whether these taxa hybridise has not been tested. A collection from Orange County, California (Beetle 13066 [OKLA]) may be a hybrid between *L. f.* subsp. *fascicularis* and *uninervia*. *Diplachne gigantea* is a rare, evidently emergent aquatic species endemic to a few narrow regions of southern Africa.
**Leaf anatomy.** Detailed anatomical descriptions follow each taxon. In general, leaves show C₄ (NAD-ME) anatomy; primary vascular bundles project considerably more than secondary bundles and a prominent parenchymatous keel is present in the midnerve region, which typically develops a single (often prominent) lacuna.

Sutton (1973a) commented briefly on leaf anatomy of *D. fusca* subsp. *fasicularis* (as *Leptochloa fasicularis* [sic]) but not in a comparative context with other taxa. Earlier workers also made limited observations of leaf anatomy. Hattersley and Watson (1976) used the presence of an “intervening cell” to predict a XyMS+ anatomy for *D. fusca* (as *Diplachne parviflora* (R. Br.) Benth.). Clifford and Watson (1977) illustrated the transverse section of *Diplachne parviflora*. Ellis (1977) reported NAD anatomy in *Diplachne fusca*. However, Valls (1978) carried out the most extensive investigation of species formerly placed in *Leptochloa* s.l., which now includes that genus, *Disakisperma* Steud., *Dinebra*, *Trigonochloa* P.M. Peterson & N. Snow and *Diplachne* (Peterson et al. 2012; 2014, 2015). Watson and Dallwitz (1992: 324) briefly mentioned leaf anatomy in *Diplachne*.

Valls (1978) studied cross sections of all of subspecies of *D. fusca* (under various names). Based on the prominent adaxial projection of the primary vascular bundles of *D. fusca*, Valls (1978) reported them as being “nodular” in transverse section, meaning that the primary (and to some degree secondary) vascular bundles project from the adjacent tissues. He also noted the broad and prominent parenchyma midnerve region of the adaxial surface among subspecies of *D. fusca* (Valls 1978), which is simply referred to as the keel. Most specimens of *D. fusca* have prominent keels on the abaxial surface, but these become increasingly narrow distally.

Whereas Snow (1997a) did not examine cellular detail of leaf surfaces, Valls (1978) observed saddle-shaped silica bodies for *Diplachne fusca* subsp. *fasicularis*, *fusca* and *uninervia*. All three species of *Disakisperma* (Snow and Peterson 2013) also had saddle-shaped silica bodies on the laminar surface (Valls 1978), as did *Leptochloa malayana* (C.E. Hubb.) Jansen ex Veldkamp and *L. longa* Griseb., species not included in molecular studies (Peterson et al. 2012) and which presently are *incertae sedis* at the generic level.

**Stem anatomy.** Comparative studies of stem anatomy in Poaceae have been limited (but see de Wet 1960; Ebinger and Carlen 1975; Sánchez 1979, 1981a-b; Sánchez et al. 1989; Clark and Fisher 1987). The internodes of *D. fusca* are hollow, whereas stellate aerenchyma comprises the pith of *D. gigantea*. Stellate aerenchyma is known from some grasses (Pohl and Lersten 1975) and is not uncommon among plants that remain submerged to somewhat emergent in water, which appears to be the preferred, if not exclusive, habitat of *D. gigantea*.

**Lemmatal micromorphology.** All examined specimens of *Diplachne* share a combination of micromorphological characters including the presence of long and short cells, silica cells, cork cells and bicellular microhairs (Snow 1996). All members of *Diplachne fusca* have macrohairs with obtuse or rounded apices, but these were absent or scant for *D. gigantea* and, if present, then restricted to the base of the lemma (Snow 1996, 1997a). *Diplachne fusca* and *D. gigantea* have papillate short cells (Snow 1996).

**Reproductive biology.** Hackel (1906) believed that some specimens of *Diplachne fusca* subsp. *fasicularis* approach a cleistogamous condition, which he defined strictly
to be plants that showed intrastigmatic anthers crushed at the top of a mature fruit. In contrast, for *D. fusca* subsp. *uninervia* Valls (1978: 96) observed flowering in the first two panicles in a greenhouse-grown specimen (Valls 3514 [TAES]) that produced numerous seeds. Anthesis was not observed despite a daily check, suggesting complete cleistogamy during this interval. However, the next two inflorescences to emerge were observed to undergo anthesis (by virtue of exserted stamens) and production of seed, suggesting the possibility of seasonal shifts in chasmogamy and cleistogamy. Valls (1978) also reported observing crushed anthers in *D. fusca* subsp. *muelleri*, which also suggests the possibility of cleistogamy. In contrast, he reported no evidence of cleistogamy for *D. fusca* subsp. *fusca*. Given that anthers tend to be significantly shorter in the predominantly Neotropical subspecies of *D. fusca* (*fuscularis* and *uninervia*) compared to the native Paleotropical subspecies (*fusca* and *muelleri*), Valls (1978) suggested that predominately chasmogamous and predominantly cleistogamous lineages appear to co-exist in *D. fusca*, which he used also as evidence that the three subspecies he studied (all excluding *D. f.* subsp. *fusca*) could be treated conspecifically, as in the present paper. Further, he posited that cleistogamous lines were developed from polymorphic chasmogamous stock in *D. fusca* subsp. *fusca* (Valls 1978: 97).

**Caryopsis morphology.** The caryopsis of *Diplachne* is flattened dorsally, with the pericarps of *D. fusca* and *D. gigantea* easily separable when soaked in water at room temperature (Snow 1998b). Dorsal flattening and readily separable pericarps also occur in species now treated in *Disakisperma* and among other genera of Chloridoideae (Snow and Peterson 2013), but most caryopses of *Disakisperma* also are broadly concave at maturity. A slightly concave surface has been noted previously (Valls 1978) for some specimens of *D. fusca*, although the caryopses of *Diplachne* are generally elliptic in transverse section and, if concave, then notably less so than the normal condition in *Disakisperma* (Snow and Peterson 2013).

**Embryo formula.** Reeder (1957, 1961) took the results of previous studies of grass embryos and those of his own to create an “embryo formula”, which typified variation in a few observable characters of grass embryos. Reeder used the letters “F” and “P” to represent the condition typically found in subfamilies Festucoideae and Panicoideae in their former, much broader circumscriptions (e.g. Hitchcock 1951). In addition, Reeder (op. cit.) indicated presence (+) or absence (−) of an epiblast. The typical formula for genera in subfamily Chloridoideae was P+PF, indicating (in order): an elongation of the vascular system between the point of divergence of the scutellum and coleoptile (P); epiblast present (+); presence of a cleft between the lower part of the scutellum and the coleorhiza (second P); and embryonic leaf in cross section with non-overlapping margins and relatively few vascular bundles (F). According to Valls (1978: 109), Reeder based his summary of *Leptochloa* (i.e. including the species treated here as *Diplachne*) on four species, but did not indicate specifically which species were examined. Valls (1978: 110 [voucher: Valls 3468 {TAES}) confirmed the formula for *D. fusca* subsp. *fusca* as P+PF.

**Pollen.** The pollen of *Diplachne* has been studied minimally, but Liu et al. (2004) report “type 4” pollen (for Chloridoid grasses) for *D. fusca*, which has an annulate
aperture, an insular exine and a “sculptural density” of 0.5–2 µm². These authors also showed that Diplachne (=Leptochloa) panicea (Retz.) P.M. Peterson & N. Snow has two apertures, in contrast with the single aperture of D. fusca, the latter of which has also a minute annulus surrounding the aperture. Further study may reveal characters of pollen that reliably diagnose Diplachne from related genera.

**Fungal infections.** The fungal genera Puccinia Pers. and Ustilago (Pers.) Roussel have been reported for species included in Diplachne (Watson and Dallwitz 1992). The Australian Ustilago serena Syd. was first collected on Diplachne in 1936 (Shivas and Vánky 2003; see also U. serena on Diplachne parviflora [= D. fusca subsp. fusca]; http://www.padil.gov.au/aus-smuts/pest/main/140235).

**Etymology.** From the Greek diploos (=double) and achne (=awn), referring to the 2-toothed condition of some specimens of the lemma.

---

**Key to Diplachne and morphologically similar genera**

A recurring and emergent theme from DNA sequencing studies in Poaceae is that morphological characters alone frequently are unreliable indicators of phylogenetic relationships (Kellogg 2015). A corollary is that generic keys are not always easily written using morphological characters. The following key is modified slightly from Peterson et al. (2012) for Diplachne and related genera.

1. Ligules (1.5–)4–8(–15) mm long, apex acute to attenuate, becoming lacerate by tearing with age; spikelets sometimes quite distant along primary branches; spikelets and lemmas somewhat dorsally rounded or flattened; nearly worldwide in tropical and warm-temperate regions below 2000 metres, often of low-lying, seasonally mesic and disturbed soils........................................... **Diplachne**
   - Ligules 0.2–7 mm long, apex usually truncate to obtuse and somewhat erose; spikelets rarely if ever distant along primary branches; spikelets and lemmas somewhat to distinctly laterally compressed; distribution various.........................2

2. Apex of lemmatal hairs mostly clavicorniculate (obtuse to somewhat acute in D. dubium); base of lemma often indurate and sometimes 5-veined; plants perennial; ligules 0.8–2.2 mm long, apex erose....................... **Disakisperma**
   - Apex of lemmatal hairs acute to obtuse, never clavicorniculate; base of lemma soft and almost always 3-veined; plants annual or perennial; ligules (0.2–)0.5–5.5(–7.0) mm long, apex usually entire...........................................3

3. Panicle branches usually with 2 or more branches per node; lemmas 1- to 3-awned or unawned (the awns often >2 mm); plants perennial; culms solid; ligules 0.5–3.0 mm long, apex ciliate....................................................... **Leptochloa**
   - Panicle branches usually with a single branch per node; lemmas unawned or shortly awned (awns typically < 2 mm); plants annual or perennial; culms hollow or sometimes solid; ligules (0.2–)0.5–5.5(–7.0) mm long, apex membranous................................................................. **Dinebra**
Taxonomic treatment


Type species. Diplachne fusca

Description. Plants cespitose, annual or perennial, arising from fibrous roots or sometimes rhizomatous. Culms (3–)10–250(–300) cm tall, round or somewhat compressed, mostly ascending to erect, often geniculate at lower nodes (rarely decumbent and rooting at nodes; sometimes highly reduced and prostrate), often branching. Internodes hollow or with stellate arenchyma; nodes glabrous. Leaves cauline, midrib (“keel”) prominent proximally on upper surface, blades flat or becoming involute when dry, apex attenuate; sheaths open, longer or shorter than internodes. Ligules (1.5–)4–8(–15) mm, membranous or hyaline, acute to attenuate but becoming lacerate in age. Inflorescence a panicle of spicate primary branches, terminal or sometimes lateral, completely exserted or partially enclosed basally in sheath. Panicle branches numerous, steeply erect to divergent or even reflexed (in age) but mostly ascending, stiff, minutely scabrous, whorled, subwhorled or (mostly) alternate along the rachis, typically one-sided throughout their length with spikelets in 2 rows, each branch terminating in a functional spikelet. Spikelets rounded to somewhat compressed, becoming more rounded or flattened in maturity (with caryopsis), distant to tightly imbricate, green to plumbeous (lead-coloured) in flower; callous glabrous; florets mostly (2–)4–12(–20), perfect (occasionally male or female); rachilla only rarely prolonged. Glumes unequal, membranous, 1-nerved. Lemmas 3-nerved, glabrous to serious on midvein and lateral nerves, especially proximally; apex acute, obtuse, sometimes emarginate, awnless, mucronate or awned; lateral nerves distinct and occasionally excurrent. Palea membranous, typically subequal to lemma. Stamens 1, 2, or (mostly) 3, anthers 0.2–2.7 mm long, yellow or maroon. Caryopsis elliptic to narrowly elliptic in hilar profile; dorsally compressed. $n=10$; $2n=19$, 20.

Vernacular name. Given unstable generic boundaries, no common name has been applied consistently. For English, “diplachne” is simply recommended given its shortness and ease of pronunciation.
Key to the species of Diplachne

1 Plants erect or geniculate, to 170 cm tall, sometimes rooting at the lower nodes; culms hollow; lemmas more or less hairy on the nerves; sheaths glabrous; panicle branches 3–25 cm long, relatively stiff, mostly erect to ascending, much less frequently divergent to reflexed; florets sometimes tightly imbricate entirely or mostly concealing the rachilla ....................... Diplachne fusca

– Plants mostly erect, to 300 cm tall, sometimes rhizomatous; culms with abundant stellate aerenchyma; lemmas glabrous or with short hairs near the base of the nerves; lower sheaths pubescent, but becoming glabrous with age; panicle branches 12–18 cm long, somewhat lax, probably divergent to reflexed when fresh (not confirmed in field); florets less tightly imbricate and sometimes revealing rachilla ....................................................................... Diplachne gigantea

Diplachne fusca (L.) P. Beauv. ex Roem. & Schult., Systema Vegetabilum 2. 1825.


Description. Annuals or perennials. Culms 3 cm long (when prostrate) to 170 cm tall, 1–8 mm wide at base, round or sometimes flattened, ascending to erect (sometimes completely prostrate at higher altitudes) or geniculate and rooting at lower nodes (facultatively stoloniferous), branched or unbranched; nodes glabrous; internodes (0.5–)3–26 cm long, soft or sometimes slightly lignified, hollow. Leaf sheaths longer or shorter than the internodes, round or flattened, glabrous on sides and margins; ligules (1.5–)5–12(–15) mm long, hyaline to membranous, apically attenuate but often becoming lacerated due to mechanical damage; blades (3–)5–50 ×0.2–0.6 cm, flat but becoming inrolled when dry, glabrous to somewhat scabrous above and below. Panicles (1.5–)15–105 ×2–30 cm, partially inserted below (subsp. muelleri and fascicularis or occasionally subsp. fusca) to completely exerted at maturity; with (3–)5–35 branches; the branches (1.5–)3–20 cm long, alternate along the rachis, sometimes reflexed or steeply erect but mostly somewhat ascending, stiff, minutely scabrous, axils glabrous. Spikelets 5–12(–14) mm long, shortly pedicillate, sometimes distant near base of branches but overlapping near branch tips; florets (4–)6–12(–20); callus glabrous or hairy; lower glumes 1.0–3.5 (–4.9) mm long, membranous, narrowly ovate to ovate, usually scabrous on the midnerves, apex broadly acute to acute, awnless or infrequently shortly awned; upper glumes 1.8–5.5 mm long, elliptic to usually ovate or widely ovate (or sometimes obovate), scabrous on midnerves, apex obtuse (rarely) or acute at apex, rarely short-awned; lemmas 2.3–6.0 mm long, nar-
rowly ovate, ovate, or elliptic, the lateral nerves distinct and sometimes slightly excurrent, more or less sericeous on lateral nerves and the midnerve (hair tips rounded), apex truncate, obtuse, to acute or acuminate and sometimes bifid, awnless, mucronate, or awned to 3.5 mm; palea subequal or slightly exceeding lemma, more or less sericeous on nerves; apex acute or obtuse. Stamens 1, 2 or mostly 3; anthers 0.2–2.7 mm. Caryopses 1.0–2.4 ×0.7–1.2 mm, elliptic, ovate, or obovate in hilar profile, transversely elliptic to depressed obovate in transverse section, hilar groove lacking, smooth or sometimes slightly rugose, brown; pericarp weakly adnate to the endosperm.

**Stem anatomy.** Stems are hollow in *Diplachne fusca* (Canfield 1934; Ebinger and Carlen 1975; Brown 1975; Auquier and Sommers 1967; Valls 1978). When branching occurs in *D. fusca* it tends to be concentrated in the upper nodes (Valls 1978). Valls (1978: 33) observed that branching in *D. f.* subsp. *uninervia* tends to occur after the terminal inflorescence is fully developed, suggesting that branching is facultative and dependent on favourable growing conditions, presumably adequate soil moisture.

**Phenology.** Flowering throughout the year in tropical latitudes; usually commencing early to mid-summer in temperate areas.

**Distribution.** Native: Widespread and common to abundant in warm–temperate and tropical areas, between approximately 49°N and 40°S in the New World and 40°N and 42°S in Old World; mostly below 2000 m. Non-native: See under subspecies.

**Vernacular names.** Malabar sprangletop; Chinese: shuang fu cao (双稃草) (and see others under subspecies).

**Comments.** Localised populations of the *Diplachne fusca* complex can be somewhat distinct morphologically from conspecifics occurring elsewhere, which is reflected in the many names that have been created to reflect such variation. However, all characters intergrade when considered globally (Snow 1997a), suggesting that the localised morphological variants do not merit recognition at the specific level. Field observations, herbarium work and multivariate statistical studies (Snow unpubl.) based on eleven population samples (n=20) from North America, Africa and Australia, which included over 80 morphometric traits, supported the recognition of four subspecies, which generally can be differentiated with little difficulty. These include: *D. fusca* subsp. *fusca*, a polymorphic Paleotropical taxon adventive in a few areas in the New World (Nicora 1995; Snow 2012); *D. f.* subsp. *muelleri*, known from much of the interior portions of Australia, particularly the Northern Territory; *D. f.* subsp. *uninervia*, native to the Neotropics but adventive elsewhere (e.g. Snow and Simon 1999) and *D. f.* subsp. *fascicularis*, native to the temperate and tropical regions of the New World.

Differentiating between subspecies can be particularly difficult in parts of California and Argentina, where *D. f.* subsp. *fusca* is adventive and sympatric with subspecies *fascicularis* and *uninervia* and in the Middle East and Australia (Western Australia, Queensland), where *D. f.* subsp. *uninervia* has become established (Snow and Simon 1999). It seems unlikely that *D. f.* subsp. *fusca* has persisted in California.

Specimens collected around wool combing mills in South Carolina in the United States by Ahles and associates in the 1950s and 1960s appear to be *L. fusca* subsp. *fusca* or occasionally subsp. *muelleri*, which likely arrived from wool exported by Australia to the Carolinas for the textile factories then common.
Key to subspecies of Diplachne fusca

1 Lowermost panicle branches generally exserted from sheath; uppermost leaf blade length generally shorter than the terminal panicle; leaf sheaths only rarely mottled with anthocyanin pigments; lemmas at maturity smoky white or not, sometimes dark green, but usually lacking a distinct dark spot ..........2
- Lowermost branches of panicles generally partially to mostly inserted in upper sheath; uppermost leaf blade length usually exceeding length of panicle; leaf sheaths sometimes mottled with anthocyanin pigments; lemmas often smoky white at maturity and with a dark spot in lower half ......................... 3

2 Lemma apices various, obtuse to acute or acuminate, notched or not; lemmas of various colours; spikelets 6–14 mm; anthers usually 0.5–2.7 mm; mostly Old World, southern South America, introduced into North America ........

.............................................................................. Diplachne fusca subsp. fusca
- Lemma apices obtuse to truncate, usually notched and often mucronate; lemmas often dark green or lead coloured; spikelets relatively short, 5–10 mm, anthers usually less than 0.7 mm; rachilla rarely visible during anthesis; mostly New World tropics .................. Diplachne fusca subsp. uninervia

3 Lemmas flat, relatively broad, to 2.0 mm wide; panicles narrow, mostly less than 5 cm wide; panicle branches generally steeply erect, often flexuous near tips; hairs on lateral nerves of lemma sericeous to velutinous, often densely so and typically becoming divaricate with age; lemma apices mostly broadly acute, awnless or sometimes mucronate; Australian interior .............

.............................................................................. Diplachne fusca subsp. muelleri
- Lemmas slightly keeled, relatively narrow, mostly less than 1.5 mm wide; panicles somewhat broad, particularly at base, to 22 cm wide; panicle branches somewhat erect to reflexed, the branches not flexuous near tips; hairs on lateral nerves of sericeous, rarely densely so, typically remaining more or less appressed; lemma apices acute to acuminate, awnless or with awns to 3.5 mm long; mostly New World ............. Diplachne fusca subsp. fascicularis

Diplachne fusca (L.) P. Beauv. ex Roem. & Schult. subsp. fusca

Figure 2


Bromus polystachios Forssk. Fl. Aegypt.–Arab. 23. 1775. Type. EGYPT. Alexandria, P Forsskål 1016 (holotype: C [C10001861]!).


Diplachne capensis (Nees) Nees var. concinna Nees, Fl. Afr. Austr. 257. 1841. Type. SOUTH AFRICA. Ad Weltevrede in ripa Gamka..., Drège s.n. (lectotype, here designated: B (! by Snow {1997a, but unpublished}; not found electronically online); isolectotypes: BM! P [P00083372], [P00083373]; fragment: PRE!). Note: Drège or a later worker assigned this species or sheet the number 2553, which at PRE is also assigned to Diplachne livida (below).

Diplachne capensis (Nees) Nees var. minor Nees, Fl. Afr. Austr. 257. 1841. Type. SOUTH AFRICA, Drège 3900 (fragment of holotype: PRE!).

Diplachne capensis (Nees) Nees var. obscura Nees, Fl. Afr. Austr. 256. 1841. Type. SOUTH AFRICA. Circa Graaf Reynet solo Karro, Ecklon s.n.; In Herb. Reg. Berol, Mundt s.n.; Ad sinum Plettenbergbai, George s.n., (fragments sytypes [Ecklon s.n., Mundt s.n.]: PRE)!
Diplachne capensis (Nees) Nees var. pauciflora Nees, Fl. Afr. Austr. 257. 1841. **Type.** South Africa. In districtus Caledon montibus. Since Poaceae types of Nees were destroyed at B, selection of a neotype may be necessary.


*Leptochloa neuroglossa* Eichinger, Repert. Spec. Nov. Regni Veg. Beih. 40 (1, Anhang): 75. 1930, and 264, 1931. **Type.** TANZANIA. Pare District, Mkomazi, Lake Manga, A Peter 41078 (holotype: B!). A neotype specimen at B (!) (“S. Pare, km 164 Sumpfgebiet Mkomasi -Mkumbara, A Peter 10497”) was suggested earlier (Snow 1997a: 227) but the specimen has not been seen recently.


**Type.** PALESTINE. Ab. loco, F. Hasselquist s.n. (lectotype: LINN 92.21!), typ. cons. prop.

**Description.** Plants annual or (mostly) perennial. Culms (15–)40–170 cm tall, 2–5 mm wide at base, round or somewhat flattened, ascending to erect or sometimes decumbent and rooting at nodes (and sometimes strongly stoloniferous in southern Africa), often branching; nodes glabrous; internodes to 26 cm long, soft or sometimes lignified, hollow. Leaf sheaths longer or shorter than the internodes, round or somewhat flattened, glabrous on sides and margins; ligules 4–8(–15) mm long; blades mostly 5–48 cm long, 2–6 mm wide, glabrous to moderately scabrous above and below. Panicles 15–105 cm long, 2–20 cm wide, exerted or occasionally partially inserted at maturity with 3–28 branches; the branches (1.5–) 4–20 cm long, mostly alternate along the rachis, ascending, erect, or infrequently reflexed, stiff to somewhat flexuous, minutely scabrous, axils glabrous. Spikelets
Figure 2. A–G *Diplachne fusca* (L.) Kunth subsp. *fusca* A habit B inflorescence C ligule D spikelet E lemma F floret and rachilla G palea, lodicules, ovary, and stamens. Drawings from *Strohbach & Sheuy-ange BD3162* (US).
6–14 mm long, distant to tightly imbricate; florets (4–)6–12(–14); callus glabrous or hairy; lower glumes 1.9–3.0(–4.9) mm long, ovate, scabrous on midnerve, obtuse to acute, rarely bifid; upper glumes 3.0–4.7(–5.5) mm long, ovate, scabrous on midnerve, obtuse to acute, rarely bifid; lemmas 3.0–4.7(–6.0) mm long, 3-nerved, narrowly ovate to ovate, the lateral nerves pronounced and often extending to the tips, sericeous (at least below) on lateral nerves and often on midnerve, glabrous between nerves, apex obtuse to acute or acuminate, sometimes bifid, unawned, mucronate, or awned; paleas subequal to slightly exceeding lemma, elliptic, more or less sericeous along nerves; apex obtuse to acute. Stamens 1–3; anthers 0.5–2.7 mm long (typically longer in perennials), maroon or yellow. Caryopses 1.6–2.3 mm long, 0.9–1.2 mm wide, obovate in hilar profile, transversely elliptic to depressed obovate in transverse section, hilar groove lacking, smooth, brown; pericarp weakly adnate to endosperm.

**Leaf anatomy.** Midrib present (or rarely absent) in mature leaves; central lacuna present. **Primary bundles:** protruding adaxially and abaxially and to a greater degree than secondary bundles; outer bundle sheaths continuous adaxially, interrupted abaxially; extension cells present adaxially; adaxial cells enlarged, abaxially cells not enlarged; sclerenchymatous girders present adaxially and abaxially, or abaxially only as strands. Colourless cells present between primary and secondary bundles; chlorenchyma continuous or discontinuous between adjacent bundles. **Secondary bundles:** protruding adaxially or not, flush abaxially; outer bundle sheath continuous or interrupted abaxially; sclerenchymatous girders present abaxially. (Vouchers [all at MO] and country of origin: Snow & Chatakutah 6767, 6829, 6908 (Botswana); Snow & Burgoyne 7108 (South Africa); Snow & Burgoyne 7176, 7196 (Namibia); Snow et al. 7208, 7214, 7215, 7217 (Australia); Ellis specimens from South Africa [all at PRE]: Ellis 1908, 3410, 3653, 4779.)

**Stem anatomy.** Stems can root at the nodes and functionally act as stolons (e.g. Hitchcock 24410 [US], Drège 3900 [P]; Valls 1978). When branching occurs, it is mostly towards the base and at lower nodes. Elliptic air canals subjacent to the epidermis of culms typically are present in populations emergent in water.

Culms hollow; pith parenchyma isodiametric; inner sclerenchymatous ring present; peripheral sclerenchymatous ring present; inner sclerenchymatous ring canal tissue present (see Culm Anatomy under *D. gigantea*); Kranz sheath cells absent; Kranz sheath cell canal tissue absent. Vouchers (at MO): Snow & Chatakutah 6808 (Botswana); Snow & Chatakutah 6829 (Botswana); Snow & Burgoyne 7196 (Namibia); Snow et al. 7217 (Australia); Snow et al. 7208 (Australia); Snow et al. 7239 (Australia); Snow et al. 7249 (Australia).

**Chromosome numbers.** \( n=10 \) (Gould 1958, 1966, 1968; Reeder 1971; Valls 1978; Spies et al. 1991); \( 2n=19 \) (Spies and Vogues 1988); \( 2n=20 \) (Larsen 1963; Bir and Sahni 1986).

**Phenology.** Flowering throughout the year but seasonally locally.

**Distribution.** **Native:** Much of paleotemperate and paleotropical areas; mostly open mesic areas, often in saline conditions. Elevation sea level to ca. 2000 m. (TDWG:
ANG, BOT, BZE-PB, BUR, CHA, ETH, JAW, IND, IRQ, ITA-IT, KEN, MDG, MLW, MLY-SI, MOZ, MYA, NAM, NGA, NGR, NSW-NS, NTA, OFS, PAK, PHI, QLD-QU, SEN, SOA, SRL, TAI, TAN, THA, UGA, VIC, WAU-WA, YEM-NY, ZAI.) Non-native: Persisting in Argentina, but non-persisting elsewhere. (TDWG: AGE-BA, AGE-ER, AGE-MI, AGS-RN, AGW-LR, AGW-SJ, BOL, CAL, CZE-CZ, GBR, GER, NWG-PN, SCA, SWI.). Diplachne fusca subsp. fusca was grown in experimental gardens in the early part of the 20th century in Chico and Berkeley, California, as introductions from New South Wales (McKee, SPI 17213 [NA]; Wight 1359 [NA] (Beetle s.n., 1941 [NA]). It has been collected outside the plots in California, but evidently has not become widely established in that state.

Conservation status. Widespread; not of concern.

Etymology. The Latin fuscus refers to dark, dusky, or swarthy and possibly alludes to the dark green or plumbeous spikelets of some specimens.


Comments. Diplachne fusca subsp. fusca is the most widely distributed taxon in the complex and occurs throughout the range of the species in the Paleotropics, with some introductions in the Neotropics and North America (California, South Carolina). It is sometimes considered a weed of rice paddies (McIntyre and Barrett 1985, McIntyre et al. 1989).

Distinguishing D. f. subsp. fusca from subsp. fascicularis where the two are sympatric can be difficult, particularly in Argentina (Snow 2012), where the populations of subsp. fusca may be non-native. The authors’ interpretation of taxa in the complex differs from Nicora (1995), who synonymised Diplachne uninervia (J. Presl) Parodi var. procumbens Parodi under D. fascicularis. In contrast, the authors synonymise the former under D. fusca subsp. fusca. The subsp. fusca is differentiated from subsp. fascicularis primarily by the latter having panicle branches inserted at the base and having anthers shorter than 0.5 mm, whereas the former more typically has fully exserted panicles and anthers exceeding 0.5 mm (sometimes significantly so).

The floret morphology of some specimens from western Africa (Audru 2704; Adam 19242; Garba 7471; Trochain 878 [all at P]), southern Africa (Snow & Chatakuta 6908 [KSP]; Strohbach & Sheuyange BD3162 [US; Fig. 2) and New Guinea [Backer 16301 {duplicates at P, U, and W}]; Backer 24130 [U]; and Brass 6065 [BRI]) closely resembles that of subsp. D. f. subsp. uninervia. The specimens from New Guinea may be from New World propagules that arrived during World War II. The spikelets of the type specimen of Diplachne pallida Hack. also closely resemble those of D. f. subsp. uninervia.

The length of the awns varies throughout the range of D. fusca subsp. fusca and is too inconsistent to be of taxonomic value.

The sexuality of the florets varies widely. A population from Namibia (Snow & Burgoyne 7196 [with numerous duplicates distributed]) had male, female and hermaphroditic florets within a single spikelet. The number of stamens can likewise vary
within a spikelet from one to three (e.g. Snow and Burgoine 7196), which has been noted also by Nicora (1995). The anthers also vary considerably in length between specimens, but typically are consistent within a specimen and within populations.

Thrips (Order Thysanoptera) of an indetermined genus were found in virtually every floret of fresh material of a specimen of *D. fusca* subsp. *fusca* from Queensland, Australia (Snow et al. 7249-F). In a study of germination, populations in Australia were affected more by nighttime than daytime temperatures (Myers and Morgan 1989).

Some populations of this subspecies have high to very high levels of tolerance for saline or sodic soils (Beadle 1948a-b; McVaugh 1983; Hackett and Wickens 1984; Myers and Morgan 1989; Kernick 1990; Chapman 1996; Ahmad 2009). This tendency is most developed in Australia, Asia and Africa and is least well documented for subsp. *uninervia*. For example, the label of Trapnell 1112 in Zambia states the species grows amidst ca. 5 cm of solid salts. Another specimen from Zambia (Greenway 622B) states that the species becomes a dominant pioneer in areas trampled out in brackish pans in grassland dominated by the grass genus *Hyparrhenia* E. Fourn. Others also have noted the high levels of salinity tolerance (Reinhold et al. 1986; Hurek et al. 1987; Reinhold-Hurek et al. 1993). Joshi et al. (1983) reported salt excretion on the leaves via small apical pores in papillate structures that they designated as salt glands. Chapman (1996) also reported that some populations of *D. f.* subsp. *fusca* excrete salt from glands on the leaves and that this taxon has been advocated for its use for lowering salt levels in soils. The ability of many populations of this subspecies to tolerate and even thrive in saline soils was one of many factors contributing to the decision to recognise them at the subspecific, rather than specific rank (Snow 1997a). In southern Africa, *D. fusca* subsp. *fusca* can be common to abundant in pans (low-lying areas that accumulate seasonal moisture but which desiccate in the dry season), where it sometimes is decumbent to geniculate and stoloniferous (Breen et al. 1993; e.g. see Hitchcock 24410 [US]; Snow 6829 [MO]).

Herbarium labels from African collections sometimes indicate grazing, presumably by the native fauna, and others indicate good grazing for livestock. The subspecies may occur in pure or nearly pure stands in Africa. In Australia, Lazarides (1970) reported the taxon as having high palatability and being preferentially grazed, but that it typically occurs in relatively small populations. Denny (1993a, 1993b: 27) and Ahmad (2009) indicated that among grasses generally, *Diplachne fusca* appears to maximally combine adaptations to wetness and salinity, combined with palatability, of any species of grass. Kernick (1990: 171) linked the salinity tolerance and palatability of *D. fusca* and suggested that additional screening for salinity tolerant races would be worthwhile. The salinity tolerance of *D. fusca* subsp. *fusca*, high viability of its seeds (Chapman 1996; Snow, pers. obs. in greenhouse), and high palatability of the subspecies among ruminants (Chapman 1996; Snow pers. obs.) collectively make *D. fusca* an excellent candidate for reclamation of saline soils (Haq and Khan 1971; Sandhu et al. 1981; Chapman 1996; Ahmad 2009).

A remarkable biological attribute of *Diplachne fusca* subsp. *fusca* is the presence in some Pakistani populations (where it is called Kallar grass) of a recently described
nitrogen-fixing genus of bacteria, *Azoarcus* (Reinhold et al. 1986, 1993; Hurek et al. 1987, 1993, 1994; Reinhold-Hurek and Hurek et al. 1997). Subsequent studies documented *Azoarcus* to be a nitrogen-fixing endosymbiont of many grasses, including rice (Hurek et al. 1997; Krause et al. 2006). Given increasing problems of salinisation in some areas and the biologically and economically important properties of the Pakistani populations (nitrogen-fixing, salinity tolerance, perennial growth form and high palatability), these populations should be investigated further for their reclamation potential of saline soils, given that they also could provide useful fodder. More recent research has examined the rhizosphere for bacterial species of *D. f.* growing in industrial sites (Abou-Shanab et al. 2005).

*Diplachne fusca* has been studied recently augmented with three experimentally introduced endophytic bacteria, as a species for use in constructed wetlands for bioremediation of wastewater from tanneries (Ashraf et al. 2017).

**Specimens examined. Afghanistan.** Maymana: 25 km SW of Maymana, Alizzi & Omar 34707 (K). Angola. Huila. Morros de Cualque, Exell and Mendonça 2704 (BM); Distrito de Huila, Pereira de Iça, Cunhama, Gossweiler 11066 (K, US). Argentina. Buenos Aires: Pdo. Magdalena, Punta Indio, Boelcke et al. 12540 (MO); A San Vincente, Zardini 246 (LP); Vicente Lopez, Parodi 7694–1/2 (BAA); Vicente Lopez, Parodi 184 (BAA); Avellaneda, prox. al cementario, Parodi 4774 (BAA); San Isidro, Parodi 4903 (BAA); San Vicente, Parodi 8118 (BAA, US); Palermo, Parodi 175 (BAA). Entre Ríos: Dpto. Uruguay, Laguna de los Negros, Nicora 3012 (SI); Dpto. Uruguay, cerca del Parque Unzué, Burkart 25675 (BAA). Misiones: Nacanguazú, Santo Pipó, Grondona and Puccinini 3188 (UC). La Rioja: Cunta de Llanos, Nicora 18527 (B). Rio Negro: Fuerte Gral Roca, Boelcke & Serrano 3122 (BAA). San Juan: Jachal, Cabrera 18025 (LP). Australia. New South Wales: 24 km S of Moree, Beadle s.n. (NE 24646), Combanning Silo, ca. 13 km E of Temora on Stockinbingal Rd., ca. 26 km W of Stockinbingal, Snow et al. 7208 (KSP, MO, NSW); Ca. 20 km E of Griffith on Ardeltan Rd., Snow et al 7213 (MO, NSW); 9.7 km S of Darlington Point on Coleambally Rd., S of Griffith, Snow et al. 7214 (KSP, MO, MU, NSW); Marrimajeelea Ck., ca. 15 km N of Boolingal on road to Ianhoene, Snow et al. 7215 (MO, NSW); 15.1 km out of Brewrrina on Collerina Rd., Snow et al. 7216 (MO, NSW); 17.9 km out of Brewrrina on Collerina Rd., ca. 4.3 km E of Bokhara Riv., Snow et al. 7217 (MO, NSW); Ca. 60 km E of Brewrrina on road to Walgett, ca. 9 km W of turnoff to Cumberah, Snow et al. 7220 (MO, NSW); Southern end of town of Walgett, along muddy margins of artificial pond created by irrigation regime in the civic park, Snow et al. 7222 (MO, NSW); 46.6 km E of Connambl on road to Baradine, Snow et al. 7226 (MO, NSW); 19.9 km N of Boggabri on road to Narrabri, Snow et al. 7232 (MO, NSW); 6.5 km N of Edgeroi, between Narrabai and Moree, Snow et al. 7234 (MO, NSW); 11.6 km N of Moree on road to Boggabilla (Hwy 39), Snow et al. 7237 (MO, NSW); Ca. 58 km N of Moree on road to Boggabilla (Hwy 39), Snow et al. 7244 (MO, NSW); Grenfell, Corbett s.n. (BISH); Duck Ck., Wollongbar, McBartron 6516 (NSW) and McBarron 6516 (NSW); Nevertire, Helms 31318 (NA, NY, SMU, US); Walgett, Vickery 18009 (US); Macquarie Marshes area, 16 km SE of
Carinda, Pajjmans 1737 (CANB); Bogan Gate – 4 km E of Parker Rd., Lloyd 156 (CANB); Moree – 3 km E on Gwyndir Hwy, Lloyd 726 (CANB); 28 mi. S of Nyngan, along road between Nyngan to Narromine, Martensz 268 (CANB); Macquarie Marshes, Warren, Goodrick 261 (CANB); Agric. Res. Station, Yanco, Boerema 7 (CANB); Riverina Dist., Boorooburan, between Deniliquin and Hay, Brown 390 (BRI, CANB); Near Barham, Ganba 3516 (CANB); Griffith, 1.7 km from W end of Hamilton Rd., Lodder and Corbett 11 (CANB); Near Homebush, Sydney, Hubbard 8185 (BRI); Fort Bourke, Pear Bore No. 1, Simon 2957 (BRI); 14 km SE of Bourke on Bourke–Nyngan Rd., Simon 2974 (BRI); Near Goonery Bore, 65 mi. E of Wanaaring, Moore 5781 (BRI); Between Fort Grey and Cameron's Corner, Corrick 6536 (BRI, MEL); Macquarie Marhes 35 km W of Quambone, just E of Macquarie Riv., Pajjmans 1704 (CANB); West of Premer, Hosking and Sullivan 472 (MEL, NE); Gulpa, Brown 389 (MEL); “Mt. Mulgah” – ca. 60 km NW of South, Moore 8231 (CANB); “Mt. Mulgah” – ca. 50 mi. NW of South, Moore 5091 (CANB); Ca. 51 mi. W of Bourke on Wanaaring Rd., Moore 5112 (CANB); 12 km W of Booligal, Pajjmans 1649 (CANB). Northern Territory: MacDonnell Range, Palm Valley Canyon, Finke Riv. Canyon, SW of Alice Springs, Vasek 680915–25 (CANB, RSA); 40 km W of Suplejack Homestead, Latz 8121 (BRI); Gardens Station, Latz 1939 (BRI, CANB); Warangaiyu Lagoon, Elcho Island, Latz 6270 (CANB); Coomarie Spring, Latz 3956 (CANB); 7 km SW Borroloola, Latz 1523 (BRI, CANB); Homestead Ck. Bing Bong Station, Latz 1493 (CANB); Gulf of Carpenteria, Maria Island, Dunlop 2800 (BRI, CANB); Swamp below Howard Springs, Darwin area, Craven 4474 (CANB); Coastal Plains Research Station, 30 mi. SE of Darwin, Lazarides 6810 (CANB); South Alligator Floodplain, 16 km S Arnhem Hwy, Wightman 1456 (BRI, CANB); Glen of Palms, James Range, Gardner 11728 (MEL); Glen of Palms, ca. 112 km SW of Alice Springs, Beauglehole 23846 (BRI, MEL); 11 km from Borroloola, Daly Waters Rd., Jacobs 1670 (CANB, NSW); Fogg Ck. Dam near Beatrice, Jacobs 1767 (CANB); Palm Valley, 10 mi. S of Hermannsburg Mission, Perry 3501 (BRI, CANB); Mangrove area on banks of South Alligator Riv. Pajjmans LAC4486 (CANB); Palm Valley, 12 mi. SW of Hermannsburg Mission, Lazarides 5290 (BRI, US); Finke Riv. 2 mi. S of Hermannsburg, Latz 3125 (BRI); Darwin, Leanyer Swamp, Latz 3616 (BRI); Fish Ck., Woolner Station, Rankin 2491 (BRI, CANB); Wirra Lagoon near Nhulumbry, Scarlett Y–257–74 (BRI); Palm Valley, Beauglehole 10359 (BRI); Palm Valley, Beauglehole 27518 (BRI); Mary Riv. Conservation Reserve, Liddle 1102 (BRI). Queensland: Burke Dist., 12 mi. E of Hughenden Township, Lazarides 3605 (BRI, MO, US); Between Mt. Emu Plains and Mt. Sturgeon Stations, Hubbard & Winders 7560 (BRI); Normanton, Blake 9002 (BRI); Agnes Lake, 79 km S of Lyndhurst Station on Hann Hwy, Simon and Clarkson 2752 (BRI); Mount Isa, Winders 7427 (BRI); Nonda, Hubbard & Winders 7228 (B, BRI, CANB, K, MO, NSW); Mt. Isa, No. 7 Tailings Dam, Schmid 712 (BRI); 3 km N of Burkettwon on Truganini Crossing Rd., Jacobs 1318 (CANB, NSW); Dry bed of Lake Louisa ca. 90 mi. N of Ougenden, Blake 8605 (CANB); 19 mi. S of Mt. Isa Township, Lazarides 4381 (US); 18 mi. SW of Claraville Station, Lazarides 3934 (CANB); 8 mi. E of Iffley Station, Lazarides 3939 (CANB); 8 mi. N of Cloncurry
Township, Lazarides 4315 (CANB); 3 mi. SW of Malbon Township, Lazarides 4400 (CANB, MO). Cook Dist., 1.6 km S of mouth of North Kennedy Riv. on Lakefield N.P., Neldner and Clarkson 3782 (BRI, NSW); Arriga area, ca. 13 km SW of Marreba, T. Maisels’s Farm, Pregno s.n. (BRI); 2.5 km SW of the aboriginal settlement at Mapoon, Clarkson 4962 (BRI, K); Weipa, Morton 1132 (MEL); 10 mi.NNE of Lyndhurst Station, Lazarides 3737 (CANB); Station Cr. saltpan, 1 km E of Inkerman homestead, Neldner & Clarkson 2873 (BRI, NSW); On southern bank of Nassau Riv., 0.5 km upstream from junction with Rocky Cr., Neldner & Clarkson 3007 (BRI); 9 km NW of Kenchering by road, Dalliston CC437 (BRI); Chohan’s Farm, Ariga W of Mareeba, Hawton s.n. (BRI); Lakefield N.P., Knifehole, 2 km from Salt-water Cr. crossing on the Musgrave to Lakefield Rd., Clarkson & Simon 7061 (BRI); Plains on eastern bank of Nomenade Cr., Morton AM1132 (BRI); 2 km N of the Morehead Riv. Crossing on the Lakefield to Musgrave Rd., Clarkson & Simon 7047 (BRI); 3 mi. ESE of Spring Cr. Station, Lazarides 3807 (BRI). Darling Downs Dist., ca. 10 mi. SW of The Gums on roadside, Johnson 729 (BRI); Kindon Station, 54 mi. NNW Goondiwindi, Smith 549 (GH); 28 km E of Goondiwindi on road to Yelarbon, Inglewood and Warick, Snow et al. 7249 (BRI, KSP, MO, NSW); 3.2 km N of junction with Cunningham Hwy (Hwy 42) on the Leichhardt Hwy, N of Goondiwindi, Snow & Simon 7312 (BRI, MO); 14.5 km N of Cunningham Hwy along the Leichhardt Hwy N of Goondiwindi, 3.1 km S of turnoff to Toowoomba (78 km S of Moonie), Snow & Simon 7326 (BRI, MO); 17.8 km W of Moonie on Moonie Hwy, Snow & Simon 7360 (BRI, MO); 22 km W of Moonie along Moonie Hwy, Snow & Simon 7363 (BRI, MO); Palardo, W of Miles, Blake 7619 (BRI, CANB, NSW); ca. 10 mi. SW of The Gums, Johnson 729 (CANB, NY); Yelarbon, Blake 10445 (BRI); Yelarbon 41 km E of Goondiwindi, McDonald 406 (BRI, CANB, K); Chinchilla, Hubbard and Winders 6405 (B, BRI, CANB, MO); ca. 7 mi. SE of Meandarra, Johnson 1206 (B, BRI); Condamine State School, Turnbull 5 (BRI); Milmerran, Hubbard 5867 (BRI, CANB); Dalby, Beiers 43 (BRI); Chinchilla, Beasley 124 (BRI); Dalby, Beiers 63 (BRI); 10 Meilen von Meandarra, Walter and Walter 2610 (B); near Gurumundi, Hubbard 5129 (B, CANB, MO); Yelarbon, Everist 889 (BRI); Pelican Lakes 30 km NE of Chinchilla, Simon et al. 3491 (BRI). Gregory North Dist., Boundary Gully Bore, 25 km N of Headingly homestead, Neldner & Stanley 1804 (BRI). Gregory South Dist., 0.7 km SW of Longford turn–off, Thompson Devel. Rd., Prendergast HDP313 (BRI); ca. 92 km W of Betoota, Nicolson & Novelty 277 (BRI). Leichhardt Dist., Broadsound Shire, “Iffley”, 3 km N of Mt. Coxendean, Anderson and Russell 896 (BRI); Broadsound Shire, Anderson 752 (BRI); Emerald, Finlay & Farqurah 2 (BRI); Broadsound Shire: “Barwon Park” ca. 70 km N of Blackwater, Anderson 2054 (BRI) and (ibid.) Anderson 2055 (BRI); Gunnewin via Roma, Kieseker 9 (BRI). Maranoa Dist., Noonoo near Dirranbandi, Blake 10690 (BRI); 13 km E of Mervynia, Walrus III, Site R030, Purdie 462D (BRI); 40 mi. W of St. George, Roe s.n. (CANB); “Warrie”, Nindigelly, Allen 111 (CANB); Noonoo Station E of Dirrabandi, Everist 817 (BRI); Mitchell, Hubbard and Winders 6309 (BRI); Boatman Station, Everist 2857 (BRI, K, NY); 15 km S of Roma, Bungil Shire, Silcock S721 (BRI); Roma, Blake
10894 (BRI); Bollon, along damp creek bands, White 11545 (GH, US). Mitchell Dist., Yaraka, Bownman s.n. (BRI); 2 mi. W of Blackall, Everist 2089 (BRI); 34 mi. NW of Longreach, Davidson 82 (BRI); 11 km SE of Corinda homestead, Thompson and Sharpe MUT1 (BRI); Jericho, Blake 10245 (BRI). Moreton Dist., Wyampa, near Bald Hills, Blake 213 (BRI); Near Redcliffe, Hubbard 5551 (B, BRI, CANB, NSW); Currumbin, White 8728 (BRI, NY); Nundah, Brisbane, Blake 159 (BRI); 2 km N of Coolum beach, ca. 130 km N of Brisbane, Sharpe 2127 (BRI); Serpentine Ck. and environs, ca. 11 km NE of Brisbane, Durrington 435 (BRI); 2 km N of Coolum Beach, ca. 130 km N of Brisbane, Sharpe 1894 (BRI); Hope Island, 2 km from Boyankil on road to Pacific Hwy, Simon et al. 2932 (BRI). North Kennedy Dist., Toonpan – Antil Plains, Everist 9194 (BRI); Mt. St. John, Hubbard & Winders 6943 (BRI, CANB); Barratta Ck., lower Burdekin Valley, Pajjmans 3508 (CANB); Near Saltern Lagoon, 5 km W of Valley of Lagoona HS, Lazarides 8167 (BRI, CANB); Cromarty, between Townsville and Ayre, Blake 8306 (BRI). Port Curtis Dist., Gladstone, Blake 12784 (BRI); Curtis Island, N of Southend, Blake 22578 (BRI, CANB, MO); Curtis Island, S end, Blake 22522 (BRI); 25 km ESE of Rockhampton, Pajjmans 2016 (CANB); E side of Herbert Ck., 5 km NW of “Banksia” homestead, Pajjmans 2017 (CANB); Gladstone, Blake 12784 (CANB); “Torilla” between Broad Sound and Shoalwater Bay, Blake & Webb 15615 (BRI, NSW). South Kennedy Dist., 17 mi. NE of “Mirtma” Station, Adams 1133 (CANB); ‘Cassiopeia’, the property of J. Mendazona, Belyando Shire, Jacobsen E 580 (BRI); 6.5 km NW of Belyando Crossing, Thompson and Sharpe BUC901 (BRI); Gormans Lagoon near Mirtma HS (site GL1), Thompson & Simon BUC755 (BRI); with 2.3 km S of Doongmabulla homestead, 197 km N of Jericho, Thompson & Henderson GAL142 (BRI); 10.5 km NE of Hyde Park homestead on road to Bulliwallah homestead, Thompson & Simon BUC813 (CANB, K); 3 km S of Doongmabulla homestead on sandy flat adjacent to Cattle Ck. [...] Thompson & Simon GAL50 (BRI); Laglan Station, ca. 105 km WNW–NW of Clermont, Smith 10293 (BRI); 3 km W of Yarromere homestead, Thompson & Henderson BUC993 (BRI). Warrego Dist., ca. 25 mi.S of Wyandra, Blake 11234 (BRI, K); Wyandra, Sutton s.n. (BRI); Curragh Station, Hubbard & Winders 6263 (K, MO, NSW); Gilruth Plains Stn, Cunnamulla, Barker 835 (CANB); “Cowley”, 40 mi. E of Quilpie, on main Quilpie–Charleville Rd., Anson 2 (BRI); Gilruth Plains, Cunnamulla, McKee 10326 (BRI, NSW); 10 km SE of Charleville along Boatman Rd., Purdie & Boyland 36 (BRI); Coongoola, between Charleville and Cunnamulla, Hubbard & Winders 6174 (BRI, CANB); “Ambathala”, 100 km WNW of Charleville on Adavale Rd., Silcock 5458 (BRI); “Peneroo” via Eulo, Young 54 (BRI); Bowalli, ca. 75 mi. SSW of Quilpie, Everist 5041 (BRI); “Wittenburra” Eulo, Ebersohn E180 (BRI); Carbeen near Cunnamulla, White 11567 (BRI, GH); Dynevor Lakes, 30 mi. E of Thargomindah, Blake 11761 (BRI); Bulloo, MacGillivray 1024 (BRI). Wide Bay Dist., Splitters Ck., Smith 437 (BRI). South Australia: 30 km W of Inllian Ck on Coober Pedy road, Badman 1282 (AD, BISH); Lower Winkie Rd.... near Berri, ca. 195 km NE of Adelaide, Kuchel 3215 (AD, BISH, BRI, MO); 32 km SW of Hawker Gate, Jacobs 3536 (BRI); Just out of Wyndham on and at base of rocky slope, Symon 5251 (CANB).
Victoria: Melbourne area, between Newmarket and Showgrounds railway stations, E of Ascot Vale Rd., Flemington, Clarke 1797 (BRI, MEL); King’s Billabong, beside the Murray Riv., between Mildura and Red Cliffs, Henshall s.n. (MEL); Murray Valley area, Tatura – Irrigation Research Institute, Brown 34 (MEL); Port MacKay, Dietrich 538 (MEL); Malle Study Area, Reedy Lake Wildlife Reserve, Beauglehole 55705 (MEL). Western Australia: Wittenoom Gorge, Hammersley Range, Beauglehole 11564 (BRI); 10 km SE of Wyndham, Pajimans 2505 (CANB); 8 km SE of New Wyndham Post Office, North Kimberely, George 14546 (CANB, K, NSW); Goody Goody, Fitzgerald 65 (US); 34 mi.SW of Wyndham Township, Lazarides 3080 (NSW, US); Wyampa, near Bald Hills, Blake 213 (K); Parry Lagoon, NE Kimberley, Kennedy 10719 (CANB); Ord Riv. 25 km NE of Wyndham, Pajimans 2268 (CANB); North West Coastal Hwy, 94 km from Minilya on road to Dampier, Simon & Stretch 3788 (BRI); 34 mi.SW of Wyndham Township, Lazarides 3080 (BRI). Belgium. Graviers de la Vesdre, Fasseaux 11a (K). Bolivia. Beni: Prov. Ballivian, Espiritu en la zona del influencia del rio Yacuma, Beck 3219 (US). Santa Cruz: Chiquitos, Est. San Ignacio, 22 km N of San Jose de Chiquitos Killeen 1712 (MO, US); Nuñlo de Chavez, San Antonio de Lomerio, Killeen 825 (MO, W). Botswana. Central: Mumpswe Pan, 25 mi. NNW of mouth of Nata Riv., Drummond & Seagrey 5167 (PRE); 17.6 road km N of Dibete (at turnoff to Mookane), ca. 135 Road km N of Gabarone, Snow & Chatakuta 6767 (GAB, K, MO, PRE); At km marker 16, W of Nata on Hwy to Maun, Snow & Chatakuta 6829 (GAB, K, MO, PRE); Along main Hwy between Nata and Maun, ca. 67 km W of Nata, Snow & Chatakuta 6878 (GAB, K, KSP, MO, MU, PRE); 44.3 road km from Sephophe on road towards Zanzibar, ca. 21.6 km prior to Tsetsejwe, Snow & Chatakuta 6908 (GAB, K, KSP, MO, MU, PRE); Along main hwy, 17.6 km N of Dibete (at turnoff to Mookane), ca. 135 road km N of Gabarone, Snow & Chatakuta 6913 (GAB, K, MO, PRE); Botletle delta area, NE of Mopipi, Tyers 616 (MO). Kgalagadi: Zanye Pan, NW of Hukuntsi, Ellis 2657 (K, MO, PRE). Mahalapye: Kalamare, de Beer K5 (GAB). Mohembo: Okavango Riv., Smith 2669 (K); in the sump of Nwaku Pan, Smith 2969(K). Northern: Mumpswe Pan, 25 mi. NNW of mouth of Nata Riv., Drummond & Seagriest 5167 (GAB, K); Kangwa (Xanwe), 27 km NE of Aha Hills, Wild & Drummond 6931 (BM, GAB, K); near Tschelenyane, 11 km from Lake Ngami on track to Khwebe Hills, Drummond 8747 (K). Ngamiland: Boteti Riv. lower reaches, Smith 2563 (K, PRE, US); Nxaí Pan N.P., Smith 1648 (K, MO); Moremi Wildlife Reserve, Smith 811 (GAB, K, MO, PRE); Moremi Wildlife Reserve, Mexara Pan, Smith 1598 (BRI, K), Brazil. Paraiba: São João do Carirí, Póstio Agro–Pequário, Mattos and Mattos 9736 (US). Burundi. Plaine de la Rusizi au N de Bujubura, Gihanga, Van der Veken 11182 (B, U); Plaine de la Rusizi (Prov. Bubanza), savane–palmeraie a hauteur du km 14 de la route Bujumbura–Cibitoke, Lambinon 75/42 (M, MO); Vallée Katunguru, Reekmans 3187 (MO). Chad. Entre Moulo et Beriem, Chevalier 10102 (P); Latir Nord Bol, Dune, Gaston 749 (P); Bahr el Ghazal–Gahine, Zolotarevsky et al. 876 (P); Bagana – Ba Gara, Murat 924 (P). China. Hebei: Peitaiha [=Beidaihe], Cowdry 213 (US); Tientsin, Clemens 1615 (B, BM, MO); Shen Hsien, Beach s.n. (US); Shatin, Shiu Ying Hu 12084 (A).

Egypt. [Province Unknown: Lake Manzala: Mصرف Abu Aziza, Mustafa & Sabet s.n. (KSC 77803)] Damietta District, Ezbat El-Burg, Mashaly s.n. (K); Aus der Umgegend von Cairo, Schweinfurth 1432 (K); Al-Faiyum District, El-Azab, Ghani 3650 (K); Faraskûr, Shabetai 33 (K); Aulad Hammam, Simpson 5183 (B); Gize, Cairo, Kneu-cker 865 (MU); near Cairo, Meintzrhagen, s.n. (BM); Fayoum, Drar 9/123 (NY); 166 km from Cairo on the desert road to Alexandria, Amin et al. s.n. (NY); An den Rändern der Bewässerungsgräben zwischen dem Dorf Giza unweit Cairo, Kneucker 254 (PR, US); Between Hamul and Baltin, Hefnawy s.n. (K); Lake-side, Manzale N of Damietta, Simpson 1451 (K); Wâdi el Gediel-Dâkhla, E part of the oasis below Balat and Ismant (Smint), Walter s.n. (K). Ethiopia. Oromia: Lake Alemaya (Haramaia), Burger 3607 (PRE, US); South shore of Lake Alemaya, 35 km on the road from Dire Dawa to Harar, de Wilde 4789 (B, MO); NW shore of Lake Langano, Ash 1377 (K, MO) and 2644 (K); Lake Awasa, ca. 20 km SW of Shashamane, de Wilde & de Wilde-Duyfjes 7016 (B, MO). Germany. Wollkammerei, Kuhbier s.n. (B). Indonesia. Java: Horsfield s.n. (BM). India. Kerala: Vembanad Lake near Alleppey, Ven-coba Rao 4061 (K). West Bengal: Salt Lake, Calcutta (Kolkata), Clarke 21605 (BM).

inghausen, Kinges 2198 (PRE); NNW of Maltahöhe on Rd. D850 to Büllspoort [Bullsport], Smook 9338 (US). Karas: Along Hwy B4, ca. 62 Road km E of Goageb, ca. 40 Road km SW of Keetmanshoop, along Fish Riv., ca. 100 m N of bridge over river, just downstream from cement irrigation channel over river, Snow & Burgoyne 7176 (K, KSP, MO, PRE, WIND); Hardap Region, 34.4 road km N on C14 from junction of C14/C13, between Helmeringhausen and Maltahöhe, Snow & Burgoyne 7196 (K, KSP, MO, PRE, WIND); 27 km W of Maltahöhe on Rd. no. 36 to Sesriem, Ellis 4779 (PRE). Kohmas: Neudam Exp. Farm, Van Vuuren 1033 (K, PRE); In vlei at Ludwein near Windhoek, Liebenberg 5074 (UC). Kunene: Erosa Game Park, 11 mi. N of Okandeka waterhold, Tinley 1202 (K); Etosha N.P., 8 km nördlich von Okaukejo am Weg nach Okondeka, Giess & Müller 13960 (M, PRE); Estosha Game Park border, Ekuma Riv., Tinley 1140 (K). Ohangwena: Ovamboland Nature Reserve, de Winter & Giess 6916 (K) Okavango: Klein Omuramba 5 mi.E of Runth, de Winter 4076 (K). Omaheke: Farm Omupanda, 8 km E of Hochveld, Gibbs Russell & Smook 5356 (K) and 5357 (PRE). Oshana: Ondangua, Soini s.n. (H). Oshikoto: Onjipa, Soini s.n. (H). Otjozondjupa: Sonop Research Stn, Strohbach 2309 (K); 35.3 mi. SW of Taumeb on road to Otavi, de Winter 2916 (K); 27 km W of Maltahöhe on Rd. no. 36 to Sesriem, Ellis 4779 (PRE); Farm Tjo Noord, 25 km E of Kalkveld, Gibbs Russell and Smook 5248 (K); Waterberg Omuramba, Volk 1420 (US). Region unknown: Ab loco, Felmer 456 (US). Niger: Zinder: Zinder, Hagerup 576 (GH, S). Region unknown: Point Sabonjari, Boudet 5040 (P). Nigeria. Bornu: North Eastern State, Baga Lake Chad Border, Wit et al. 1474 (MO); N of Mardufuri, de Leeun 1896 (P). Pakistan. Punjab: ca. 10 mi. from Lahore on way to Baidyan, Qaiser 3551 (K, TAES). Papua New Guinea. Western: Mainland, opposite Daru Island, Brass 6065 (BM, GH, NY, US); Near Bula Village, at mouth of Morehead Riv., Pullen 7029 (A, K, US); near Mabaduan Hill, 50 km WSW of Daru, Pajimans 1501 (CANB). Philippines. Luzon: Manila, Merrill 554a (B, BM, K, PR, UC, US); Hot Springs, Los Baños, Gates 6348 (KSC); Los Baños, Merrill 5104 (K, US, W); Los Baños, Williams 2027 (K, NY, US); Manila, Santos 27 (US); Barrio Tanuk, Buluan Marsh, SE bank of Buluan Lake, Vera Santas 5969 (B, US). Pampanga: Masantol, “Fishery Student” s.n. (PNH). Saudi Arabia [provinces unknown]; km 106, Makkah by-pass, Collenette 3938 (K); Al-Taif, Al-Hada region, ca. 20 km from Al-Taif, Fayed 1151 (K). Senegal. Dakar: Hann, Adam 14090 (MO); Rufisque, Rte de Mboud, Adam 2273 (MO); Dakar Bongo, Audru 2783 (P); Rufisque, Route de M’Bour, Adam 2273 (MO). Kaolak: Ravan des Voleurs, Berhart 3784 (P); Kaolak, Trochain 4035 (P); Kaolak, Berhart 626 (P). Louga: Menguilé, Ferlo, Mosnier 2405 (P). Saint-Louis: St. Louis, Berhart 2813 (P); St. Louis, Khor Marshes, Hepper 3613 (P); Tiguett, Audru 2938 (P); N’Dial, Audru 2982 (P). Unknown: Mbijjem, rive W du Tanma, Raynal 6559 (P). Singapore. Perak, Ag. Officer 35646 (BM). South Africa. Cape Districts (Northern, Western, Eastern): Beaufort West Dist., Farm Layton, Shearing 267 (K); Dist. Swellendam, Nat. Bontebok Park, Liebenberg 7204 (K); Near Riversdale, Muir 2859 (K); Gordonia, Kalahri Bemsgbok N.P., Leistner 1017 (K); Ft. Beaufort, between Ulster and Mooiriver, Smook 4033 (K); Dist. East London, Bulura Mouth, Eacocks 15785 (K);
Dunswart, near Johannesburg, Moss 13959 (K); Duivenhoksriver, 10 km NW of Vermaaklikheid on road to Heidelberg, Davidse 33779A (MO); Springbok Dist., Namaqualand, top of Wilderperdehoek Pass SW of Springbok, Goldblatt 2820 (MO); Piquetberg, Liedenberg 4266 (UC); Upington, Gordonia Dist., Liebenberg 4163 (P, UC); Buffelsrivier valley between Pedroskloof and Bobbejaanhoek on road to Rooifontein, Davidse 33309 (MO); 10 km S of Humansdorp on road to Cape St. Francis, Davidse 33626 (MO); NW...on Holbakk rivier in small port, Smook 3858 (K, US); Carnarvon, Acoc 1737 (US); Cape of Good Hope at Douglas Heights, NW of Grahamstown, Godfrey and Storey SH–1362 (US); Hardenbeck Riv. dam cistern on Excelsior Farm, Hugo 2286 (MO, US); Farm Lemoenkop 337, ca. 2 km N of Lemoenkop farmhouse, just S of True Beacon 25 in drainage channel, Le Roux & Lloyd 94 (PRE); Nat. Kalahari Gembsbokpark, Liebenberg 7080 (PRE); Obobgorap, ca. 120 mi. NW of Upington, Leinster 1781 (PRE); Nat. Bontebok Park, Liebenberg 7204 (PRE); Kleinemonde, Ward 8897 (PRE); (Ubombo) Lower Mkuze floodplain, Ward 8785 (K); Paterson, 2 km off main road to Addo, Smook 3768 (K, PRE); 53 km SE of Graaff Reinet on small running stream below homestead, Smook 3896 (K, PRE); Karoo N.P., Doornhooek, Bengis 462 (PRE); Grootfontein, Theron 701 (PRE); Beaufort West Dist., Farm Layton, Shearing 380 (PRE); Kalahari Gembsbok Park, Mata–Mata, Van Rooyen and Bredenkamp 115 (CM); Kaffirria, Burtt–Davy 12786 (PRE). Free State: 8 km from Luckhoff on road to Jacobsdal, Smook & Gibbs Russell 2456 (K); Boskop (363) langs Petrusburg–Boshofpad, Muller 1304 (K); Small pan just S of Mayhem Pan, Edwards 4159 (K); 11 km from Petrusburg on road to Boshof, Smook & Gibbs Russell 2498 (K, PRE, US); 23 km from Petrusburg on road to Boshof at Modder Riv. Bridge, Smook & Gibbs Russell 2501 (K, PRE, US); 5 km from Bultfontein on road to Brandfort, Ellis 3653 (PRE); Bloemfontein, du Preez 1884 (PRE); ca. 10 km W of Odendaalsrus, Smook 6501 (BRI); 25 km from Luckhoff on road to Philipolis, Smook 2879 (PRE); 5 km from Bultfontein on road to Brandfort, Smook 2728a (PRE); Distr. Harrismith, Mont Pelaan, Ferreira F212 (P); Mont Pelaan, Harrismith, Ferreira 212 (P). Gauteng: Benoni, Bradfield T371 (PRE). KwaZulu-Natal: Bridge over St Lucia Estuary, Ellis 3410 (PRE); St. Lucia Lake, Hlabisa, Zululand, Liebenberg 5903 (UC); South Coast, Pole–Evans 778 (PRE); Bridge over St Lucia Estuary, Ellis 3410 (PRE); Falce Bay Park, Ward 7724 (PRE); Bartlow Combine bay Hluhluwe Wildtuin, 24 km van Mkuzi op pad na Mtubatuba, draai na Weste vir 20 km, du Toit 660 (PRE). Limpopo: Kruger N.P., Malongafontein, Ellis 1908 (PRE); 13 km SE of Chrissiesmeer, Smook 4905 (K); On Farm Mosdene, Distr. Naboomspoint, Liebenberg 4424 (UC); Dist. Bloemhof, SA Lombard Nature Reserve, Leinster 78 (K); Kruger N.P., Malongafontein, Davidse 5875 (BRI, K); Kruger N.P., Malongafontein, Ellis 1908 (PRE); Kruger N.P., Shingwidi rest camp, Oakes 1455 (US); Kruger N.P. 19 mi. NE of Skukuza, De Winter and Codd 560 (BM, K); Kruger N.P., near Malonga Spring, Oakes 1483 (US); Wanetzi, Van der Schyff 508 (PRE); 23 mi. SE of Punda Maria, De Winter & Codd 674 (BM, K, PRE); Mosdene farm Naboomspruit [Mookgophong], Germishuizen 42 (PRE); Naboomspruit, Schweickerdt 1791 (BM); 2 mi. N of Rust der Winter Dam, De Winter & Codd 248 (BM, CANB). Mpuma-
langa: 3 km from Lake Chrissie near the shore of the lake, Loxton 398 (PRE). North West: Beneath spillway of small (ca. 5 m tall) earthen dam, located below N side of road ca. 50 m, on N14 Hwy, 4.1 road km E of Kuruman, Snow & Burgoyne 7108 (K, MO, PRE); 11 mi. NNE of Lichtenbrug, along the coastal road, Davidse & Sumithraarachchi 9119 (BRI, CANB, K, MO, TAES, US); Keerimalai to Point Pedro, Clayton 5201 (CANB, K, TAES, US); Near Chavakachcheri, Clayton 5255 (CANB, K, TAES, US). Mannar: Mantai, Davidse & Sumithraarachchi 9174 (BRI, CANB, K, MO, NY, TAES, US). Puttalam: Puttalam, sea front, Clayton 5664 (CANB, K, TAES, US); Puttalam, sea front, Clayton 5665 (US); Trincomalee Dist., ca. 5 mi. N of Mullaitivu, Davidse 7581 (CANB, US). Province Unknown: ca. 4 mi. NE of Hambantota, marker 154/4, Gould 13458 (US).

Switzerland. Skåne, Långånga, Furuland, Blom s.n. (US).

Taiwan. Little Quemoy, Chuang 4459 (UC, US).

Tanzania. Arusha: Sanya Plain, Arusha–Moshi, Leipper 6455 (M); Ngorogoro Crater, Greenway & Kanuri 12355 (P); Ngorogoro Crater floor, Gorigor swamp, western end, Raynal 19521 (P); Ngorogoro Crater, Heady 1517 (UC); Tituski Riv. near Lake Magadi, Greenway & Turner 10043 (US); Nyumba ya Mungia Lake, at Magadini fishing village, Mhoro & Backéus 2025 (MO). Mara: Musoma Distr., Mbalageti Riv., Greenway 9027 (B, PRE). Mbeya: Ikoga, 100 mi. SW of Iringo, Heady 1871 (MO, UC). Rukwa: Lake Rukwa, Bullock 3439 (B); Near Kampunda, Bullock 3605 (US). Tanga: Mkomazi Valley, Semsei 3964 (P). Province Unknown: Lake Rukwa Extension, Michelmore 738 (US); Milepa, Lake Rukwa, Michelmore 1418 (BM, MO); SW Serengeti Plains, headwaters of the Mbalageti Riv., Greenway et al. 13183 (K, MO); Northern Province, Scout 618 (NY).

Thailand. Paknam, Sørensen et al 2038 (A, B, K, P); Ab. loc., Kerr 16107 (BM, K); Hua Hiss, Kerr 16126 (BM, K); Tachin, Kerr 9879a (K); Palanam, Kerr 20441 (K, US). Paknam, Sørensen et al. 2035 (B, K); Tachin, near Bangkok, Marcan 1812 (BM); Kao Tao, Kerr 16183 (BM, K).

Uganda. Butiaba, Lake Albert, Greenway & Eggeling 7047 (K).

United Kingdom. Barming, Mason J/67/K1 (K); Blackmoor, N. Hants, Lousley 1348 (BM, K); Charlton, Webster 8899 (BM, K) and Webster 2053 (K); Blackmoor fruit farm, grown on at Ware, Herts, Hanson 162 (BM); Blackmoor, Wurzell 1086 (MO) and Lousley 2914 (K) and Lousley 3008 (K) and Webster 7005 (K).

Ahles & Haesloop 53442 (NCU); ibid., Ahles & Haesloop 47048 (NCU); ibid., Ahles & Haesloop 52773 (NCU); ibid., Ahles & Haesloop 43027 (NCU). Florence Co., Wellman Wool Combing Mill, N of Johnsonville on SC Rt. 41, Ahles 42895 (MO, USCH); ibid., Ahles 42984 (NCU), Ahles & Haesloop 30873 (NCU), and Ahles & Haesloop 30876 (NCU), and Ahles 42895 (OKL). **Yemen.** Rada, Westinga 3 (K); just N of Rada, Wood 3207 (BM, K). **Uruguay.** San José: Río San José, Puerto Tres Bocas, Rosengurtt B–7316 (P). **Zambia.** Kabwe: Kakumbasa Riv., Verboom 3185 (K). Sen-anga: Barotseland, Mulonga and Siloana plains, Verboom 1125 (BM, K). Districts unconfirmed: Kafue flats, Magabuka, Astle 1404 (K) and Greenway 6228 (K); Monze, near Lochinvar, Rensburg 2707 (K); Lochinvar estates, Trapnell 1112 (K); Fort Jame-son, Van Rensburg 2135 (B); Kafue N.P, Mitchell 24/42 (B, BM); Muckle Neuk, 12 mi. N of Choma, Robinson 587 (M); 12 mi. N of Choma, Robinson 2857 (M, P); Njeju Game Reserve, Verboom 749 (BM, K); Kakumbasa Riv., Kabwe rural, Verboom 3185 (MO); Lake Chisi, E of Mwerwa Na Tipa, Michelmore 428 (K). **Zimbabwe.** Gwampa Forest Reserve, Goldsmith 10/56 (B, BRI, CANB, NY, P, UC, US); Lower Sabi District, Rattray 1235 (BRI, P, US); Shashi Irrigation Scheme, 12 mi. SE of Tuli, Drummond 5924 (BM); Sentinel Ranch, some 12 mi. N of Pazhi–Limpopo conflu-ence, Drummond 5982 (BM); Beaufort West, Bleak House Farm, Gibbs Russell et al. 370 (MO); Ft. Beaufort, 3226 DD Alice, “Woodstock” H. E. Matthews’ farm, Giffen 1624 (MO).


Figures 3–4


**Type.** AUSTRALIA. Northern Territory: Charlotte Waters, Giles s.n., Herb. Wm. Munro (lectotype, designated here: K [K000899903, specimen on right side of sheet]!; isolectotypes: K!, US [734098]!).

**Description.** Plants annual. Culms 15–100 cm tall, 1.5–3.8 mm wide at base, round, cespitose, erect or rarely geniculate below and rooting at lower nodes, usually branching (sometimes profusely); nodes glabrous; internodes 1.5–18 cm long, soft, hollow. Leaf sheaths longer or shorter than internodes, glabrous on sides and margins; ligules (1.5–)5–7.5 mm long; blades (3.5–)7–25 long ×0.2–0.5 cm wide, scabrous above, scabrous to nearly glabrous below. Panicles 5–35 ×2–7 cm, partially inserted below with 5–16 branches; the branches (0.7–)2–9(13) cm long, alternate or sometimes subopposite, ascending to erect, rigid, glabrous to minutely scabrous, axils glabrous.
Figure 3. Inflorescence of Diplachne fusca subsp. muelleri (no voucher). Image by Mark Marathon (CC-BY-SA-4.0).
Spikelets 10–14 mm long, mostly imbricate; florets 8–13; callus glabrous; lower glumes (2.4–)3.3–4.7 mm long, narrowly ovate or somewhat irregularly asymmetric, glabrous, obtuse to acute apically; upper glumes 4–5.4 mm long, ovate, glabrous, obtuse and sometimes bifid; lemmas 4.7–5.8 mm long, 3-nerved, ovate, pale or smoky white, the lateral nerves pronounced and excurrent or not, sericeous to densely velutinous on lower 1/3–2/3 of lateral nerves, the midnerve usually somewhat less pubescent, apex acute, often bifid, mostly awnless or mucronate; paleas subequal to slightly exceeding lemma, obovate to narrowly ovate, sericeous to velutinous along lower 1/2 to 2/3 of nerves (hairs often diverging widely at maturity); apex obtuse to acute. Stamens 3; anthers 0.5–0.7(–1.0) mm long, yellow. Caryopses 1.6–2.4 ×1.0–1.1 mm long, obovate in hilar profile, depressed obovate in transverse section, hilar groove lacking, smooth, brown; pericarp weakly adnate to the endosperm.
Figure 5 Typical growth form (left) of Diplachne fusca subsp. fascicularis (Montgomery Co., Kansas; Snow 10978 [KSP]). As typical for the subspecies, it has fewer, longer, and more widely spaced panicle branches (right) than *L. f.* subsp. uninervia, with one or more of the lower panicle branches enclosed in the uppermost leaf sheath.

Leaf anatomy. Voucher: Badman 675 (CANB) (Fig. 5). Description as per *D. fusca* subsp. *fascicularis*.

Stem anatomy. Not examined.

Chromosome number. Unknown.

Phenology. Flowering January through October.

Distribution. Native: Widespread across inland Australia, particularly the central regions; wet areas such as streambanks, around boreholes, and swamps, in a variety of soil types (TDWG: WAU-WA, NSW, VIC, QLD-QU, NTE.) Elevation from near sea level, upper elevation unconfirmed. Non-native: TDWG: SWI; not confirmed.

Conservation status. Least Concern (IUCN 2012) due to its widespread distribution across Australia.


Vernacular names. Mueller sprangletop; Mueller beetlegrass, Sugar Grass (in the Maranoa District of Queensland, Australia).

Comments. Diplachne fusca subsp. muelleri is most easily recognised by the relatively narrow panicles, which are largely inserted at their bases and the presence of inflorescences at most points of branching on the culms. The mature lemmas often have a dark spot at the base at maturity, are relatively broad, flattened and the dense trichomes along the nerves typically spread widely at maturity.

*Diplachne fusca* subsp. *muelleri* most closely resembles *D. f.* subsp. *fascicularis* by virtue of the lower inflorescence branches that typically remain inserted at the bases,
especially from lateral inflorescences. However, the upper glumes are generally much broader than the primarily North American subspecies.

Another occasional trait is a pronounced magenta to purplish mottling of the leaf sheaths (e.g. Carolin 6300 [US, K], Weber 8769 [US, W]), which typically is absent in *D. fusca* subsp. *fusca*, another native Australian subspecies, but which recurs sometimes in the American subspecies *fascicularis*. The relatively short spikelets of Lazarides 4381 (CANB), Chippendale 2036 (CANB), Hubbard & Winders 6263 (B, CANB), coupled with inserted, narrow panicles, suggest hybridisation between between *D. fusca* subsp. *muelleri* and *fusca*.

This subspecies is a relatively short-lived annual, whose relative abundance is often associated with the vagaries of water availability, particularly along watercourses and bores (=wells). The label of Symon 5617 (CANB, US) states the specimen grew relatively close to the hottest water emerging from the bore (ca. 110°F / 42°C). Cattle will graze the foliage and pastured horses eagerly consumed freshly collected specimens when offered (Snow pers. obs. 1996).

**Specimens examined. Australia.** New South Wales: Tero Ck Station, Martensz G 308 (MU). Along road between White Cliffs–Tero Ck. Station, Martensz 4494 (CANB); Near Goonery Bore, 65 mi.E of Wanaaring, Moore 5785 (BRI,CANB); ca. 35 km NW of Milparinka, Hawker's Gate Rd., Jacobs 3510 (BRI); 39 km from Brewarrina towards Collerina, Dunlop 933 (CANB); 11 km from Brewarrina towards Collerina, Dunlop 915 (CANB); “Mt. Mulyah”, ca. 50 mi. NW of South, Moore 5010 (CANB); Calindary Station, Libke 4479 (CANB); Tero Ck. Sn., Martensz 2320 (CANB). Northern Territory: Burt Plain, 33 mi.N of Alice Springs, Must 487 (BRI, CANB); Ruby Gorge, Hale Riv., ca. 70 mi. ENE of Alice Springs, Beauglehole 20735 (BRI); Heavitree Range, Ormiston Gorge, Beauglehole 45280 (BRI); Twin Bore, Todd Riv. station, Latz 812 (BRI); 1 mi. S Long waterhole, Coniston Station, Latz 1192 (BRI, CANB); Busrt Ck., 36.5 mi. N of Alice Springs, Nelson 1653 (BRI, K); 24 mi. S of Barrow Ck., Perry 5352 (BRI, K); Heavitree Range, Ormiston Gorge, Beauglehole 45280 (BRI); North West Simpson Desert, Latz 4642 (CANB); Twin Bore, Todd Riv. Station, Latz 812 (BRI); Burt Plain, 33 km N of Alice Springs, Must 487 (BRI,CANB); Andado, Buckley 1280 (CANB); Palm Valley, Chippendale 2669 (BRI, CANB); ca. 8 km SW of Mt. Conner, Carr & Beauglehole 1959 (CANB); Coolata Springs, 30 mi. SSE of Mt. Ebenezer Station, Lazarides 6194 (BRI, CANB, K, US); Emily Gap, 10 mi. E of Alice Springs Township, Lazarides 5329 (BRI, CANB, MO, US); 1/2 mi. S of Yambah Station, Lazarides 5192 (CANB); Petermann Bore, Tempe Downs Station, Henry 558 (CANB); Livingstone Pass, Petermann Ranges, Carolin 6300 (US, K [n.v.])10 mi. SW Alice Springs, Swinbourne 792 (CANB); Mt. Denison Station, Martin 40 (CANB); ca. 13 km SSW of Alice Springs, Pullen 10525 (CANB); 24 km S of Barrow Ck. Township, Perry 5352 (CANB, US); 28 mi. NNE of Alice Springs, Perry 3340 (CANB, K); 5 mi. S Alice Springs, Paige s.n. (CANB); Bloodwood Bore (No. 25) 46 km SW Brunette, Must 516 (CANB); 5 km E Old Coniston Homestead, Latz 1170 (BRI, CANB); 8 km NNE of Willowra Homestead, Latz 1250 (CANB); 65.5 mi. NNW of Old Andado Homestead, Beauglehole 27805 (BRI); 9
38

mi. W of Old Andado Homestead, Beauglehole 27998 (BRI); 8 km SW of Mount Conner, Beauglehole 45738 (BRI); George Gill Range, Kings Canyon, along Kings Ck., Beauglehole 20294 (CANB); Alice Springs Airport entrance, Nelson 2067 (BRI); 28 mi. NNE of Alice Springs Township, Perry 3340 (BRI); Deep Well Rd., 13 mi. S Alice Springs, Nelson 1832 (BRI); Palm Valley, Beauglehole 10351 (BRI); Palm Valley, Chippendale 2036 (CANB); Ruby Gorge, Hale Riv., ca. 70 mi. ENE of Alice Springs, Beauglehole 20735 (BRI); 1 mi. S of Long Waterhole, Coniston Station, Latz 1192 (BRI, CANB). Queensland: Burke Dist., Sandhurst Bore, Millungera Station, Blake & Lazarides 4783 (K, MEL, NSW, US). Darling Downs Dist., 16.5 km SE of Cunningham Hwy on Glenarbon Rd., NE of Texas, Snow & Simon 7311 (BRI, MO). Gregory North Dist., W side of Lake Phillipi, Kamaran Downs Station, ca. 60 km W of Bedourie, Edmunds KN2 (BRI); 30–35 mi. S of Bedouire, Blake 12307 (BRI, K). Gregory South Dist., Coochie bore, 55 km NW of Birdsville, Edmuds AD62 (BRI); Earlstown between Quilpie and Windorah, Blake 5459 (BRI), Mulligan–Eyre Survey, Gasteen 11 (BRI); Between Betoota and Birdsville, Peart 1720 (BRI). Maranoa Dist., Boatman Station; “Bluebush Swamp”, Everist 2857 (CANB, US). Mitchell Dist., Near Lochnagar, Blake 10322 (BRI, CANB, K, NSW); Geera, E of Barcaldine, Blake 10371 (CANB, K); Walrus V, Site G215, just S of Lake Mueller, ca. 29 km NE of Aramac on Lake Dunn Rd., McDonald 2672 (BRI). Warrego Dist., ca. 14 km N of Thargomindah, Fairfax 1273 & Kemp (BRI); On Paroo Riv. channels, 7 km N of Hungerford, Eberson E202 (BRI). “Gilruth Plains”, Allen 269 (CANB); “Curragh” Station, near Cunnamulla, Hubbard & Winders 6263 (B, CANB, NY); Eulo, White 11575 (K). South Australia: in the hot water from Murnpeowie flowing bore, Symon 5617 (B, CANB, K, US); Northern margin of Margaret Ck., ca. 30 km W of Coward Spring Railway Station, Weber 8769 (US, W); Between Camp and Rotten Swamp ca. 12 km NW of Quinyambie Homestead, Whibley 3587 (NY); Region 2, Lake Eyre Basin, Margeret Ck., near Curdimurka, Badman 492 (CANB); 16 km NE of Marree on the Birdsville Track, Badman 730 (AD, BISH); 1 km S of Anna Ck. HS, 16 km W of William Ck., Badman 1263 (BRI); Region 2, Lake Eyre Basin, N Lake Talinnie, O’Malley 374 (BRI); 34 km S of William Ck., Beauglehole 28112 (BRI); ca. 40 km W of Marree and 9 km in a southerly direction off the main road to William Ck., Weber 9671 (BRI); Lake Eyre South, Sales and lower slopes of sandhills S of the lake, Badman 488 (CANB); Region 4: Gairdner–Torrens, Bates 16944 (CANB); Region 2: Lake Eyre Basin, Callanna Ck., 15 km W of Marree, Badman 378 (CANB); Region 2: Lake Eyre Basin, 4 km SE of Coward Springs, Badman 675 (CANB); Region 2: Lake Eyre Basin, km SE of Nunns Bore 28 km SE of William Ck., Badman 1876 (CANB); N of Marree, Lake Harry, McKean APG3 (CANB); Clayton Riv.... 50 km (ca. 30 mi) NE of Marree, Lothian L2011 (B); Near Queensland border, ca. 15 km NE of Innamincka, Whibley 2480 (B); Region 2: Lake Eyre Basin, Marree–Oodnadatta Rd., 42 km by road NW of William Ck., Donner 9870 (MEL); Lake Eyre Basin, 5 km E of Strzelecik Ck crossing, Williams 8023 (AD, BISH). Victoria: Near Mt. Everard, Giles s.n. (MEL). Western Australia: ca. 20 km E of Mulga Downs Headquarters, Mitchell PRP263 (BRI); Bore, 6.4 km W of Mongral Downs, Dunlop 2119 (BRI); 28 mi. E
of Windidda, Eremean Prov., Speck 1269 (CANB, US); Donkey Well, Yoothapina Station, Cranfield 5557 (CANB); Hadji Well, near Lake Way, Craven 5392 (CANB); Bore, 6.4 km W of Mongral Downs, Dunlop 219 (BRI); Bore, 6.4 km W of Mongral Downs, Dunlop 2119 (BRI); 28 mi. E of Windidda, Speck 1269 (CANB, US); Donkey Well, Yoothapina Station, Cranfield 5557 (CANB); Hadji Well, near Lake Way, Craven 5392 (CANB). Switzerland. Derendingen, Probst 8902 (US, n.v.).


Figures 5–6


*Festuca texana* Steud., Syn Pl. Glumac. 1: 310. 1854. *Type*. UNITED STATES OF AMERICA, Texas. T. Drummond 387 (holotype: P [P032675]!). Snow (1997a: 253) inadvertently referred to the holotype as a lectotype and annotated it as the latter, although the specimen is marked “Herbarium Steudel”.

*Festuca thouini* Steud., Syn Pl. Glumac. 1: 311. 1854. *Type*. West Indies, Ins. Antillae in Domingo, A. Thouin (holotype: P [P032674]!, fragment US! (US–78820)). This specimen (see previous) also was annotated incorrectly as a lectotype (Snow 1997a: 253).


sary given the citation of two collections (of Tracy and Palmer and each of these assigned the number 619 by some later worker) in the work by Beal. However, Vasey’s description included a description of the newly proposed species, in addition to citation of a specimen collected by Tracy and made no reference to Palmer’s collection, so lectotypification was unnecessary. Zanoni ([NY-1144033]) in 2010 also made reference to this on an annotation slip.


**Description.** Annuals. Culms (3.5–)15–130 cm tall, 1–5(–8) mm wide at base, round, ascending to erect (or completely prostrate and densely cespitose at higher elevations; or rarely rhizomatous and rooting at nodes in freshwater marshes, often branching; nodes glabrous; internodes (0.5–) 3–18 cm long, soft, hollow. Leaf sheaths mostly longer than the internodes, round or somewhat flattened, glabrous on sides and margins; ligules (2–)5–7 mm long; blades 3–45 cm ×2.5–7 mm, usually sparsely scabrous above and below. Panicles (1.5–)10–72 ×(1–)4–22 cm, generally partially included below at maturity with 3–35 branches; branches (0.5–)3–22 cm long, alternate along the rachis, erect, ascending, or occasionally divergent, rigid or slightly flexu-
ous, minutely scabrous, the axils glabrous. Spikelets 5–12 mm long, distant to mostly imbricate; florets 6–12; callus glabrous; lower glumes 2–3 mm long, narrowly ovate or somewhat asymmetric, scabrous on midnerve, acute to aristate and occasionally short-awned; upper glumes 2.5–5.0 mm long, elliptic to ovate, scabrous on midnerve, obtuse, aristate, or short-awned; lemmas 2.5–5 mm long, narrowly ovate, light brown or smoky white at maturity, the lateral nerves pronounced and extending to edges often as small teeth, sparsely sericeous along lateral nerves and often midnerve, glabrous between nerves, apex acute to attenuate, often mucronate or with awns to 3.5 long; paleas elliptic, generally subequal to lemma, sericeous along nerves; apex acute to obtuse. Stamens 3; anthers 0.2–0.5 mm long, yellow. Caryopses 1–2 mm long, 0.8–1.0 mm wide, elliptic to obovate in hilar profile, transversely elliptic in transverse section, hilar groove lacking, smooth, brown; pericarp weakly adnate to the endosperm.

**Leaf anatomy.** Midrib present; central lucunae present. **Primary bundles:** protruding adaxially or not; protruding abaxially; outer bundle sheath interrupted adaxially and abaxially; extension cells present adaxially; adaxial sclerenchyma present as girders or strands; abaxial sclerenchyma present as girders; adaxial cells of primary bundle sheath cells enlarged; abaxial cells of primary bundle sheath cells not enlarged. Colourless cells present between primary and secondary bundles; chlorenchyma continuous or discontinuous between adjacent bundles. **Secondary bundles:** protruding adaxially or not; flush abaxially; outer bundle sheath continuous or interrupted abaxially; adaxial sclerenchyma present as girders or strands; abaxial sclerenchyma present as girders.
(Vouchers [at MO]: Snow 5804 [USA], 6672 [México].)


**Chromosome number.** $2n=20$ (Gould 1966; Reeder 1971; vouchers: Reeder & Reeder 4844 & 4883 [ARIZ]).

**Phenology.** Flowering mostly May to October in North America and throughout the year in South America during and after warm and wet seasons.

**Distribution.** Southern Canada (infrequently) through USA (where most common) south sporadically to Paraguay. The transition between the native and non-native distribution of *L. fusca* subsp. *fascicularis* is somewhat uncertain, particularly in its southerly range. Elevation from sea level to 2300 metres. **Native:** Most of the United States mainland (excluding Georgia) north to Ontario, Canada, occurring irregularly to about 40°S in Argentina. (TDWG: in North America in part or all of regions 73-80 (see additional specimens for additional detail): BLZ, COS, HON; 81: BAH, CAY, CUB, DOM, HAI, JAM, LEE-NL, LEE-VI, TCI; 82: VEN; 83: BOL, COL; 84: BZC, BZE, BZL, BZS; 85: AGE, AGW, AGW, PAR. **Non-native:** TDWG: CZE. Collected once from a rail-yard in Vancouver, British Columbia but not persisting (F. Lomer, pers. comm. 2010). Possible occurrences in Saskatchewan and Quebec have not been confirmed.

**Conservation status.** Least Concern (IUCN 2012), given its wide distribution and abundance.

**Etymology.** Possibly in reference to the fasciculate (bundled or clustered) arrangement of the lower panicle branches before they are exserted from the sheath.

**Vernacular names.** bearded diplachne; salt meadow grass; zacate salado lagunero; salado fasciculado.

**Comments.** Specimens from Florida and the Bahamas typically have the shortest spikelets (e.g. Vincent 16032 [MU]; Davis s.n. [FLAS 38436]; Craighead s.n. [FLAS 84837]; Herndon 905 [RSA]). On rare occasions, a specimen growing in a saturated soil may branch and root so vigorously at nodes that it appears to be stoloniferous (e.g. Fleetwood 12215 [SMU]). Older specimens from Reno, Nevada, identified as *Diplachne tracyi* Vasey, have narrow, relatively long and somewhat cylindrical spikelets (e.g. the type specimen), but since this spikelet morphology recurs in the species complex from parts of Africa and Australia and is narrowly distributed, this variant is unworthy of taxonomic recognition. Those specimens may be waifs of *D. f.* subsp. *fusca* from the Paleotropics, but genetic analyses would be necessary to test this hypothesis. Some specimens from California (Twissleman 6491 [MO]) also closely resemble some forms of *D. fusca* subsp. *fusca*.
A morphotype in the United States described as *Diplachne acuminata* Nash in Britton has been recognised based on the relative elongation of glumes and lemmas and awned lemmas (Gleason, 1968: 188; Gleason and Cronquist, 1991: 785). *Diplachne maritima* E.P. Bicknell was described based on its prostrate habit, more pronounced lemmatal awns and ecological occurrence in brackish coastal areas from Massachusetts to Florida (e.g. Weatherby 4390; Commons 155; Metcalf 5717; Torrey 8765; Williams 3102 [all at US]) and around saline areas in Onondaga and Cayuga counties, New York (e.g. Leonard 8559 [FLAS]; Congdon s.n. [RSA]; Perkins s.n. [RSA], Fogg 3889 [MO]). However, given that three of the four subspecies of *Diplachne fusca*, recognised in this treatment, have moderate to high levels of salinity tolerance (but little evidence for this with subsp. *uninervia*) and that populations with elongated awns often occur elsewhere, such as in the Distrito Federal and Estado de México (Jiménez–Ostorino 40 [RSA]; Mattuda 25656 [MEXU, MO, MU]; Espinosa & Sarukhán 318 [ENCB, MEXU, MO]; Rzedowski 26251 [ENCB, MO]; Rzedowski 28145 [ENCB, US]; Villegas 585 [ENCB]; Rzedowski 20432 [ENCB], Schaffner 49 [W]), taxonomic recognition of specimens with longer than average lemmatal awns also is unwarranted.

Specimens have not been confirmed for this subspecies listed on websites from Sweden (e.g. Lackalänga, year 1949 [LD, S]) and Poland (Vogel, years 1916 and 1918 [OHN]).

*Diplachne fusca* subsp. *fascicularis* is more widespread in North America than subsp. *uninervia*, although the latter is more invasive outside of its range (e.g. Snow & Simon 1999). Specimens morphologically intermediate between *D. f.* subsp. *fascicularis* and *uninervia* occasionally are seen (Hitchcock 93 [TEX]), but the taxa maintain their distinct morphology in sympatry (e.g. Snow 5899 and 5900 at Falcon Lake, Zapata County, Texas).

Sutton (1973a) briefly described the anatomy of *D. fascicularis* (as “fascicularis”) and placed *Leptochloa* into the tribe Chlorideae (Sutton 1973b), but these papers extrapolated the limited analysis beyond their usefulness. Clifford and Watson (1977) illustrated *D. fusca* subsp. *fusca* (as *Diplachne parviflora*). Renvoize (1984) illustrated the midrib of *D. fusca* and discussed its prominent air canal, but cited no voucher.

Characters of *Diplachne fusca* subsp. *fascicularis* that generally differ from those of subsp. *uninervia* include: lower panicle branches inserted in sheath, a greater tendency for sheaths to be mottled with anthocyanins (e.g. McGregor 12652 [KANU, US]), the tip of the uppermost leaf blade often extending beyond the apex of the panicle and the lemmatal apices generally acute to acuminate and sometimes mucronate on the lateral nerves. Specimens of *D. f.* subsp. *fascicularis* with exserted panicles bearing relatively short, somewhat flexuous branches (Morello and Cuezzo 1124 [BAA])) can resemble *Dinebra scabra* (Nees) P.M. Peterson & N. Snow. Relatively erect specimens of *Dinebra viscida* (Scribn.) P.M. Peterson & N. Snow are often confused for *D. f.* subsp. *fascicularis* where the species overlap, but the panicle length and width of the former are usually significantly shorter and the fresh foliage is slightly sticky or viscid.

**Specimens examined.** Argentina. Buenos Aires: Ptdo. de San Fernando, cerca dela estación “El Delta”, Hunziker 3561 (MO); Avellandeda, Venturi 209 (GH, NY, US); Villa Elina, Cabrera 6321 (LP). Catamarca: Dpto. Capayán, Ruta 60 (Km 1044)


Great Inagua: Open gravel area by the “town pans”, Dunbar 223 (A, US); In mud of Grassy Pond, E of Morton Bahamas Ltd. headquarters, Correll 47401 (NY); In mud of sink at Horse Pond, just NE of Matthew Town, Correll 45812 (NY); In clumps in water of pond, Horse Pond, NE of Matthew Town, Correll 47549 (MO); Cleared portion of Maroon Hill, NE of Matthew Town, Gillis 12131 (A); Inaqua, water hole near airport runway, Gillis 11750 (A, MO); dry pond in algal mat, 2.5 mi. N of Mathew Town on road to salt works, Gillis & Proctor 11727 (A). Andros Island: North Andros, along Queens Hwy at Stafford Ck., at roadside, Jacobs s.n. (MU); The Bluff, Freid 06-713 (MU). Long Cay: South Side, Brace 4084 (NY). Long Island: A short distance NE of St. Paul’s Church at the base of the slope, Clarence Town, Hill 2339 (MO); Edge of palmetto flat near Alligator Bay, Correll 48200 (NY); Millerton, Freid and Richley 98-423 (MU); Stella Maris, Fried and Richey 98-341 (MU). Grand Bahama: In ditch along road to dump, W of Freeport Airport, Correll & Correll 50942 (NY); Open moist area of Bucida spinosa marsh, W end of Freeport Airport, Correll and Kral 43008 (NY). New Providence Island: Near Nassau, Curtiss 176 (CM, NY, P, PR); Edge of freshwater marsh, SW Bay, Britton and Brace 504 (US). Great Exuma: Sink hole near Georgetown, Britton and Millspaugh 3108 (GH, NY, US). Cat Island: Orange Ck. and vicinity, Britton and Millspaugh 5719 (NY).

**Bolivia.** Cochabamba: Prov. Mizque, Town of Mizque, wetland adjacent to the Río Mizque, near the intersection with the road to Aiquille, Ritter et al., 2119 (NHA); Prov. Cercado, City of Cochabamba, Laguna Alalay, Ritter 1674 (NHA). Bonaire (Nether Antilles). Back of the dam near Jatoe Bacon, Stoffers 662 (A). Brazil. Bahia: Cachoiara, base of cliff in slimey water, Chase 8097 (US); Rio de Contas a Jequié, Davidse et al. 11647 (K, MO, TAES); Iacú, Faz. Suíbra (Boa Sorte), 18 km al este da cidade, Noblick 3655 (K); Mpio. Livramento do Brumado, agua Vargem de Dentro, c. 8 km ao oeste da cidade, Harley et al. 25858 (K); Rio Salitre, 46 km WSW of Joaiziero, Chase 7934 (BAA, GH, MO, US, W); 64 km N of Senhor do Bonfim on the BA 130 Hwy to Juaziero, Harley et al. 16343 (K, NY, P, US). Ceará: Thickets on shores of Acude Choró, Mpio. de Quixadá, Drouet 2408 (US); Picos, Piauhy to Campo Salles, Swallen 4265 (BAA, US); Campo Salles to Crato, Swallen 4300 (US); Iguatú, Swallen 4415 (US); Crateus, edge of small pond, Swallen 4497 (US). Distrito Federal: Brasilia, Luetzelburg 418a (K) and Luetzelburg 794 (K). Paraíba: Escola de Agronomia do Nordeste, Areia, Paraíba, Coêlho 1145 (US); Pocinhos, Pickel 3841 (MU). Pernambuco: In low field, Tapera, Pickel 1701 (GH, MICH, P, US); Caruaru, on border of a rivulet, Pickel 4257 (MU); Bello Jadim, Serra do Genipapo, Chase 7685 (GH, MO, US); Vicinity of Pernambuco (Recife), Chase 7740 (MO, US); Mpio. Belem de São Francisco, 3 km S of city of Belem de S. Francisco (also called Jatanã) at point where road stops at shore of Rio São Fransisco, Eiten & Eiten 4958 (K, US). Rio de Janeiro: Margin of Lagoa R. de
(NY); Black Riv., Hitchcock 9643 (US). Westmoreland Parish: Savanna-la-Mar, swamps and ditches, Hitchcock 9863 (US); Ferry Peux, Harris 12498 (CM, GH, MO, NY, P, US, W). **México.** Aguascalientes: Rincon de Romos, Hernández & Mathus N–1609 (GH); 16 km al N de Aguascalientes, sobre la carretera a Rincón de Romos, Rzedowski & McVaugh 731 (ENCB, NY). Campeche: Carr. Tankuche–El Remate, 1 km al S del camino, Mpio. Calkini, Ortiz 761 (UC). Chihuahua: Km 33 Nuevo Casas Grandes–Galeana, Hernández and Tapia N–130 (US); Hilly terrain, 9 mi.S of Villa Matamoros, Reeder & Reeder 4883 (ENCB); Rio Conchos, Cd. Camargo, Harvey 1403 (GH, MICH, US); Rio Aros, LeSueur 202 (GH, SMU, US); Santa Maria en el Valle de Aldama, Hernández and Mathus N–1744 (GH); 28 km SW of La Junta on road to Creel, Peterson 9610 (BISH, K, US); Low area between Hwy and railroad tracks... 11 mi. W of Cuauhtémoc, Reeder et al. 4844 (ARIZ, ENCB, US); Torreon, Johnston 44166 (ARIZ, MO, SMU); Plains near Chihuahua, Pringle 813 (GH, MEXU, MICH, MO, NA, NY, P, PR, RSA, S, UC, US, W); ca. 65 (air) mi. SW of Cd. Juarez, 6.8 road mi. N of Guzman, Henrickson 14105 (LL); At Paplole Ljas Luntas (Presen de Anteojos), 2 km NW of Hacienda El Berrendo, on Las Pampas Ranch, Chiang et al. 8870 (LL); Rio Florida, Jiménez, Harvey 1320 (ENCB, TEX, US); At Papalote Las Luntas, (Presón de Anteojos), 2 km NW of Hacienda El Berrendo, on Las Pampas Ranch, Chiang et al. 8870 (MO). Coahuila: Don Martín Dam, Harvey 944 (MICH, US); ca. 51.5 (air) mi. ENE of Torreon on SW edge of Laguna Mayran, along trail from Estacion Cuchilla to Ejido Mayran, Henrickson 14349 (LL); 20 mi.NW of San Pedro ... 63 km de Ocampo rumbo a Sierra Mojada, Carranza C–631 (ARIZ, MO, TEX); Sierra La Madera, Rcho. Laguna la Leche, aprox. 62 km de Ocampo rumbo a Sierra Mojada, Carranza 617 & Carranza (BRIT); road to San Martín Dam near near Nuevo Leon–Coahuila border, Harvey 947 (GH, MICH, MO, MONTU, US); 10 km carretera Matamoros – Saltillo, Espinosa A. 89 (ARIZ); Hwy 30, in wet shore of Laguna de Mayran, Henrickson 5985 (LL); Torreón, Palmer 503 (GH, MO, TAES); Torreón, Fisher 44166 (NY, TAES). Distrito Federal: Tlahuac Distr., chinampas at San Andrés Mixquic, 40 km SE of Mexico City & 7.5 km W of Chalco in the Chalco Lk basin, Jiménez–Osornio 40 (ARIZ); Ixtapalapa, en ladera humeda cerca de canal, Matuda 25656 (MEXU, MO, MU); Xochimilco, Espinosa & Sarukhán 318 (ENCB, MEXU, MO); NW de Xico Viejo, cerca de la aldea, Villegas 558 (ENCB); Deleg. de Tláhuac, Mixquic, orilla de canal, Rzedowski 26268 (ENCB); W de Tláhuac, en zona de chinampas, Villegas 564 (ENCB); Xochimilco, Rzedowski 20432 (ENCB, MICH); Tláhuac District: Chenampas at San Andrés Mixquia, 40 km SE of Mexico City and 7.5 km W of Chalco in the Chalco Lake Basin, Jiménez–Osorino 40 (RSA). Durango: Durango, Hitchcock 7567 (US); Torreón, Hitchcock 7729 (US); Cienega bottomland near small lake 40 mi.N of Ciudad Durango, Gentry 8600 (ARIZ, GH, MICH, RSA, US); 10 mi. NE of Durango on Durango–Torreón Rd., Soderstrom 803 (SMU, US); 66 km N of Durango on HWY 45, Peterson & Annable 5987 (BISH, US); Colonia Filipe Angeles, at 15 km S of Durango on Hwy 23 towards Mezquital, Peterson et al. 18963 (BISH, US). Guanajuato: Irapuato, Hitchcock 7386 (US); ca. 6 km W of San Felipe, Sohns 402 (MICH, MO, NY, TAES, US); 6 km al
NNE de Salvatierra, sobre la carretera a Celaya, Rzedowski 40295 (ENCB). Guerrero: Near Pie de la Cuesta, 6 mi. N of Acapulco, Barkley et al. (TEX). Hidalgo: Mpio. Huichapán, Roadside ditches near El Carmen on Huichapan–Querétaro Rd., Moore 2158 (GH, UC, US); El Peñón, 5 km al sur de Alfaajayucan, Mpio. de Alfaajayucan, Hernández 6721 (MO). Jalisco: Villa Obregon, Beetle M-5545 & Guzmán (ARIZ); 2 km from San Julian, Beetle M-5538 & Guzmán (ARIZ); Hwy 54, along Río Juchipila, ca. 50 mi. N of Guadalajara, just past Puente Santa Rosa, Spellenberg 2945 (NMC, NY); 3 km N Ojuelos, Hernandez X-2487 (KANU); 2 km al E de San Diego de Alejandría, rumbo a la Cd. de León, Lot & Novel 969 (GH); Mpio de Ixtlahuacán del Río, Atotonilquillo, Guzmán 8377 (ENCB); Isla de Alacranes, Lago de Chapala, Cota 56 (ENCB); El Jaguey, 14 kms al N de Ixtlahuacán del Río, Guzmán 7977 (ENCB); 23.3 km E of Aguacalientes on Hwy 70 towards San Luis Potosí, just past state boundary, Peterson & Annable 6186 (US); ca. 6 mi. W of Lagos, Reeder et al. 1416 (GH, RSA); Laguna de Zacolacoal, Díaz Luna 1063 (ENCB); ca. 50 mi. N of Hwy 54 along Río Juchipila, just pass Puente Santa Rosa, Spellenberg et al. 5342 (NMC). México: S de Ixtapaluca, a 2 km del pueblo, Villegas 585 (ENCB); 1 km al N de Zumpango, Rzedowski 25850 (ENCB, MICH); Lago de Tezoco, 18 km al WSW de Tezoco, sobre el camino a México, Rzedowski 28145 (ARIZ, ENCB, MICH, US); Atenco, cerca de Tezoco, Torres s.n. (ENCB). Michoacán: 6 km al E de Maravatío, sobre la carretera a Conatepec, Rzedowski 44199 (ENCB); Shore of Lake Pátzcuaro, Barkley et al. 2669 (US); Shore of Lake Pátzcuaro, Barkley et al., 2663 (TEX); Vicinity of Morelia, Arsène 5760 (CM, GH, MO, S). Morelos: Morelos. Valley near Jojutla, Pringle 9595 (GH, MEXU, MO, NY, TAES, US). Nuevo Leon: 32 mi. S of San Roberto along Hwy 57, McGregor et al. 501 (KANU); Monterrey, Arsène 6108 (NY, US); Monterrey (Nuevo Leon) río, Abbon 201 (MO); Pan Am. Hwy from Laredo to Monterrey near Maulique Pass, Leavenworth & Leavenworth 740 (MO, US); Mpio. de Linares, Ejido Los Cristales, Ortíz s.n. (ENCB). Querétaro: Cerro de las Campanas, Arsène 10072 (GH, MO); Querétaro, in water of irrigation ditch, Hitchcock 5836 (US); Querétaro, Arsène 10289 (US); 2 mi. SE of San Juan del Rio, O’Brien s.n. (MEXU 321518). Quintana Roo: Cozumel al sur de la Islan a 200 m del embarcadero, Ortíz 904 (MEXU, MO); Punta Nizuc, Can–Cun, Mpio. Isla Mujeres, Ortíz 530 (MEXU). San Luis Potosí: Charcas, Lundell 5535 (ARIZ, MICH, US); 8 km al E de S. L. Potosí; Rzedowski 11236 (ENCB); Mpio. Guadalcazar, Ejido Minas de Plata, Bravo 34 (ENCB); ca. 2 mi. W of Arriaga on road from Aguascalientes to S. L. Potosí; Reeder et al. 1358 (ARIZ, ENCB, MEXU); Charcas, Whiting 1052 (ARIZ, MEXU, MICH, TEX, US); Mpio. Charcas, Laguna Seca, Rzedowski 6535 (ENCB, LL); 5 mi. SE of SLP, Gould 11566 (ENCB, TAES, UC, US); Rio Verde, along polluted creek on N side of town (along road to Las Tables), Thomas 2773 (MO). Sinaloa: Along Hwy 15 (de cuota), at marker 19 km N of Mazatlán, Snow 6599 (MEXU, MO); Mazatlán, Harvey 8828 (MONTU). Sonora: Mpio. Agua Prieta, W Side of Agua Prieta, Reina G. 2006–445 (ARIZ); Mpio. Empalme, on Mex. Hwy 15, 10.3 mi. E of Empalme end of Douglas Bridge, Felger 85–1141 (ARIZ); Mpio. Guaymas, Cañón La Balandrona, north side of Sierra El AguaJE, Felger 01–655 et al. (ARIZ); Mpio. Guaymas, ca. 6 km
E of Las Guasimas exit, ca. 31 km ESE of Empalme on MEX 15, Van Devender 2002-1072 et al. (ARIZ); Mpio. Guaymas, Mex. Hwy 15, 1.7 km NW of Pitahaya (Belem, Rio Yaqui) junction, 3.6 mi. S of Pitahaya, Felger 85-1293a & Reichenbacher (ARIZ); Mpio. Guaymas, Cañón Las Barajitas, Felger 96-51 et al. (ARIZ); Mpio. Hermosillo, Hwy 24, 5.0 mi. N of El Sahuaral (4.7 mi. N of Bahia San Augustin Road junction), Felger 85-1570 (ARIZ); Mpio. Cucurpe, Cañon las Barajitas, Sierra el Aguaje, ca. 18 km NW of San Carlos, Felger 95-228 & Wilson (ARIZ); Reservoir, ca. 6 km SE of Magdalena off the road to Cucurpe, Reina G. 2001-750 & Van Devender (ARIZ); Rio Mayo drainage, along the Hwy from Navojoa to Huatabampo, ca. 0.6 mi. NE of turnoff to Bacobampo and 8 mi.SW of Navojoa, Sanders et al. 8945 (ARIZ) and 8947 (MO, UC); Mayocahui, Van Devender 95-292 et al. (ARIZ); On paved road leading to Ortíz, 14.1 road mi. N of intersection with Hwy 15, SE of Guaymas, Snow 6564 & Prinzie (MEXU, MO); SE of Guaymas, along Hwy 15, ca. 100 m S of km 82 signpost, Snow 6566 & Prinzie (KSP, MEXU, MO, MU); Between road and railroad tracks, at km 90 on Hwy 15, SE of Guaymas heading to Ciudad Obregon, Gibson & Gibson 2043 (ARIZ, ENCB). Tamaulipas: Sierra de San Carlos, Vicinity of El Mulato, Bartlett 10972 (GH, MICH, US); Mpio. Aldama: Ejido La Piedra, Mora-Olivo 1478 (BRIT). Tlaxcala: Entrada W de la población de san Jorge Tezoquipan, al W de Tlaxcala, Weber 697 (ENCB). Yucatán: Progreso, Swallen 2918 (MICH); Carr. San Felipe–Rio Lagartos, a 5 km del crucero, Mpio. Rio Lagartos, Ortíz 691 (UC); Mpio. Sisal, 4 km al SE de Sisal, Santos Meza 60 (MO); Mpio. Progresso, mangrove 3 km S of El Progresso, Davide & Davide 29454 (MO); 18 km al SE de Celestún, Gutiérrez–Parra 30 (ENCB). Zacatecas: Along Hwy 54, at turnoff to Jalpa, Snow 6672 (MEXU, MO); Villa de Cos, Johnston 7429 (GH, US). Paraguay. Boquerón: Filadelfia, Hahn 801 (MO); A 12 km E de Pratts Gill, Molas & Vera 1388 (MO). Turks and Caicos. Pine Cay, Correll 43169 (LL); Provo, Long Bay, Neis 406 (MU). United States of America. Alabama: Mobile Co., Battleship Park, by causeway US 90–98, E of Mobile on the bay, Kral 32754 (US); Along (and S) of the newly completed Interstate Hwy 10 overpass, SE part of Blakeley Island between Mobile Riv. and Mobile Bay, Lelong 7323 (NCU). Morgan Co., Port DeKatur, sandy beach by Dekatur boat ramps along Tennessee Riv., Kral 54428 (MO). Arizona: Apache Co., Canyon de Chelly Nat. Mon., Capmgroud, Rink 1555 (ARIZ). Cochise Co., Mule Mountains, near watercourse, Goodding 297-61 (ARIZ); Douglas, Tornber s.n. (ARIZ 147338); S edge of St. David, Gould & Haskell 4496 (ARIZ, GH); playa just W of Willcox, Reeder & Reeder 7955 (ARIZ); just W of Willcox along road to Cascabel, Reeder & Reeder 8879 (ARIZ); Willcox Playa area, SW of the town, Reeder & Reeder 9061 (ARIZ); San Pedro Riparian National Conservation Area, St. David Cienega, just W of Upper San Pedro River, N end of wetland, Makings 1624 (ASU). Gila Co., Black Riv., near settlement of Black Riv., Gould & Robinson 4925 (ARIZ, UC). Graham Co., Hooker Cienega, SW of Bonita along Sunset School Road, Jenkins 2466 (ARIZ); Tatcher, Thornber s.n. (ARIZ 147336); San Simon Valley, 15 mi.NE of Bowie, Bingham 2338 (ASU). Mohave Co., Arizona Strip, Rock Crossing along the Colorado City-Main Street Valley road, Reeder & Reeder 9649 (ARIZ); Around a large charco at Rock Crossing on the Colorado
City to Main Street Valley road, Reeder & Reeder 8627 (ARIZ); ca. 5 km S of jct of AZ-389 and Cane Beds road, then ca. 10.5 km west, Reeder & Reeder 8441 (ARIZ); Havasu Nat. Wildlife Refuge, Krakowski s.n. (ASU 70812). Navajo Co., Woodruff, in moist soil along reservoir, Darrow 3324 (ARIZ, US); Hwy 260, ¾ mi. SE. Ent. St., Stephenson 1968 (ARIZ). Pima Co., edge of old clay quarry, flats W of Tumamoc Hill, Tucson, Bowers 2716 (ARIZ). Pinal Co., 9 mi. N of Casa Grande overpass on Hwy 87, Pultz & Phillips 1532 (NY); Southwestern shoreline of Picacho Lake, Gould 4630 (ARIZ); Near the Mormon Battalion Monument along AZ-387 ca. 5 km N of its jct. with AZ-84 in Casa Grande, Reeder & Reeder 9599 (ARIZ). Santa Cruz Co., Along road to Canelo Pass, ca. 5 km S of its jct with AZ-83, Reeder & Reeder 8924 (ARIZ); 1 km N of Canelo Pass summit, Reeder & Reeder 9896 (ARIZ); N of Canelo Pass summit, Reeder & Reeder 9899 (ARIZ). Yavapai Co., Perkinsville Quadrangle, T17N R2E SE ¼ SE 1/4, NW of Jerome, W of Mormon Pocket, east of HORSESHOE CANYON, along Verde Riv., Baker 12076 & Routson (ARIZ, ASU); Chino Valley North, Inscription Ranch, along the Verde River 2.7 km ENE of its confluence with Granite Creek, Baker 12753 (ASU). Yuma Co., Backwater A-7 to Colorado Riv., 1 mi. S of Ehrenberg, on east shore ca. 1 mi. S of N end of lake, Kennedy 10 (ARIZ). Arkansas: Arkansas Co., US Hwy 79, 0.3 mi. NE of junction with US Hwy 165, southbound just N of Stuttgart, Snow 5809 (MO); US Hwy 79, 0.2 mi. NE of junction with US Hwy 165 (southbound), just N of Stuttgart, Snow 5811a (MO). Drew Co., Along railroad tracks at Ark. Hwy 138 and Coon Bayou in Winchester, Thomas et al. 171074 (GREE); Lewisville, Sundel et al. 11976 (KANU). Lawrence Co., 4 mi. SW of Hoxie, Taylor s.n. (MU barcode 00008103). Ouachita Co., RR tracks at the Port of Camden E of Adams St., in downtown Camden, Thomas 171837 (BRIT, MU). Pulaski Co., Arkansas Riv. up the river from North Little Rock, Demaree 8364 (SMU, US). Sebastian Co., Arkansas Riv. floodplain, Sec 25, T8N, R31W, Thompson et al. C1074 (GH). California: Butte Co., Lake Oroville at Vinton Gulch, ca. 0.7 (air) mi. N of Cherokee, Oswald and Ahart 4413 (UC); Gray Lodge Game Refuge, NW of Pennigton, Mason 12730 (POM); Joie Osgood Ranch, ca. 2 mi. E of Honcut, Ahart 6721 (MO, UC); ca. 1.1–1.5 mi. S of the clay burrow for Oroville Dam, 1/4 mi. E of Larkin Rd., ca. 6 mi. SW of Oroville, Ahart 5480 (MO); Rice fields between Nelson and Richvale, Heller 13354 (GH, MO, NY). Colusa Co., Pond on Colusa–Marysville Hwy, 4 mi. S of Colusa, W side of Sacramento Riv., Mason & Grant 12962 (FSU). Fresno Co., Cottonfield 2 mi. NE of Fresno, Wiggins 4198 (POM); Fresno, Griffiths 4729 (US); Fresno, Springer 469 (ARIZ). Glen Co., S of Willows Migratory Wildfowl Refuge, Beetle 3062 (US). Inyo Co. 4 mi. N of Lone Pine, Kerr s.n. (RSA). Kern Co., Kern Riv. Canyon, Howell 38682 (MO); South Fork Valley ca. 2 mi. NE of Weldon, Howell 40133 (MO); Bed of Lake Isabella below mouth of Tillie Ck., Twisselmann 19263 (MO); Dissicated strand–bed of Lake Isabella (E side of N arm), ca. 5 mi. S of Kernville, Howell 47465 (RSA). Los Angeles Co., Coast Hwy just N of mouth of Santa Monica Canyon, Raven 16753 (RSA); California–Mojave Desert, W end of Rosamond Dry Lake at Ave. “C”, Sanders 2340 (CM); Rancho Santa Ana Bot. Garden, Claremont, Balls 9465 (W). Marin Co., Nicasio Reservoir ca. 10 air mi. SW of Petaluma and W of Novato, Erter
Monograph of Diplachne (Poaceae, Chloridoideae, Cynodonteae)

Commons s.n. (GH); Ab loco, Commons 155 (US). Florida: Bay Co., Crooked Island east, Tyndall Air Force Base, Johson 7970 (FSU). Brevard Co., 0.5 mi. W of I–95, immediately S of FL 50, edge of St. Johns Riv., SW of Titusville, Hall and Beeman 1901 (FLAS); In marsh, E side of Lake Poinsett, Chamberlain 17 (FLAS); Sect. 23 of St. Johns Nat. Wildlife Refuge, ca. 3.5 mi. W of Titusville, Rakestra s.n. (GA). Broward Co. E side of Hwy 27 just S of Griffin Rd. (Rte 818), ca. 14 air mi. WSW of Ft. Lauderdale, Anderson 9905 (FSU). Charlotte Co., Vicinity of Port Charlotte, Godfrey & Reinert 60966 (FSU, NCU); Old field, Frye C–67 (FLAS); Caloosa Experimental Range, USFS and Range Station, Adams 239 (GA); 15 mi.NNW of Fort Myers, frequent on wet sands of disturbed flatwoods, Kral 7521 (GH, NCU). Citrus Co., Crystal, along or in water along railroad, Combs 1004 (US). Collier Co., Rte 41, 1 mi.W of Monroe Station, Hill 2754 (SMU); Naples, Godfrey 74458 (FSU, NCU); Fathlachche Swamp, J. H. Davis s.n. (FLAS); Fakahatchee Strand, Roadside, Janes Hwy, Avery and Churchill 2062 (FLAS); Fakahatchee Strand 7 mi.NW of route 29 junction, Churchill s.n. (SMU); NW of Copeland, Atwater 612 (FLAS); Vicinity of Bahama Ranch, off US 41, W of Everglades City, Lakela 31325 (GA, NCU); Remuda Ranch, W of Everglades City on Tamiami Trail, US 41, extensive cut area in Big Cypress Swamp, Lakela 31723 (NCU, RM); Marco Island, Harvey 8203 (MONTU). Dade Co., Montgomery Foundation, E of Old Cutler Rd at a point E of end of SW 120 St, ca. 3 mi. S of South Miami, Orzell 22042 & Bridges (BRIT). About ponds along road just E of Homestead Airforce Base, Correll & Popenoe 49096 (NCU); Homestead, Herndon 905 (BRIT, RSA); Long Pine Key, Atwater GS–149 (FSU); W of Homestead, Avery & McPherson 1691 (FLAS); Marl Prairie, Davis s.n. (FLAS 38437); Homestead, Byrd s.n. (FLAS 114443). Franklin Co. 6 mi. SW Carrabelle, White 176 (RSA); Cape St. George Island, ca. 0.7 mi. of Marshall House, Anderson 9949 (FSU); St. Vincent Island, just W of Tahiti Point on NE sector of Island, Anderson 8964 (FSU); Dog Island, in W sector of Cannonball Acres, Anderson 5907 (FSU); St. Vincent Island, 1.8 mi.W of Tahiti Beach, Anderson 8580 (FSU). Glades Co., Hicpochee, Beardsley s.n. (FLAS 50590); Hendy Co. 12 mile Slough, Davis s.n. (FLAS 38438). Hillsborough Co., ca. 12 mi. SE of Tampa off US 41, Ray et al. 10615 (US). Lee Co., Sanibel Island, scrub along Caloosa Drive, Churchill 7952 (ASU); Middle Sanibel Island, Brumbach 5374 (FLAS); W Sanibel Island, Brumbach 6964 (GH, FLAS); Upper Captiva Island, Brumbach 9160 (BRIT, FLAS, GA, GH, MICH, NCU); Central Sanibel Island, Brumbach 6960 (FLAS); 5 mi. E of Ft. Myers Beach, Kral 7543 (GH, FLAS, NCU); 4 mi.N of Ft. Myers, Godfrey 65411 (FSU). Manatee Co., Brandenton Beach, Godfrey 65221 (FSU). Monroe Co., Loop Rd. 94, Correll et al. 42238 (LL); Flamingo, Everglades N.P., Atwater GS–162 (FLAS); Moist ground near Watson Hammock, NW side Big Pine Key, Thorne 15030 (GH); Big Pine Key, around small pond and brook, Swallen 5174 (US). Palm Beach Co., 18 mi. E of Belle Glade on FL 80, Dusky s.n. (FLAS 150015). Pinellas Co., Near Maximo Pt., St. Petersburg, Thorne 15440 (FSU, US). Sarasota Co., 3.5 mi. N of Englewood on Rte 775, Brass 28964 (NCU). St. Johns Co., Guana Lake, 10 mi. N of St. Augustine, Simons s.n. (FLAS 134057). Sarasota Co., 3.5 mi. N of Englewood on Rte 775, Brass 28964 (FLAS).
Monograph of Diplachne (Poaceae, Chloridoideae, Cynodonteae)

Management Area, ca. 15 mi. E of Crane along Yellowstone River, Heidel 1568
(MONT). Roosevelt Co., SW end of Horstead Lake, 5 mi. NW of Froid, Hotchkiss
6965 (MONT). Yellowstone Co., W edge of Billings just N and E of intersection of
Danford Rd and 56th St., McEldowney s.n. (MONT). Nebraska: Burt Co., Uct of US
Rt 75 & St Rt 51, Cusick 36392 (MU). Cass Co., N of Louisville on Hwy 50, along
the Platte Riv., Churchill s.n. (MO 2619370). Clay Co., 1 mi. W and 1.5 mi. N of
Ong, Churchill and Albert 2079 (MO). Cuming Co., 0.5 mi. W of West Point on
Hwy 32, along Elkhorn Riv., Churchill 4809 (MO). Dawson Co., Channel of Platte
41638 (UC). Jefferson Co., 4 mi. NW of Gladstone, Churchill 7989 (BRIT, KANU,
MO). Kearney Co., Hapeman s.n. (POM); “Prairies and sandhills”, Rydberg 6512
(NY, RM); Minden, Hapeman s.n. (ARIZ 147351; MU barcode 000078455; OKLA
Lancaster Co., E shore of Oak Lake, just W of Lincoln, Churchill 2631 (MO); Lin-
coln, 27th St and Hwy 80, Ungar 1178 (KANU). Merrick Co., Just S of Silver Creek
on Hwy 39, T15N, R3W, sec. 4, Churchill 6648 (KANU). Richardson Co., Lake bed
of the Verdon Lake, W of Verdon, Reynolds 2285 (MO); East shoulder of Rulo-White
Cloud Road, Shildneck C-6922 (KANU); SE bank of cut-off lake between levee and
west bank of Missouri River, SE corner of S29, R18E, T2N, Shildneck C-6802
(KANU). Thomas Co., On Middle Loup Riv., near Thedford, Rydberg 1713 (NY,
US). Webster Co., 1 mi. S of Red Cloud, Stephens 51200 (KANU). Nevada: Church-
ill Co., Lahontan Valley, Stillwater Point Reservoir Diversion Canal, Tiehm 12743
(ASU, MONTU). Clark Co., Las Vegas, Corner of Mayflower and Falcon Lanes, Bo-
stick 5002 (ARIZ). Douglas Co., Carson Valley, near Minden, Archer 6746 (GH, NA,
NY). Elko Co., Hot Springs 0.5 mi. S Elko along Humboldt Riv., Holmgren 1872
(ARIZ, NA, UC, W). Humboldt Co., Sheldon Nat. Wildlife Refuge, Virgin Valley,
Pond 21, 0.7 air mi. SE of Range HQ Duffurena Ranch, Tiehm & Rogers 4684 (NY).
Nye Co., Nevada Test Site, Vicinity of drainage channel from Warm Springs, Rt. 6,
base of S Hot Ck. Range, Beatty 11826 (NY, US). Washoe Co., Pyramid Lake Indian
Reservation, Tiehm 13411 (ASU, MONTU); Reno, Tracey s.n. (BRIT, KSC). New
Jersey: Atlantic Co., Salt marsh pond, Ventor, Mackenzie 7372 (MIC, MO); Brack-
ish meadows, Atlantic City, Parker 10925 (MO). Cape May Co., In sand, Cape May
Point, Brown 102 (GH, MU). Salem Co., Clayey cornfield along Alloways Ck., 3.5
mi. W of Hancock’s Bridge, Fogg 7734 (MO); tidal marsh along Alloways Ck., 3 mi.
W of Hancock’s Bridge, Fogg 7730 (GH). New Mexico: Chaves Co., Roswell, Earle
and Earle 330 (MO, NMC, NY, US, W). Dona Ana Co., Las Cruces, NW corner of
NMSU campus, Spellenberg 4336 (NY) Franklin Mts., Anthony Gap, Worthington
17211 (NY); 1.5 Road mi. SW of the old Mt. Riley train watering stop at playa, Wor-
thington 12715 (NY, UTEP); Potrillo Mts, W Potrillo Mts, playa along Columbus to
El Paso Rd., ca. 2.5 km SW of the old Mt. Riley Station, Worthington 22368 (NY,
UTEP). Eddy Co., Carlsbad, Tracy 8172 (NY). Grant Co., Phelps Dodge 1, Plot 14M,
Rosa along the Pecos Riv., Higgins 8915 (ASU, NY). Hidalgo Co., Diamond A
from Okla. Univ. Biol. Sta., Anderson 321 (OKL); Near Denison Dam of Lake Texoma, Riggs s.n. (OKL [01-0072171]). Canadian Co., T10N, R7W, S11, N/2 of NE/4, T. Albers (landowner), McCarty 727 (BRIT) and McCarty 728 (OKL). Choctaw Co., ca. 4 mi. NE of Swink, Taylor s.n. (BRIT 18811). Cimarron Co., 3 mi. NE of Kenton at base of a canyon in the E end of Black Mesa, Talyor & Taylor 25082 (BRIT); Near Lake Etling in Black Mesa State Park, Taylor & Taylor 2415 (OKL); Rocky canyon that runs to the W from Lake Carl Etling in the State Park, Taylor 16820 (OKL). Cleveland Co., 2 mi. N of Norman, Hopkins 767 (OKL); Canadian Riv. bed, Ten Mile Flats, Lawson and Goodman 578 (NCU, OKL); sandy bed of Canadian Riv., 3 mi. S of Norman, Goodman 4506 (NY, OKL). Comanche Co., Quanah Parker Lake, S end of island Wichita Mts. Wildlife Refuge, McMurry 835 (US); Geronimo Hill, Ft Sill Reservation, Thompson S0873 et al. (BRIT, OKL, OKLA); ibid, Thompson & Rudman S0601 (OKL, OKLA). Cotton Co., White’s Lake, 3 mi. N on Hwy 281/277 from intersection with 5A and 7 mi. W, Hoagland & McCarty 2111 (OKL); Randlett, 3 mi. S and 3 m. E on sectionline roads from intersection of Hwy 70 and Hwy 277/281, Hoagland & McCarty BLM0388 (OKL). Creek Co., Keystone WMA, 3.7 mi.W of 48/51 jct on Hwy 51, 2.0 mi. N to WMA, & 1.0 mi. E, T19N R8E Sec. 14, Hoagland et al., KEY-279 (OKL). Custer Co., Washita National Wildlife Refuge, T13N R19W Sec. 5, Buthod & Hoagland AB-3355 (OKL). Ellis Co., Four Canyon Nature Preserve, Hoagland 4C-430 & Buthod (BRIT) and 4C-431 (BRIT, OKL); Lake Lloyd Vincent, T9N R26W S34, McCarty 518 (OKL). Garfield Co., 1 mi.E of Plainview, Johnson & Brown VAN0159 (OKL). Garvin Co., 1.5 mi.S of Paul's Valley, Pohl 5205 (SMU); T3N R3W Sec 20 SE/1/4, Crawford & Crawford 1355 (OKL). Grady Co., 6 mi. NW of Chickasha, Engelman s.n. (OKL [01-0072208]); 3 mi. NW of Minco along the South Canadian River, Pearce 1259 (OKL, OKLA, SMU); Alex Marsh, Anderson Farm, 1 mi. W on SH 19 & 1.2 N of Alex, Magrath et al. 19985 (OKL). Grant Co., 3 mi. W of Jefferson, Hoagland & McCarty 1769 (OKL). Greer Co., 1 mi.E of Plainview, Higgins 7678 (ASU, NY); 1.5 mi. S & 6.0 mi. W of Jester on EW Rd 160, Buthod et al. AB-3354 (OKL). Harper Co., From SH 64 & 34 6.0 mi. W and 6.8 mi. N, Hoagland & McCarty 99-238 (OKL); bridge over West Sandy Creek on US Rt 160, 6 mi. W of Attica, Vincent 10104 (MU); Alkali bottoms N of Laverne on Beaver River, Engleman s.n. (OKLA); Plainview, 5 mi. W along US Hwy 64, Freeman 18237 & Morse (KANU, OKL); Along the Beaver (Canadian) River, 15 mi. W and 4.0 mi. S of Buffalo, Taylor & Taylor 32695 (BRIT, OKL). Jackson Co., N boundary, 200 m E of active runway, Johnson & Proctor ALT0046 (OKL); 0.5 km NE of calibration hardstand, T2N R20W Sec 11, Johnson & Browning ALT0127 (OKL). Jefferson Co.Waurika, S side of Hwy 79 bridge at the Red River crossing, Hoagland et al. BLM464 (OKL). Johnston Co., ca. 4 mi. SE of Tishomingo on the Tishomingo Nat. Wildl. Refuge, Taylor & Taylor 4153 (BRIT); ibid, ca. 1 mi.NW of Reeves Lake, Thieret 41160 (MU). Kay Co., 6 mi. N. of Newkirk, Stephens 71090 (KANU); Blackwell, city park, Buthod & Hoagland AB4202 (OKL). Kingfisher Co., R9W T19N, Sec. 22, 1 mi. SE on Hwy 51 from bridge over Cimarron, Palmer 1647 (OKLA); 4.6 mi. NW of Kingfisher at Lake Elmer, Buthod & Hoagland AB-2509
Kiowa Co., Just outside entrance to Quartz State Park, Smith 298 (OKL).
Logan Co., N of Crescent on Hwy 74, Buthod et al. AB-4405 (OKL). Love Co., Edge of a branch of Lake Texoma called Wilson Creek, ca. 10.7 mi. NW of Marietta, Taylor & Taylor 26010 (BRIT). Marshall Co., Fobb Bottom State Hunting Area of Willis Island, Perkins & Perkins 585 (OKL); Margin of Lake Texhoma, Univ. of Oklahoma Biol. Station, Goodman 5758 (GH, KANU, OKL, SMU, UC); E side of Lake Texhoma in Fobb Bottom Unit of Lake Texhoma Public Hunting Area, Tyrl & Estes 65 (OKL); sandy margin of Lake Texhoma, OK. Univ. Biol. Station, Willis, Schaefer 386 (KSC).
Monograph of *Diplachne* (Poaceae, Chloridoideae, Cynodonteae)

Monograph of Diplachne (Poaceae, Chloridoideae, Cynodonteae)

67


Figures 7–8


**Fetuca glyceroides** Steud., Bot. Berberid. Amer. Austral. 56. 1857. Nom. nud. **Type.** PERU.


404 (lectotype, here designated, NY [00019497]); isolectotypes: GH [00062450]!, US, fragment ex GH [00386253]!.


Diplachne festuciformis H. Scholz, Willdenowia 11(1): 98. 1981. Type. LIBYA. C Riceri & CH Steinberg 129 (holotype: FI!).

**Type.** MEXICO. Haenke 101 (lectotype, designated by Snow [Novon 8: 79. 1998]: PR!; isolectotypes: LE, W [0028807]!, US, fragment [00513245]!).

**Description.** Plants annual (or sometimes weakly perennial in regions with infrequent freezing). Culms (15–) 25–110 cm tall, 2.0–5.0 mm wide at base, round, erect, ascending, often branching; nodes glabrous; internodes 2–11 cm long, soft, hollow. Leaf sheaths longer or shorter than the internodes, often flattened below, glabrous on sides and margins; ligules 5–8 mm long; blades (2–)5–37 cm long, 2.0–5.5 mm wide, linear, usually densely scabrous above, sparsely to densely scabrous below. Panicles 10–57 ×(0.5–) 3–18 cm, branches (3–)10–60 and most or all exserted at maturity; branches (0.3–)2–11 cm long, mostly alternate along the rachis, ascending to stiff or slightly flexuous, minutely scabrous, axils glabrous. Spikelets 5–10 mm long, rarely distant to normally imbricate (sometimes tightly so); florets (3–)6–10; calyx sparsely sericeous; lower glumes 1.0–2.6 mm long, narrowly triangular, narrowly ovate, or ovate, glabrous or scabrous on midnerve, acute to aristate or mucronate; upper glumes 1.8–2.8 mm long, obovate to widely ovate, glabrous or scabrous on midnerve, obtuse, acute, or rarely mucronate; lemmas 2.0–3.6 mm long, ovate or elliptic, light brown to very dark green or somewhat plumbeous, lateral nerves more or less prominent and generally extending to edges, sparsely sericeous below on lateral nerves and often midnerves, glabrous between nerves, apex broadly acute, more commonly obtuse to truncate, sometimes bifid or mucronate; paleas subequal or slightly longer than lemma, elliptic, sericeous along nerves; apex obtuse. Stamens 3; anthers 0.4–1.0 mm long, yellow. Caryopses 1.0–1.5 mm long, 0.7–0.8 mm wide, elliptic, ovate, or obovate in hilar profile, transversely elliptic in transverse section, hilar groove lacking, smooth or slightly rugose, brown; pericarp weakly adnate to endosperm.

**Leaf anatomy.** As reported above for *D. fusca* subsp. *fascicularis*. (Vouchers [at MO]: Snow 5916–F [USA]; Snow & Simon 7387 [Australia].)

**Stem anatomy.** Internodes hollow. Inner sclerenchymatous ring present. Peripheral sclerenchymatous girders connected to the outermost vascular bundles present or absent. Intervascular peripheral scler-
Figure 7. Spikelets of *Diplachne fusca* subspecies *uninervia*. The dark olive-green or often plumbeous color of spikelets is common for this subspecies, but rarely occurs in its Neotropical counterpart *D. f.* subsp. *fascicularis*. Photo with permission by Anthony Valois, Santa Monica Mountains National Recreation Area, California (no voucher).

renchymatous pillars not associated with outermost vascular bundles absent. Inner sclerenchymatous ring canal tissue absent. Kranz sheath cells present. Kranz sheath cell canal tissue absent or present. Vascular bundles nested in outer portion of Kranz sheath cell canals not applicable. Sclerenchymatous rings surrounding vascular bundles located inside inner sclerenchymatous ring absent. Sclerenchymatous rings (5–10 cells thick) surrounding outermost primary vascular bundles absent.

**Chromosome number.** *n*=10 (Gould 1958); 2*n*=20 (Gould 1958, 1968).

**Phenology.** Flowering throughout the year in both Northern and Southern hemispheres as limited by cold or moisture availability.

**Distribution.** The native and non-native distributions of *Diplachne fusca* subsp. *uninervia* are uncertain, particularly regarding the southwestern USA west of Texas and east of the Mississippi River (but excluding Florida), where it is considered to be non-native based on relatively few older collections (early 20th Century or earlier). In contrast, the occurrences north of Virginia are certainly all non-native. Given its greater abundance in parts of the USA, México and South America (e.g. Argentina, Paraguay), it is hypothesised that this taxon is an amphitropical disjunct, although it was not reported as such previously (Peterson et al. 2007). **Native:** In the New World mostly south of Latitude 37°N, south to Argentina, occasionally adventive in Old World; open mesic areas, agricultural lands, saline flats, mangrove swamps. Elevation
Figure 8. Cross section of leaf of Diplache fusca subsp. uninervia (Snow 5916-F) displaying nearly identical midrib anatomy as that of subspecies muelleri (see Fig. 4).


Conservation status. Least Concern (IUCN 2012) given its wide distribution.

Etymology. Uninervia, meaning one-nerved, may be a reference to the prominent nerve on the glumes.


Comments. Diplache fusca subsp. uninervia has a greater tendency to become invasive and weedy compared to other taxa in the genus (Snow and Simon 1999; Perez et al. 2010).

The panicle of D. f. subsp. uninervia generally is completely exerted and (typically) narrowly elliptic to elliptic in profile. Some specimens from Arizona and California have highly contracted panicles with erect branches (Peebles & Harrison 5063 [US]; Lemmon & Lemmon 360 [UC]). However, most others have more open and diffuse pani-
cles (Pedersen 4071 [MO]; Guaglianone et al. 358 [SI]; Snow 6598 [MEXU, MO]). The often truncate (or sub-truncate) and frequently mucronate apex of the lemma and smoky white glumes can make this subspecies appear similar to the southern African form some have called *D. cuspidata* (e.g. Geiss & Van der Walt 12632 [M, MO]; see Gibbs Russell et al. 1991), which the authors include as a synonym of *D. f. subsp. fusca*.

The report of *D. fusca* from the Canary Islands (Scholz and Böcker 1996) applies to *D. f. subsp. uninervia*.

Rusts can cause abnormal expansion of florets in South American specimens (Jörgensen 2445 [SI]; Krapovickas et al. 18507 [P, UC]; Hartley SH126 [US]; Stuckert 18787 [MO, NY, W]).

Monograph of Diplachne (Poaceae, Chloridoideae, Cynodonteae) 73

Australia: 123 km S of Mt. Augustus station on Landor/Mt. Augustus Rd at Landor Ck, Peterson et al. 14375 (K, MO, NY, RSA, US); Tank near Milbhillillie H/S, Craven 5383 (CANB, MO); Kimberley Research Stn., Kununurra, Parker 471 (BRI); Carawine Gorge, ca. 140 km SE of Shay Gap, Newbey 10463 (CANB); Corong Ck., Woodstock Stn., S of Port Hedland, Burbidge 5845 (CANB); Dept. of Agric. Exper. Farm, Kununurra, Gilbey s.n. (CANB). Belize. The Fort Belize, Smart 46 (US). Bolivia. Cochabamba: Prov. Cercado, City of Cochabamba, the NW shore of Laguna Alalay, Ritter 745 (NHA); Cochabamba, Steinbach 8746 (MO, NY); San Pedro, San Pedro, Sahonero 19 (MO); LA PAZ: Colcapirhua (Cochabamba) a 7 kms, Adolfo 155 (US); Punta–Cochabamba, Spiaggi 39 (US). Brazil. Amapá: Rio Araguari, entre Apurema e Uruguaína, Black & Froes 51–12376 (US); São Joaquim, Black & Lobato 50–9399 (US). Mato Grosso do Sul: Faz. Bodoquena, Carandazal, Mun. de Corumbá, Allem et al. 2197 (MO). Pará: Fazenda Camburupy, near Soure, Isla de Marajó, Swallen 4926 (US); Marajó Island, Estate “Gavinho”, Goeldi 173 (KSC, NY, US, W). Rio Grande do Norte: Angicos, Swallen 4704 (BA). Canary Islands. Gran Canaria, Wasserstellen im Barranco de Maspalomas nähe der Meeresmündung bei El Oasis, Scholz s.n. (B). Chile. Atacama: Pica, Pérez 20596 (US). Tacna: Tacna, Werdermann 735 (BA, GH, LIL, MO, NY, UC, US); desert of Arica, Skottsberg & Skottsberg 1103 (NY). Tapatapa: Ab loco, Phillippi 3 (US) and Philippi 1888 (W); Arica, Jaffuel 1606 (BA); Valle de Lluta, Arica, Pfister 9488 (US); Iquique, Barros 716 (BA); [collected from] ca. 1/2 mi. S of Victoria, Salar del Sul, Norte Grande [raised from seed at Environm. Res. Lab, Tucson], Yensen NPY800428-16 (ARIZ). China. Hong Kong: Castle Peak, China Light Ash Lagoon, Hu & But 22508 (A); Hong Kong, Castle Peak, Power Station, Hu & But 22229 (A, MO). Colombia. Atlántico: Entre Palmar de Varela y Ponedera, Dugand 5304 (COL, US). Magdalena: Ciénega, alrededores de Aguacoca, Romero–Castañeda 7268 (COL, US). Costa Rica. Guanacaste: ca. 1 km E of Rio Tempisque ferry, Crow 6110 (MO, RSA). Cuba. Oriente: Near Novaliches Stn, S of Guantánamo, Hioram 1359 (US); Estación de Novaliche, Guantánamo, Hioram 2166 (GH, NY, US). Diego Garcia: Grass in coral sand quarry east of runway, Whistler 9775 (US); in clearing, Field 112 (K). Ecuador. Guayas: Guayaquil, near the cement mill, Asplund 7695 (NY, P); Guayaquil, wet clayey ground, Asplund 15991 (NY). Egypt. 166 km from Cairo on the desert road to Alexandria, Amin et al. s.n. (H, K, MO); Rice cultivation at Mut, Dakhla Oasis, El Hadidi 623 (K, MO). Honduras. Choluteca: 2 km NO San Bernardo, Repulski 503 (MO). Jamaica. Hills W of Great salt Ponds, Orcutt 6470 (UC); Port Henderson, Ridley 132 (US); Salt ponds, Harris 12309 (BISH, NY). Jordan. Wádi Araba, 50 km S of Ghor Safi, 5–8 km E of the main road to Aqaba, along the lane to Ammarien and Sadien tribes farm, Al–Eisawi 2429 (BM). México. Baja California Norte: Mpio. de Ensenada, 3 km N of Maneadero, Moran 24517 (ENCB); Adobe flat in La Mesa, SE of Tijuana, Moran 18568 (ENCB); Mpio. de Mexicali, ca. 0.3 km S from Prese Morelos, Felger 06-17 et al. (ARIZ); Mpio. de Mexicali, Lower Río Colorado valley, adjacent to irrigated agriculture, Felger 06-38 et al. (ARIZ); Along draw, Chase 5518 (US); Canyon de Guadalupe, Thorne et al. 61679 (RSA); Punta Banda, SW of Ensenada, Beetle M–2825 (RSA) Entrance to San
Carlos Canyon S of Ensenada, Beetle & Alcaraz M-6598 (ARIZ). Baja California Sur: Banks of Rio Colorado below Yuma, MacDougall s.n. (NY); Río Comondú, along road to Comondú, 14.25 road mi. NE of E. Francisco Villa, Baker 8740 & Johnson (ARIZ); La Paz, Palmer 134 (GH, NY, UC); El Centenario, 10 km al SW de La Paz, Domínguez L. 381 (ARIZ); Sandy beach near El Centenario, W of La Paz, Reeder & Reeder 6732 (ARIZ, ENCB); Quitovac between Sonoyta & Caborca, Nabhan 161 (ARIZ); Villa Ignacio Zaragoza, ca. 10 km NW of Ciudad Insurgentes, Snow 6484 & Prinzie (MEXU, MO); N of Villa Constitucion, 20 km E of Insurgentes, Beetle M-2477 (MO); Arroyo de San Raymondo, 78 km NW of La Purísima, Carter et al. 2501 (MEXU, UC, US); San José del Cabo, Purpus 312 (MO, UC, US); Vicinity of San Jose del Cabo, Wiggins 5685B (US). Chiapas: Mpio. Tonalá, E shor of Mar Muerto, N of Paredón, Breedlove & Thorne 20834 (DS, ENCB, MEXU, MICH, MO, NY, RSA); Mpio. Tonalá, NW of Puerto Arista, mangroves behind sand dunes, Breedlove & Davidse 54224 (CAS, MO, NY); Mpio. of Tonalá, mangroves behind sand dunes NW of Puerto Arista, Breedlove 52842 (CAS, MO). Chihuahua: Cerca del rio, Pringle 438 (MEXU). Guanajuato: Irapuato, Hitchcock 7432 (US). Guerrero: Coyuca, Hinton et al. 5543 (MEXU, MO, NY, US). Jalisco: 2 km al N de El Palo Blanco, ejido el Limón, Santana M. 8283 et al. (BRIT); 8 km al S de Acatlan de Juárez, Rzedowski 14516 (ENCB); Rio Blanco, Palmer 331 (GH, MO, NY, US); 9 mi. N of Zocoalco, by the road towards Acatlan, Dorado et al. 1676b (RSA); Laguna de Zacoalco, Díaz Luna 1063 (ENCB, RSA); Lagoon SW of Guadalajara, 20 km despues de Calera, Beetle M-5313 & Guzman M (ARIZ). Morelos: Mpio. Tlaquiltenango, Lagunillas a la altura del Terraplen, Vasquez 660 (ARIZ, NY). Nayarit: Matachen, beyond the point S of San Blas, McVaugh 19450 (MICH, n.v., US). Oaxaca: N of Tuxtepec, Nelson 367 (US). Sinaloa: 14.9 road mi. S of border of Sonora along Hwy 15, Snow 6527 & Prinzie (KSP, MO, MU); Headwaters of the Mazatlan Riv., Wright 1317a (US); Vicinity of Mazatlán, about a salt marsh, Rose et al. 14108 (NY, US). Puebla: Mpio. de Tehuacán, Tehuacán, NW side of town near the highway to Puebla, Steinmann & Steinmann 2401 (ARIZ). México: 10.5 mi. N of Aculco on Hwy 55 towards San Juan Del Río, Peterson 21305, Saarea & Flores Villegas 21305 (US). Sonora: Sonoyta, northwest side of town ca. 0.5 mi. south of river, Felger 86-402A & Joseph (ARIZ); Quitovac between Sonoyta aand Caborca, Nabhan 161 (ARIZ); Presa Derivadora, on Rio Santo at NE side of town of Sonohyta, Felger 86-297 & Leigh (ARIZ); ca. 3.5 km E of village of Tastiota, Bun nell et al. 20891 (ARIZ); 2.3 mi. on Sonora Hwy 24 N of El Sahuaral, Felger 86-27 & Straub (ARIZ); Mpio. de Pitiquito: Pozo Coyote, small ranch ca. 10 km northwards from El Desemboque along the Arroyo San Ignacio, Felger 83-104 et al. (ARIZ); 3 km E of Puerto Peñasco, empty lot between beach houses, Felger 85-800 (ARIZ); ca. 10 mi. W of Sonoyta on Mex Hwy 2, Felger 20594 et al. (ARIZ); Rio Sonoyta, ca. 1.6 km SSW of Quitobaquito, Felger 89-34 & Broyles (ARIZ); Río Sonoyta 21 km on Mex 2 W of Sonoyta, at ca. 1 km W of Quitobaquito and ca. 1 km S of highway, Felger 85-972 & Van Houten (ARIZ); Río Sonoyta at Sonoyta, Felger 85-708 & Dimmitt (ARIZ); Rio Magdalena at Tumutama road in Magdalena, Reina G. 2001-602 et al. (ARIZ); Cienega de Santa Clara, delta region of
Rio Colorado, 7.7 mi. along canal road SW of El Golfo-San Luis Hwy, Felger 92-524 et al. (ARIZ); 18 km S of San Luis Río Colorado on road to El Golfo, Felger 85-1042 & Van Houten (ARIZ); San Luis Río Colorado, W side of the city, on the east bank of the Río Colorado, Felger 93-204 & Ortiz Reyna (ARIZ); ca. 2 km NW of Condominios Pilar at ca. 0.5 km W of Estero Soldado, vicinity of Bahía San Carlos, Felger 84-522 (ARIZ); Intersection of Hwys 15 and 128, ca. 25 road mi. W of Navojoa, Snow 6598 (MEXU, MO); Mpio. de Yecora, El Llano de Curea, Reina 2004-539 (ARIZ); 2 mi. NW of Sahural, between Guaymas and Kino Bay, Spellenberg 4603 (NMC, NY); Yaqui Riv., Palmer 5 (MO, US); SE of Guaymas, along Hwy 15, ca. 100 m S of km 82 signpost, Snow 6567 & Prinzie (MEXU, MO); Along Hwy 14 leading NE out of Hermosillo, ca. 37.5 km SW of Ures, Snow 6568 & Prinzie (MEXU, MO); Hermosillo, Hitchcock 3577 (US); 2.3 mi. on Son. Hwy 24 N of El Sahuaral, Felger and Straub 86-27 (MICH). Tamaulipas, km 25 al S de la playa Lauro Villar, Baro 253 (MO); Mpio. Valle Hermoso, “Distrito 025”, Mora–Olivo 5182 (MO); Mpio. González Manuel, Villega–López 271 (MO). Veracruz: Near Ebano, banks of Panuco, LeSueur 662 (ARIZ); Mpio. Panuco, Laguna de Tamos, sobre la carretera Tampico–Panuco, Calzada & Marquez 4503 (ARIZ, ENCB). New Zealand. Waikato: Thames, Walker 25084 (US). Nicaragua. Managua: S shore of Lago de Managua, ca. km 31 on Carretera Nueva a Leon, near Piedras Azules, Stevens 13157 (CM, MO). Paraguay. Boqueron: Estancia Primavera, Ramírez 25 (BAA); Isla Poi, Col. Menno, Laguna Captian, Vanni et al. 2036 (MO); Col. Fernheim, Ea. Laguna Porá, Vanni et al. 2580 (GH, MO); Ruta Trans Chaco, en préstamos al lado del camino con agua semi–permanente, Schinini & Palacios 25800 (MO); Puerto Casado, Rojas 2305 (US); Puerto Casado, Rojas 8783 (US); FC Casado km 10, Rosengurtt B–5852 (K, SI); Puerto Casado, Hartley SH126 (US); Puerto Casado and vicinity, near Estancia “Guajhó”, Pedersen 4071 (MO). Chaco: Loma Clavel, Hassler 2461 (GH, K, MO, NY, P, UC, W); Puerto Guarani, Rojas 13594 (NY); Estancia Gustafson, Rosengurtt B–5481 (K, US); Dpto. General Pacheco, Partido de Pilar, en el bañado del Río “Las Conchas”, Krapovickas 2723 (SMU, US); Al S de Villa Hayes, Rosengurtt B–5622 (US). Presidente Hayes: Pilcomayo Riv., Morong 981 (GH, MO, NY, UC, US); Concepción – Pozo Colorado, Zardini and Guerrero 37529 (MO). Peru. Ancash: Prov. Santa, Pampa la Grama, Aguilar s.n. (MO 2995176). Arequipa: 15 km W of Arequipa on Hwy to jct. with Pan America, SW of Puente Uchumayo, Peterson et al. 20786 (K, US); Carmana–Calderona, Anderson 833 (US); Camana, Anderson 823 (US). Cajamarca: Prov. Pacasmayo, Dpto. La Libertad, en el desvío de la carretera a Cajamarca, sobre la Panamericana, Sánchez 2988 (MO). Prov. San Miguel, a 3 km de la localidad de Quindén, sobre la carretera a San Miguel, Sánchez 2749 (MO). Huanuco: Weed in the public garden, Macbride & Featherstone 2443 (US). Huarochiri: Dpt. Lima, San Bartolomé, Asplund 11204 (NY). Ica: Prov. Ica, Orillas de la laguna de Huachachina, Cerrate 899 (US); Río Ingenio, Angulo 2430 (NY). La Libertad: Prov. Trujillo, Haceinda Tanguchi, Angulo 1876 (US); Chicama Valley, Graywood Smyth 46 (US); Prov. Trujillo; Barraza, Sagastegui 7635 (MO); Prov. Trujillo, Hda. Santa Clara, Gagliardi 6516 (GH). Lambayeque: On E side of Chiclayo, Hudson...
927 (MO). Lima: Paramanya, Anderson 415 (US); Prov. Alrededores de La Molina, 13 km Este de Lima, Ferreyra 11113 (US); Prov. Huarochari, San Bartolomé, Asplund 11204 (US). Loreto: Maynas, Playa de Timicurillo just above (ca. 5 km) Baradero de Mazán, sandy beach of Río Amazonas, McDaniel & Rimachi 23074 (MO, US). Piura: Hacienda Buenos Aires, Anderson 573 (UC, US); Despoblado–kil 970, Anderson 931 (UC); Ab. Ico, Haught 116 (US). Rosengurtt B-7410 (BAA, P). San Jose: Barra, Herter 81619 (B, MO, UC, US). **Puerto Rico.** San Juan, vertedero area, García and Quevedo s.n. (NY); Area Vertedero, San Juan, Woodbury s.n. et al. (BRIT). **Saudi Arabia.** Eastern: Adh-Dhulayqiyah, Al-Hasa, King Faysal Univ. Res. Farm, Mandaville 7810 (BM). Northern Hijaz Region: Yanbu al-Sinaiyah, Goddard s.n. (K). Province unknown: Hofuf Agric. Res. Centre, Kasasion 1478 (BM); Riyadh, road to Hair, Collenette 4874 (K); km 106.5 on Mecca bypass, Smith 47 (K); Hofuf Agric. Res. Centre, Parker SA126 (BM). **Spain.** Parc Natural del Delta de l’Ebre, Masip s.n. (fragment, BISH). **United States of America.** Alabama: Mobile Co., SE 1.4 of NE 1/4 of Sect. 16, T4S; R2W, Univ. of South Alabama Property, Mobile, SE of Three Mile Ck., Le- long 6460 (NCU); Along US 90–98 causeway over Mobile Bay, Kral 28449 (US); By Battleship Park, along US 90–98 causeway over Mobile Bay, Kral 28449 (GA); Sandy dock area by truck bypass US 98–90 across Riv. from Mobile, Kral 56599 (GA, MO). Arizona: Cochise Co., Chiricahua Mts., Lemmon & Lemmon 360 (UC); Wilcox, Thornber s.n. (ARIZ 147339). Gila Co., Tonto National Forest, Mazatal Mts, Mt. Ord, 1.0 mi. E of Beeline Hwy (SR 87) along FR 626, Gutierrez 1497 (ASU, UTEP). Graham Co., Clifton, Davidson 261 (RSA); 16 km S of Safford on US Hwy 66, Reeder & Reeder 7297 (ARIZ); ca. 2 mi. E of Solomon along US-70, Reeder & Reeder 9269 (ARIZ). Maricopa Co., Hassayampa River Preserve, S end near rest area, Makings 3739 et al. (ASU); 6 mi. E of Mesa, O.S. Stapley Ranch, McClellan & Stitt 555 (ASU); Tonto National Forest, Superstition Wilderness Area, Tortilla Trailhead, E of Tortilla Flat Post Office ca. 6 mi. on Hwy 88, Rice 1348 & Imdorf (ARIZ, ASU); Tonto National Forest, Verde River, ca. 5 mi.below Bartlett Dam, Landrum 9799 et al. (ASU); Scottsdale, Blakley & McCleary B755 (ASU); Lake Pleasant, Pinkava s.n. (ASU 70803); Sierra Estrella Regional Park, Salt River Bed near park entrance, Sundell & Sundell 349 (ASU); Gila Riv. below Salt Riv. confluence, Marler 2204 (ASU); Rio Salado between junctions of Interstate 10 and 7th Ave., Damrel 1958-B & Pacheco (ASU); Salt River at Central Ave., Makings 3679 & Butler (ASU); Salt River at 115th Ave., Rea 853 (ARIZ); Along I-8, ca. 10 mi. W of Gila Bend, Tieret & Brandenburg 53036 (OKL); East of intersection of Avondale Rd. and the Salt River in Tres Rios wetlands, Wolkis 108 et al. (ASU); Mormon Flats Dam, Goodding 2494 (ARIZ); Papago Park, Pinkava & Lehto 6701 (ASU); NW Phoenix, Wilson 3815 (KSTC); Papago Park, Phoenix, Lehr & Weber 1103 (NY); near Phoenix, Orcutt 2518 (US); Biltmore Golf Course, Featherly s.n. (KANU 187777; OKLA 13739); Vicinity of Tempe, Gillespie 8400 (US); Phoenix, Williams 3032 (US); ibid., Griffiths 5891 (US); 11 mi.E of Gila Bend, Wolf 2310 (POM, RSA); Lower Dripping Springs Canyon area, White Tank Regional Park, Keil 6230 (ASU); Riverbed near Phoenix International Raceway, Keil 874 (ASU 70718); Tempe, Judd s.n. (ASU 70720 & ASU 70721);
Tempe, Rural Rd. & S.P. railroad tracks, Lehto 1955 (ASU); Tempe, Double Buttes, Keil 874 & Lehto 874 (ASU 70802); ASU Campus, south of Saguaro Hall, Damrel 1094 (ASU); Gilbert, Riparian Preserve at Water Ranch, between Pond #3 and Pond #2 along Whistling Duck Way, Gutierrez 2047 (ARIZ, ASU); Gilbert, near corner of Greenfield and Chandler Heights roads, Landrum 10941 & Pinto (ASU); Tempe, growing in vacant parking lots, McLellan & Stitt 552 (GH); Tempe, McLellan & Stitt 1016 (ASU); 11 mi. E of Gila Bend, Wolf 2310 (GH); Barry M. Goldwater Airforce Range, Sand Tank Mts, Bender Srping, Felger 95-426 et al. (ARIZ, ASU); Palo Verde, ca. 1 mi. S of Wintersburg, Lehto & Crandell 21 (CM); Palo Verde, end of Palo Verde Rd. on N side of Gila River bottom, Landrum 9500 et al. (ASU); ca. 95 to ca. 105 Ave and Gila River, Schuessler & Lehto 17987 (ASU). Mohave Co., Lake Havasu at Toprock, Hevly s.n. et al. (ARIZ 139296). Pima Co., Sabino Canyon, Santa Catalina Mts., Gould 4631 (ARIZ, UC, US); West Branch of the Santa Cruz (Riv.), Church Wash diversion, Mauz 22-024 (ARIZ); Along the Church Wash diversion, Mauz 21- 67 (ARIZ); Coyote Mtns, Mendoza Canyon, Reeder & Toolin 8389 (ARIZ). Pinal Co., E of Maricopa, Rossbach 5203 (UC); 3 mi. W of Coolidge, Parker 8261 (RSA, US); Experimental Farm, Sacaton, Peebles 76 et al. (ARIZ); Along AZ-287, ca. 6.5 km W of Florence, Reeder & Reeder 9388 (ARIZ); Picacho Mtns, Wiens 2005-028 (ARIZ); Coolidge, Goodding 101-41 (ASU). Yuma Co., Yuma, Vasey 540 (P, US); Yuma, Silveus 7640 (SMU); 8.6 mi. SW of Hope, Ahles 8899 (MO); Frontage Rd S of Interstate Hwy 8, 1 road mi. W of Aztec, Yatskievych 81-132 (ARIZ); Colorado Riv. bottom near Yuma, Peebles & Harrison 5063 (US); ca. 2 km N of Laguna Dam; Pratt Agr. Lease to BLM, Felger 06-51A et al. (ASU, TEX); Dome Valley, dirt road at Gila Riv. crossing, 0.3 mi. W of Avenue 19E and County 8th Street, Felger 06-61 et al. (ARIZ, ASU); Centennial Wash, 2 mi. SE of Salome near Buckeye-Salome Rd., Butterwick & Hillyard 6392 (ASU); Fortuna Pond, 32°43’25.6"N, 114°27’14.2"W, Felger 06-55 et al. (ASU); Lower Colorado Riv., Dunfee YLD-39 et al. (ASU); Cibola National Wildlife Refuge, G & SR Meridian, Dodson 16 (ASU). Arkansas. Lafayette Co., Sandy bank of Red Riv. at Spring Ck. Ferry on Ark. 160 W of Gin City and Bradley, Thomas & Thomas 120762 (NY). Lawrence Co., 4 mi. SW of Hoxie, Taylor s.n. (BRIT). California: County unknown: Salto Basin, MacDougal 50 (ARIZ). Escondido Co., Park Lawn, Escondido, Gander 4689 (US). Fresno Co., Selma, currently undeveloped area S of Dinuba Avenue and east of Thomason Avenue, in Young Pond, Snow & Clark 9973 (GREE). Imperial Co., Between Brawley and Westmoreland, Sanders et al. 8746 (RSA); Holtville, 15 ft. below sea level, Parish 8243 (RSA, US); Palo Verde Valley, 5 airline mi. S of Palo Verde, Holmgren and Holmgren 6502 (NY); near Ranger Station, Picacho State Rec. Area, 22 air mi. N of Yuma, McLaughlin 2723 & Bowers (ARIZ); Along Colorado River, Quechan Indian Reservation, McLaughlin 3231 & Bowers (ARIZ); Along CA-115 ca. 2 km NW of exit from I-8 E of Holtville, Reeder & Reeder 8157 (ARIZ, ASU); 6.5 km NW of Niland, Reeder & Reeder 8244 (ARIZ, ASU); 1.3 mi. N of Laguna Dam along Hwy S24, McLaughlin 2854 & Bowers (ARIZ); Roadside near Niland, Barr 67-203 (ARIZ); Ferguson Lake, Imperial Nat. Wildl. Ref., McMurry 1407 (ARIZ). Inyo Co., Cow Ck., Gioman 431 (RSA). Kern
Monograph of Diplachne (Poaceae, Chloridoideae, Cynodonteae)

Co., ca. 6 mi. N of Bakersfield, Nobs and Smith 469 (FSU); Rosedale, Abrams s.n. (RSA); Section 20, 5–10 mi. NW of Wasco, Braun 8 (CM). Los Angeles Co., W. Adams St., Los Angeles, Davidson 247 (KSC); E end of Malibu Lake, Raven & Thompson 14641 (GH, RSA); San Gabriel Mts. West Fork San Gabriel Riv., ¼ mi. westerly from confluence with North Fork, Wheeler 6331 (ARIZ); San Dimas Canyon Dam, San Gabriel Mts., Wheeler 2339 (RSA); Saline flats, Hasse s.n. (MO 768959); Whittier Hills (Puente Hills, pro parte), seepage ca. 300 ft SW of Colima Rd x Camino del Sur, Ross 4168 (NY, RSA, UC). Merced Co., Big Water Club, E of Gustine, Nobs & Smith 136 (POM); Whittier Hills (Puente Hills, pro parte), 300 ft. SW of Loima Rod x Camino del Sur, Ross 4168 (ARIZ); Los Banos Wildlife Refuge, 1.5 N of Los Banos, Nobs & Smith 48 (ARIZ). Orange Co., Roadside drainage gutter, along W side of village of Atwood, Wiggins 20336 (RSA); from Back Bay area at Newport Beach, Sawyer 34 (ASU). Riverside Co., Vail Lake area, Temecula Ck. at confluence with lake and sedimentary hills to the east, Boyd & Ross 3801 (MO, RSA); 2 mi. N of Indio, Nobs & Smith 494 (ARIZ); Hemet, Bautista creek Ranches, 45200 Bautista Rd, near Fairview Ave., Lahti s.n. (MU); NW Palomar Mts., Agua Tibia Mts, Along lower Arroyo Seco, S of Dripping Springs Campground, Banks 0808 & Boyd (MU). Coachella, Salton Basin, Reed 4201 (US); N end of Lake Elsinore, Munz and Johnston 11242 (GH, NY, RSA); Batista Canyon Wash, entering San Jacinto Riv. (Wash), just N of Cedar and Mt., NE end of Hemet, Peterson 4989 (AAU, BISH, K, MICH, MO, NY, P, RSA, TAES, UTC, GH, US, WIS); San Jacinto: 8.8 km W of State Hwy 79 on Ramona Expressway towards Lakeview, Peterson & Peterson 8123 (BISH, K, MO, NY, RSA, US); ca. 2 km S of Ripley, Reeder & Reeder 8054 (ARIZ, ASU). San Bernardino Co., San Bernardino, Wilder 1128 (US); Arrowhead Hot Sprgs, San Bernardino Mts., Sanders et al. 13792 (RSA); Loma Linda, Munz and Johnston 8904 (GH); near San Berandino, Parish 2118 (NY); near San Bernadino, Wright s.n. (ARIZ 114027). San Diego Co., Encinitas, Gander 8801 (US); San Diego, Spencer 901 (MU). Larkin's Station, Palmer 404 (MEXU, NA, NY); Irrigating canals, Calexico, Abrams 4000 (GH, MO, NY); San Mateo Canyon Wilderness Area, “Miller Canyon”, Boyd et al. 7554 (RSA). San Luis Obispo Co., Estrella Plains, Hwy US 466, 7 mi. E of Paso Robles, Twisselmann 9204 (RSA); San Luis Creek near junction of S Higuera Rd and US Hwy 101, Keil s.n. (ASU 75319). Santa Barbara Co., Roadside ditch ca. 1 mi. E of Buelton, Pollard s.n. (RSA); Iola Vista Tract, Goleta, Pollard s.n. (ARIZ 131363); Along shore of Lake Cachuma near the dam, Santa Ynez River, Smith 5664 (ARIZ). Sierra Co., Gold Lake, Barker 803 (RSA); Santa Barbara R.R. yards, Pollard s.n. (SMU). Tulare Co., Ab loxo, Twisselmann 11614 (RSA). Sutter Co., Along Nicolaus Ave., 2.2 mi. NW of the Placer Co., line, 4.4 mi. ENE of Nicolaus, Helmkamp 15559 (ARIZ). Ventura Co., Pool in Ventura Riv. near Mill School, Ventura Ave., S of Foster Park, Pollard s.n. (SMU [no accession number], US 2460463); California Prep. Schol Grounds, Ojai Valley, Pollard s.n. (ARIZ 3317); Canada Larga Creek, near Southern Pacific RR trestle, ca. 1 mi. S of Foster Park, Pollard s.n. (ARIZ 175945). San Antonio Ck. at Hermosa Rd. crossing, Ojai Valley, Pollard s.n. (MO 1970989); San Antonio Ck., between Royal Oaks Dairy and Country Club Drive, Ojai, Pollard s.n. (RSA).
Plain Dealing on LA 2, Allen & Vincent 8525 (GA). Caddo Par., Median strip of Clyde Fant Parkway, NW of Shreve City shopping centre, Shreveport, MacRoberts 1325 (ASU). Calcasieu Par., LA Hwy 14, at junction with Linkswile Rd, 2.1 mi. S of Interstate 210, in Lake Charles, Snow 5803 (MO); Near Interstate 10, Lake Charles, Lonard 2086 (KSTC, SMU). Cameron Par., Back Ridge, Sabine Nat. Wildlife Ref., Valentine s.n. (FSU 72340); Along Gulf of Mexico ca. 1 mi. W of Holly Beach, Thieret & Reese 10039 (FSU, SMU); [...] S of LA Hwys 27 and 82 just E of Holly Beach, Thomas et al. 84819 (GREE, NLU). East Baton Rouge Par., LSU Campus, N of Nicolson Extension and CEBA overflow lot, McKenzie 157 (GA, BRIT); Ben Hur Rd, ca. 200 m NE of jct with Nicholson Rd. (LA 30) in Baton Rouge, Pruski 2687 (US). Grant Par., Red Riv., ca. 0.2 mi. NE of Boyce on LA 8, Vincent 56 (GA); Red Riv. ca. 0.2 mi. NE of Boyce off LA 8, Vincent & Allen 7025 (NCU). Jefferson Par., Grand Island, Town of Grand Island, sandy saline flat, Thieret 25254 (FSU, GA, SMU). La Salle Par., ca. 10 mi. NE of Holloway, Thieret 33501 (FLAS). Livingston Par., 4.4 mi. W of Albany, Shinners 29892 (SMU). Natchitoches Par., Along N bank of Red Riv. at the LA 6 bridge between Clarence and Natchitoches, Thomas & Allen 94291 (NLU, NY); [...] S side of Red Riv. at the LA 6 bridge N of Natchitoches and Grand Ecore, Thomas 114845 (GREE, NLU) and Thomas 114846 (BRIT, FLAS, MO, MONTU, MU, NCU, NLU, NY, OKL, USCH, VPI). Orleans Par., Reclaimed sandy beach, Lake Ponchatrain, Brown 2386 (US); W side of Paris Rd. immediately S of Intracoastal Waterway, Lemaire 1100 (US); Irish Bayou, near junction of I-10 and Hwy 11, Montz 5474 (BRIT); N edge of Irish Bayou, Jctn of Hwy 11 and I-10, SE shore of Lake Ponchatrain, Urbatsch 2553 et al. (ASU). Ouachita Par., Ditch banks beside US 165, just N of Monroe, Thomas & Scurria 36887 (ARIZ, KANU, Mich, MU, NCU). Plaquemines Par., Between levee and Mississippi Riv., just E of Parish Rd. 11, 0.9 mi. from junction with LA Hwy 23, 1.8 mi. S of Port Sulphur, Snow 5789 (MO); S side of LA 39, 0.2 mi. W of the St. Bernard Par. line and 2.1 mi.E of Braithwaite, Thomas & Allen 123787 (MO, NLU, NY); Fort Jackson along the edge of the Mississippi River about 3 mi. SE of Triumph, Taylor & Taylor 21450 (BRIT). Red River Par., 1.5 mi. W of Crichton and about 9 mi. northwest of Coushatta, Peterson 9551 (BISH, K, MO, US); E bank of Red Riv. 1.5 mi. SW of Crichton, ca. 9 mi. NW of Coushatta, Thieret 20615 (A, FSU, GA, SMU, US); Along W bank of Red Riv. S of US 84 bridge at Coushatta, Thomas 114935 (MO, NLU, NY). St Charles Par., ca. 2 mi. E of Bonnet Carre Spillway along S side of IC railroad near LaBranche, Montz 5266 & Cali (BRIT). St. Landry Par., ca. 4 mi. E of P. Barre, on road to Baton Rouge, Thieret 32328 (GA, FSU, NCU); 2.5 mi. E of Port Barre, Thieret 31454 (SMU). St. Mary Parish, Cote Blanche Island, Thieret 16315 (MU). St. Tammany Par., N shore of Lake Ponchatrain near the mouth of the Techfunte River ca. 1 mi. S of Madisonville, Allen 2921 (BRIT, MU). Tensas Par., [...] west bank of the Mississippi Riv. S of the end of LA Hwy 3078 at Port Gibson Ferry, N of St. Joseph, Thomas 86789 (GREE, NLU). Vermilion Par., Along railroad tracks W of LA 82 and S of LA 14 in Abbeville, Thomas 122365 (NLU, NY). West Feliciana Par., Roadbank of LA Hwy 10 ca. 1.4 mi. E of US Hwy 61 and St. Francisville, Thomas 118023 (GREE, NLU). Mississippi. Hancock Co., Miss. Test
Facility (NASA) Rogers et al. 3996–a (SMU) and 3996–b (NCU) and 3996–c (MO).

Harrison Co., ca. 4 mi. N of Biloxi along Hwy to Hattiesburg, Lasseigne 2811 (MO);
NE Biloxi, Lasseigne 2852 (MO); Biloxi, along beach, Rogers 3439-b (NCU). Jackson
Co., At I–10, ca. 1.5 mi. W of Alabama State Line, Brooks & McDaniel 530 (FSU).

Pearl River Co. Picayune, railroad yard and adjacent places, Rogers 8393 (NCU). Mis-
souri. St. Louis Co., right-of-way of the Missouri Pacific Railroad, S of Loughborough
St., Mühlenbach 3910 (MO); Lesperance Street Freigh Yard of the Missouri-Pacific
R.R., Central switching tracks, Mühlenbach 2407 (ARIZ). New Jersey. Camden Co.,

Sandoval Co., Low Roadside, along NM 44, ca. 23 mi. NW of Bernalillo, Henderson
69–352 (USCH). Nevada. Clark Co. Logadale, State Rte. 169 and Whipple Avenue,
Gregor 48 (NY); Intersection of Washington and 23rd St., Las Vegas, along drainage
ditch at Fremont and Jones, Bostick 3561 (ARIZ); Las Vegas, Hogan 8 (ARIZ); Las

Vegas, Lake Mead Blvd., 120 m SE of the intersection of Ranch Rd., Lathrop P–8
(NY); Nevada Test Site, Amargosa Drainage Basin, E of Spring Meadows Farm Hdqtrs,
Beatley 13450 (US); Lake Mead, Tilley et al. 1605 (BRY). North Carolina. Guilford
Co., West Greensboro, Blomquist 328 (US); W of Greensboro, Blomquist 799 (GH).

Orange Co., Soil Conservation Service Nusery, Chapel Hill, Mathews B9#32 (NCU).

Oklahoma. Cleveland Co., Near Canadian River S of Hwy 9 off Jenkins St in T8N
R8W Sec. 8, Burgess & Larsen 32 (OKL); Canadian River bed, Ten Mile Flats, Law-
son & Goodman 609 (OKL); S of Norman near Canadian River at the old municipal
landfill, Burgess s.n. (OKL [01-0093243]). Hughes Co., Roadside, 4 mi. SE of Hold-
enville, Dossett 38 (OKLA). Jefferson Co., Waurika, south side of Hwy 79 bridge at
the Red River Crossing, Hoagland et al. BLM0464 (OKL). Love Co., Shoreline on N
arm of Hickory Creek, Lake Texhoma, E of Marietta, Harris s.n. (OKLA, SMU);
Branch of Lake Texoma called Wilson Creek, ca. 10.8 mi. NW of Marietta, Taylor &
Taylor 26010 (BRIT). Pawnee Co., On sand bar in Arkansas Riv., 200 yards N of OK
Hwy 18 at bridge at Ralston, Tyrl & McDonald 732 (MO, OKLA). Waggoner Co., 5
mi. N of Muskogee along Arkansas River, Kelting s.n. (OKL [01-0072347]). Washin-
gton Co., 0.5 mi. and 2.2 mi. E of Ramona, McDonald 1029 (OKLA). Oregon. Polk
Co., ca. 2 mi. N of Monmouth along Hwy 99W, Halse 2330 (NCU); ca. 2 mi. N of
Monmouth along Hwy 99W (as weed in greenhouse), Halse 2330 (ARIZ). South

Carolina. Berkeley Co., Waste ground around the Santee Wool Combing Mill, Jame-
town on SC Rt. 45, Ahles & Haesloop 47009 (NCU) and Ahles & Haesloop 42992
(NCU) and Ahles & Haesloop 38180 (NCU) and Ahles & Haesloop 35618 (NCU)
and Ahles & Haesloop 53794 (NCU). Charleston Co., Hydrologic Spoil Area along
W bank of Clouter Ck., Charleston Harbor, Porcher s.n. (NCU). Florence Co., Well-
man Wool Combing Mill, N of Johnsonville on SC Rt. 41, Ahles & Haesloop 49154
(NCU) and Ahles & Haesloop 46951 (NCU) and Ahles & Haesloop 42896 (NCU).

Georgetown Co., Just N of roadbed of old bridge over Great Pee Dee Riv., N side of existing US 17,
Waccamaw Point at upper end of Winyah Bay, E side of Georgetown, Nelson & Horn
14619 (GA, USCH). Tennessee. Davidson Co., Weedy on drawdown of borrow pit by
Cumberland River, Metro Center, Nashville, Kral 73090 (APSC). Leon Co., Vicinity
of crossing of Centerville Rd. over Interstate 10, Godfrey 72336 (NCU). Shelby Co., Hwy 78 S of Memphis at right across bridge at Drainage Canal, Rogers 33505 (GH). Rutherford Co., Railroad yards by Farmer’s Coop, Luvergne [La vernge], Kral 74564 (APSC). Texas. Aransas Co., Rockport, Reverchon 1993 (MO). Brazos Co., Next to Agronomy greenhouses, Texas A & M Univ. campus, Snow & Jensen 184 (TAES); 3 mi. S of Bryan, Ward 165 (OKLA). Brewster Co., Along Rio Grande near mouth of Tornillo Ck., Sperry 1537 (US); bank of Rio Grande at Ogle Spring, Sperry 1348 (US); along Rio Grande nera Mariscal Canyon, Warnock 811 (GH, US); Mariscal Canyon, Chisos Mt. area, Warnock 811 (ARIZ); Boquillas-Chisos Mts, Marsh 140 (SMU); near the Rio Grande, Hot Springs, Big Bend National Park, Goodman & Waterfall 4600 (OKL). Cameron Co., 15 mi.W of Boca Chica along Hwy 14, Anderson 4551 (RSA); Between Tex. Hwy 4 and the beach of Brazos Island, Henderson 78–22 (MO, USCH); 7.3 mi. S of Ed Carey Blvd of Harlingen along US Hwy 83, Snow 5907 (KSP, US); Brownsville, Benke 5328 (US); Brownsville, Silveus 2565 (SMU); Resaca park, near the girl scouts camp, Runyon 2172 (US); Padre Island, 5 km NE of Port Isabel and across from the Sunchase Mall and McDonalds, Peterson et al. 11157 (BISH, US). Chambers Co., Along brackish swale just off High Island, Gould 7442 (SM, UC); Along entrance to Anahuauc Nat. Wildl. Ref., Kessler 5894 (BRIT). Culberson Co., South McKittrick Canyon, Guadalupe Mts., 5 mi. N of Pine Springs, Fischer s.n. (OKLA; OK-13738). Galveston Co., 13 mi.N of Galveston, Gould 11984 (UC, US); Near plant entrance P. H. Robinson Generating Station near Bacliff, Waller 2604 (GH, MO); Tidal flats beneath SH 146 drawbridge over Clear Ck. channel at Kemah, Waller 2607 (GH); West beach in Galveston, ca. 200 m from Gulf of Mexico, Kessler 5603 (BRIT); Coastal marsh at Texas City, Van Devender & Van Devender 88-262 (ARIZ). Harris Co., Morgans Point, Palmer 11963 (UC); Houston, Fisher s.n. (ARIZ 147207); Near the Houston Ship Channel in the San Jacinto State Park, Brown 2557 (ARIZ); East side of Houston, Thieret 30813 (SMU). Hidalgo Co., East of Mission, Coover 1336 (ARIZ); Alamo, Clover 918 (MICH); Anzalduas County Park, ca. 2.7 mi.W of Mission, ca. 5 mi. W of McAllen, Snow 5906 (KSP, MO); ca. 1.4 mi. E of US Hwy 281 on Rd. 490, Snow & Evans 4393 (GREE, RM); [...] FM Rd. 2062 just N of Bensten State Park and W of Mission, Thomas et al. 39476 (GREE). Jefferson Co., Coastal marsh, Tharp s.n. (GH). Jim Wells, Co., Along US Hwy 281 ca. 35 air mi.WSW of Corpus Cristi, ca. 4.5 mi. N of Premont, Snow 5897 (KSP, MO). Kenedy Co., Sarita, Hitchcock 5447 (US); Sarita, Hitchcock 5463 (US); Alazan Well on Payne Ranch (Julian Quadrangle), Carr 20282 et al. (BRIT); 0.5 mi. S of Sarita in drainage between divided Hwy 77, Peterson 9555 (BISH, GH, K, MO, NY, P, RSA, TAES, US, UTC); Near Las Norias, Runyon 3829 (RSA). Kleberg Co., Banks of Tranquitos Ck., first 150 metres, W of US Hwy 77 in Kingsville, Snow 6414 (KSP, MO); ca. 30 air mi. SSW of Corpus Cristi, inside Seawind RV Resort, adjacent to Kaufer–Hubert Memorial Park, Snow 5916 (KSP, MO, MU); Kingsville, Reed 6 (US). La Salle, Cotulla, Planck 32 (US); Rivera, Silveus 186 (SMU). Matagorda Co., 5 mi.E of] Wadsworth, Wilson 15144 (KSTC). Nueces Co., Corpus Cristi, Silveus 126 (MU, US); ibid., Silveus 2407 (SMU). Red Riv. Co., On sand bar, Old Pine Bluff
ferry crossing across Red Riv., ca. 3.5 mi. W of Kanawha, Correll 37906 (NY). San Patricio Co., 2 mi. E of Taft, Harvey & Elliot 7351 (MICH); Shore of Lake Mathis, Gould 11467 (UC); 5 mi. W of Aransas Pass, Webster 7079 & Rowell (SMU); South banks of Chiltipin Ck., just E of US Hwy 77 overpass, ca. 2 air mi. W of Sinton city centre, Snow 6394 (KSP, MO); 0.4 mi. S of Jct of FM 892, ca. 4.7 mi. S of Robstown, Snow 5919 (KSP, MO); US Hwy 77, along Chiltipin Ck. just N of Sinton, Snow & Evans 4389 (RM); Gregory, Reed s.n. (FLAS 167640, USCH); Big Lake area of Welder Wildlife Foundation, Penn 53 (GA); S side of Corpus Cristi, Jones 1142 (NCU, SMU). Starr Co., Town of Garciasville, along RR tracks, Snow 5904 (MO); Rio Grande City, Griffiths 6486 (US). Val Verde Co., Mouth of the Pecos Riv., Hinckley and Hinckley 412 (SMU, US). Victoria Co., Along US Hwy 77, ca. 1.1 mi. N of Colesito Ck., a few air mi. SW of Victoria, Snow 6372 and 6373 (MO). Webb Co., ca. 4 mi. SE of Laredo, Zapata 20 (BRIT); Casa Blanca Lake, 3 mi. NE of Lardo, Alvarez 7432 (OKLA); Lake Casa Blanca, 6 mi. NE of Laredo, Ramirez 2 (SMU); Laredo, Fisher 252 (US); Lake Casa Blanca, 6 mi. NE of Laredo, Lozano 17 (BRIT); ibid, McCart et al. 1 (OKLA); Laredo, Orcutt 5574 (MO); Lake Casa Blanca, 6 mi. E of Laredo, García et al. 8731 (FSU, GA); Lake Casa Blanca, 6 mi. E of Laredo, Ramírez 6 (BRIT); Bank of Rio Grande near Lardo, Barkley 13E016 (NCU). Willacy Co., 2–1/4 mi. N of Raymondville, Cory 51477 (MICH, NY, SMU); Route 497, 19 mi. E of Raymondville, Correll and Johnston 17879 (MO, NY, TEX, US). Zapata Co., Saline arroyo 3 mi. N of San Ygnacio, Correll & Johnston 18083 (NCU, SMU, US); End of Texas FM 496, ca. 2.5 mi. W of Zapata, gravelly shores of Falcon Lake, Snow 5899 (MO); ca. 250 m S of end of Texas FM 496, ca. 2.5 mi. W of Zapata, Snow 5902 (KSP, MO); 11 mi. N of San Ygnacio, shinners 17668 (SMU). Utah. Utah Co., North Park, Provo, Mengies 8001 (BRY, MO). Virginia. King William Co., End of Eltham Bridge and railroad, VA 30 and 33 in West Point, Bradley 24033 (GA). Warrick Co., Chrome ore piles, Newport News, Reed 44052 (US). Uruguay. San Jose: Barra, Herter 519 (GH, M, NY). Venezuela. Anzoategui: Guanta and Puerto La Cruz, Tamayo 2057 (US); Dsto. Bolivar–Swamp at Boca de Tigre, at the intersection of the road to Bergatín and Barcelona–el Crucero Rd., Davidse and Gonzalez 20010 (MO, NY). Falcon: Coro, 3 km E del centro, Wingfield 5184 (MO); 12 km SE de Coro, entre La Negrita y Siburúa, Wingfield 5095 (MO). Sucre: Lagunas Litorales de Cumaná, Cumana Campos 519 (NY, US).


**Type.** ZAMBIA. Mbala (Abercorn), Saisi River (near Jerico), 27 Feb 1958, floodplain (in swamp) in ditch at side of embankment, LDF Vesey-Fitzgerald 1551 (holotype: K!, isotype: BM!, K!).
Description. Plants perennial. Culms to nearly 300 cm tall, 5–10 mm wide at base, round, erect, arising from thickly rhizomatous root crowns, branching; nodes glabrous; internodes mostly 5–18 cm long, firm but spongy (aerenchymatous) in centre. Leaf sheaths usually much longer than internodes, sericeous but becoming glabrous with age, the margins ciliate; ligules to 14 mm long, membranous, attenuate but becoming lacerated; blades 30–65 × 0.5–0.65 cm, linear, tightly involute on drying, glabrous to slightly scabrous above and below. Panicles 50–80 × ca. 25 cm wide, exserted with 19–44 branches; the branches 12–18 cm long, alternate or whorled along the rachis, somewhat reflexed to ascending, flexuous, minutely scabrous, the axils scabrous to short pilose. Spikelets 8–13 mm long, distant near base of branches to imbricate at tips; florets (6–)10–15; callus glabrous; lower glumes 2.7–3.4 mm long, narrowly ovate to ovate, scabrous on midnerves, acute to obtuse; upper glumes 2.5–4.0 mm long, otherwise similar to lower glumes; lemmas 3.6–4.8 mm long, narrowly ovate to ovate, dark green, the lateral nerves faint, appearing glabrous but sparsely sericeous upon close inspection, apex acute to attenuate, awnless or with mucros to 1.3 mm long; paleas subequal to lemma, elliptic to narrowly ovate, sparsely sericeous on nerves; apex acute. Stamens 3; anthers 1.9–2.5 mm long, purple or yellow. Caryopses ca. 1.8 mm × ca. 0.6 mm, elliptic in hilar side profile, depressed obovate in transverse section, hilar groove lacking, smooth but slightly uneven; pericarp apparently weakly adnate to the endosperm.

Leaf anatomy. Not studied.

Stem anatomy. The stellate aerenchyma of *D. gigantea* probably reflects adaptations for its emergent growth habit in aquatic situations. A series of relatively large, elliptic air canals are subjacent to the epidermal layers (Fig. 10). Chlorenchymatous tissue is also present near the surface. Peripheral sclerenchymatous ring present and linked to outermost vascular bundles via girders. Inner sclerenchymatous ring canal tissue present. Sclerenchymatous rings surrounding vascular bundles located inside inner sclerenchymatous ring present. Kranz sheath cells present, with vascular bundles present in outer portions of sheaths; Kranz sheath cell canal tissue present. Vouchers: Simon & Williamson 2025 (BM); Smith 4126 (MO).

Chromosome number. Unknown.

Phenology. Flowering December through May.


Conservation status. Data Deficient (IUCN 2012). However, detailed localities are provided below given the evident rarity of *Diplachne gigantea*, which apparently has not been collected since 1983. Focused attempts by the first author in January of 1996 to re-collect at the two localities of Pete Smith in the Okavango region of Botswana were unsuccessful, even after speaking with Smith regarding his knowledge of the species. To the best of the authors’ knowledge, Smith is the last person to have collected the species. He knew of no vernacular name for the species in Botswana which, if it existed, might help in relocating efforts and indicated that each of the two populations
Figure 9. **A–K Diplachne gigantea** Launert **A** habit **B** inflorescence **C** ligule **D** spikelet **E** lower glume **F** upper glume **G** lemma **H** palea and lodicules **I** ovary and stigmas **J** stamen **K** caryopsis, dorsal view (left) and lateral view (right). Drawings from McCallum Webster A305 (K), from Zambia.
from which he had collected were small. He confirmed, as some herbarium specimens labels and the stellate culm anatomy suggest, that the species is an emergent aquatic that can continue to grow on sandbars.
More specifically, on 28 and 30 January 1996 the first author hired a boat and driver at Drotskys Cabins in Botswana, located approximately 20 km south of the Namibian boarder (Caprivi Strip) and approximately 7 km southeast of the small town of Shakawe (Highway A 35). One entire day each was devoted to searching for *D. gigantea* moving southeast downstream on the Okavango River and returning by the same route on the opposite bank of the river and upstream and back from the same point of departure. No individuals were seen. Although only speculative, two hypotheses concerning the evidently limited distribution in relation to its habitat merit consideration. First, the stellate aerenchyma of the culm likely contributes to a relatively soft texture, which may render it particularly palatable for large grazers such as hippopotamus (*Hippopotamus amphibius*), which are common in the Okavango Delta and which consume large quantities of food. Second, given the extensive potential habitat for *D. gigantea* in the Okavango Delta, *D. gigantea* may occur more frequently than herbarium records suggest. However, given the paucity of collections to date, it likely is uncommon anywhere in its range.

*Diplachne gigantea* was cultivated in the early 1980s at the Lakeside National Botanic gardens in Zimbabwe (*Browning 8; A, P*). Gibbs Russell et al. (1991: 118) indicate that *D. gigantea* has been collected at the western edge of the Caprivi Strip in Namibia but the authors have not seen a voucher.

In summary, the data suggest that *Diplachne gigantea* is rare and additional knowledge of its distribution, ecology and relative abundance are critical for making a recommendation following IUCN standards.

**Etymology.** The word gigantea refers to the large stature of the species.

**Vernacular name.** Giant diplachne.

**Comments.** *Diplachne gigantea* is easily diagnosed from *D. fusca* by its much taller stature at maturity, its evidently obligate and usually emergent growth in hydric habitats, the stellate aerenchyma of the culms, the absence or near-absence of lemmatal macrohairs and the relatively lax panicle branches. The collection from cultivation at the Lakeside Botanic Gardens (see below) is indicated as growing from a “dense mat at the base”, presumably meaning the culms arose from short rhizomes.

The fourth author personally recalled the species as being fairly commonly locally at the time of his collection in 1983 (Simon & Williamson 2025).

**Specimens examined.** Botswana. Ngamiland: Okavango River, sandbank just recovering from being inundated by high waters during the previous six weeks, 18°34.25’S, 22°06.3’E, 8 May 1985, Smith 1387 (BRI, K, MO); In water 1 m deep in a backwater off the mainstream of the Okavango River among water lillies, reeds, 18°20.2’S, 21°49.9’E, Smith 4126 (K, PRE, SRGH [n.v.]). Tanzania. Reported but not confirmed from the Iringa District (Phillips 1974). Zambia. Kabompo: Bog by river 100 yards from Customs point [near the Tanzanian border], McCallen Webster A305 (BM, K). Mbala (Abercorn): 70 mi. S of Mwinilunga on Kabompo Rd., rooted in water, +/- 1250 metres elev. (ca. 4,100 ft), 25 Dec 1969, Simon & Williamson 2025 (K, BM, SGRH [n.v.]). Zimbabwe. Cultivated at Lakside Botanic Gardens in 1983 from an unknown source, Browning 8 (A, P [P06795263]).
Excluded names

The following names, for which the authors have confirmed the type specimens, are not in Diplachne.


**Diplachne arenaria** Nees ex Steud., Nomencl. Bot. [Steudel], ed. 2. i. 514; et ex Hochst. in Flora, xxxviii. (1855) 427, nom. inval. = *Trichoneura mollis* (Kunth) Ekman


**Diplachne cearensis** Ekman, Ark. Bot. 10(17): 32, t. 5, f. 3, t. 6, f. 18 (1911) Type. Brazil: Ceara, in silvis caatinga dictis viam entre Crato et Barbalha, Loeffgren 672 (holotype: S, n.v.; isotype: US, fragment [00478599]!) = *Gouinia cearensis* (Ekman)

Diplachne dominguensis (Jacq.) Chapm., Fl. South. U.S. (ed. 3) 609 (1897). Type. Dominican Republic: Anonymous s.n. (holotype [probable]: W [W-0027107]! Laegaard (in 1990, see specimen label) interpreted this collection to be the holo-type, which appears sound given “Hb. Jacq.” on what appears to be the oldest af-fixed label, and “Herbar, Jacquin Fil.”, on an evidently younger label, referring to Jacquin’s son J.F. Jacquin = Leptochloa virgata (L.) P. Beauv.


Diplachne dubia var. pringleana Kuntze, Revis. Pl. 3(3): 349 (1898). Type. U.S.A. Arizona: Sierra Tucson, 27 April 1884, Pringle s.n. (holotype: MSC-8177; isotypes: GH, US, VT) = Disakisperma dubium (Kunth) P.M. Peterson & N. Snow. (See Mauz (2011) for discussion compared to Snow (1997a) and Peterson et al. (2001)).


Diplachne loliiiformis (F. Muell.) Benth. = Tripognella loliiiformis (F. Muell.) P.M. Peterson & Romasch (see Peterson et al. 2016)

Diplachne mendocina (Phil.) Kurtz, Bol. Acad. Ci. (Cordoba) 15: 521 (1897). Type. Argentina, Mendoza (holotype: SGO-PHIL-356; isotypes: BAA, SGO, US (US-899255 [fragment ex USDA Herb. ex SGO-PHIL]) = Disakisperma dubium (Kunth) P.M. Peterson & N. Snow


**Diplachne monticola** (Chase) McNeill, Brittonia 31(3): 401 (1979). **Type.** Haiti. Vicinity of Furcy, common on summit of Pic de Brouet, vicinity of Furcy, Leonard 4751 (holotype: US! [00134132]; isotypes: B!, NY!, US! [00516790]) = *incertae sedis*. Its correct generic placement may be within *Goinia* given the general resemblance of its spikelets to other species of this genus.


**Diplachne pringlei** Vaset ex Beal, Grass. N. Amer. 2: 436 (1896), nom. inval. pro syn *Leptochloa pringlei* Beal = *Disakisperma dubium* (Kunth) P.M. Peterson & N. Snow.


**Diplachne reverchonii** Vasey, Bull. Torrey Bot. Club 13(70: 118 (1886). **Type.** U.S.A. Texas. Llano Co., collected on granite rocks, Reverchon 1613 (lectotype, here designated: US [00133610]!); isolectotypes: CM!, MO! [123188, 123189], VT) = *Tripogon spicatus* (Nees) Ekman. A previous worker annotated the numbered collection (Reverchon 1613) at MO as isotype or probable isotype, which was incorrect given that no specimen was cited in the protologue.


Diplachne “sessilis Pilg. ms.” Listed as type at Z but the name evidently never published.


Diplachne squarrosa var. longiaristata Rendle, J. Linn. Soc., Bot. 36(254): 411–412 (1904). **Type.** China. Syntypes at BM need to be examined and a lectotype chosen.


Diplachne thoroldii Stapf ex Hemsl., J. Linn. Soc., Bot. 30: 121. (1894). **Type.** China (Xizang), Thorold 120 (holotype: K! [K000907432, viewed digitally]) = *Orinus thoroldii* (Stapf ex Hemsl.) Bor.


**Diplachne viciaida** Scribn., Bull. Torrey Bot. Club 10(3): 30 (1883). **Type.** status unconfirmed = **Dinebra viciaida** (Scribn.) P.M. Peterson & N. Snow.


**Unconfirmed names**

The following names have been associated with various subspecies of **Diplachne fusca** (Snow 1997a), but the authors cannot confirm them at the present for want of having seen type specimens.

**Names associated with Diplachne fusca subsp. fusca:**


*Diplachne capensis* (Nees) Nees var. *pauciflora* Nees, Fl. Afr. Austr. 257. 1841. **Type.** South Africa. In districtus Caledon montibus. Since Poaceae types of Nees were destroyed at B, selection of a neotype may be necessary.


Names associated with Diplotachne fusca subsp. fascicularis:


Names associated with Diplotachne fusca subsp. uninervia:

Diplotachne tarapacana Phil., Verz. Antofagasta Pfl. 88. 1891. Lectotypification evidently is needed given that two specimens at SGO likely were in the original material (Rahmer s.n. and Philippi s.n.), although neither was cited in the protologue.


**In memorium**

We dedicate this paper to Bryan Kenneth Simon (1943‒2015), our colleague, coauthor and friend, who regrettably did not live to see its completion (Snow 2015).

**Acknowledgments**

This paper updates and expands data from a doctoral dissertation submitted to Washington University in St. Louis (Snow 1997a). Additional research was carried out during short-term visitor grants from the Smithsonian Institution to the first author in 1989 and 2007, who thanks the second author for his assistance and hospitality during his extended visits to US. The initial research was supported by the National Science Foundation (BIR-9256779) to Washington University in St. Louis, The Explorer’s Club, Grants-in-Aid of Research (Sigma Xi), National Geographic Society, Andrew W. Mellon Foundation, Missouri Botanical Garden and American Society of Plant Taxonomists, all of which are thanked. J. Travis Columbus (RSA) and Richard Keating (MO) assisted the first author on anatomical studies. Tarciso Filguieras provided input on some typification issues. For assistance with fieldwork Snow thanks: Botswana (M. Chatakuta); South Africa (P. Burgoyne, L. Cohen, J. Gumbi, R. Roux and O. McKibbin); North America and México (T. Evans, R. Koster, T. Prinzie); Australia (S. Jacobs, B. Simon and D. Snow). For answering
questions about specimens or sending information, we thank Zaplan Zdeněk (PRA), Jordan Teisher (PH) and Martin Xanthos and Maria Voronstova (K). Cabela's Corporation of Sidney, Nebraska, generously donated field equipment for a collecting trip to Africa and Australia in 1996. Alice R. Tangerini provided the excellent new illustrations. We thank the following herbaria (abbreviations following Thiers 2017) for loans or permission to view specimens: AAU, ANSM, APSC, ARIZ, ASU, B, BAA, BISH, BM, BRI, BRIT, C, CANB, CAS, CM, COL, CORD, CS, DNA, DS, ENCB, FLAS, FSU, G, GA, GAB, GH, GREE, H, I, JEPS, K, KANU, KSC, KSP, KSTC, L, LD, LINN, LL, LP, M, MEL, MEXU, MICH, MO, MONT, MONTU, MU, NA, NE, NCU, NMC, NSW, NY, OKL, OKLA, P, PH, PNH, POM, PR, PRA, PRE, PSO, RM, RSA, S, SI, SMU, TAES, TEX, UC, UMO, US, USCH, UTC, VPI, W, WKY. We greatly appreciate Christopher Reid (Louisiana Department of Wildlife and Fisheries), Mike Skinner (Linguistic Editor for Pensoft Publishing Ltd) and Cliff Morden (University of Hawaii) for their thorough reviews.

References


Steudel EG (1855) Synopsis Plantarum Glumacearum. Pars 2.


Valls JFM (1978) A biosystematic study of *Leptochloa* with special emphasis on *Leptochloa dubia* (Gramineae: Chloridoideae). PhD Dissertation, Texas A&M University, College Station.