CAREX MICHOACANA, A NEW SPECIES OF CAREX SECTION OVALES (CYPERACEAE) FROM MEXICO

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ABSTRACT. Carex michoacana is described as new from Michoacán, Mexico. It is most similar morphologically to C. tetrastachya from the southern United States, but differs in having smaller perigynia with narrower achenes. It differs from all other species in the Carex brevior group with similarly large perigynia in having staminate and pistillate scales with a scabrous awn formed by the excurrent midvein and perigynia nerveless over the achene adaxially. From a molecular phylogenetic standpoint, the position of this species is equivocal, but the more conclusive of the two nuclear ribosomal DNA datasets utilized supports the morphological evidence suggesting that it is a member of the Carex brevior group. The names C. tetrastachya and C. brittoniana are typified.

CAREX MICHOACANA

Carex sect. Ovales is a large and difficult section of ca. 90 species that is predominantly North American, but with a number of species also in mountainous areas of the neotropics (Hipp et al. 2006). The group is complex, but relatively well understood in Mexico, with 13 species recognized by Reznicek (1993). Field work for the Flora del Bajío area has disclosed an unusual new species of sect. Ovales, known only from a single collection. It is morphologically most similar to C. tetrastachya of the southern United States, but quite distant geographically; the type locality in Michoacán is ca. 900 km southwest of the nearest occurrence of C. tetrastachya.

Carex michoacana Reznicek, Hipp & S. González, sp. nov.—TYPE: MEXICO. Michoacán: Mpio. Angamacutiro, lugares cercanos a la cortina de la presa El Rosario, 1750 m, 8 May 2005, Rzedowski 54150 (holotype: IEB!; isotypes: CIIDIR! MICH!).

Planta laxa caespitosa; culmi fertiles 55–83 cm alti. Folia 5–8; laminae 2–30 cm longae, 1.5–3.1 mm latae; vaginae ca. 3–8 mm longae, ventraliter albidio-hyalinae, glabrae; ligulae 3.2–6.8 mm longae. Inflorescentiae 2.5–3.8 cm longae; spicae gynaecandae, ovoideae, 9–14 mm longae, 8.5–11.5 mm latae. Squamae pistillatae anguste ovatae, albo-hyalinae, 1-nervatae, 3.8–4 mm longae, 1.5–1.7 mm latae, aristatae costa

excurrenti, aristae 0.1–0.6 mm longae. Perigynia 5.2–5.8 mm longa, 2.9–3.5 mm lata, 1.6–1.8plo longiora quam latiora, patentia, planoconvexa, corporibus late ellipticis vel orbiculatis, 3.6–4 mm longis, 1–1.2plo longioribus quam latoribus, in rostrum serrulatum 1.4–1.9 mm longum contracta. Achenium 2.4–2.7 mm longum, 1.1–1.35 mm latum, biconvexum. Styli marcescentes; stigmata 2. Antherae 3, ca. 1.5–2.2 mm longae.

Loosely cespitose in small clumps from short, thick, woody rhizomes; rhizomes elongating with age; fertile culms ca. 55–83 cm tall, erect, trigonous, sometimes flattened below, sparsely scabrous-angled below inflorescence; bladeless basal sheaths dark brown, disintegrating into short fibers. Leaves 5–8, on the lower 2/5–1/2 of the culm; blades 2–30 cm long, 1.5–3.1 mm wide, plicate or flat, glabrous, the margins and midrib antrorsely scabrous distally; leaf sheaths ca. 3–8 cm long, tightly enveloping culms, smooth, green, larger sheaths with the interval areas pale whitish green with scattered, more or less horizontal green septae on the upper portion; the inner band of sheaths glabrous, green with a prominent whitish hyaline zone, the apex concave, more or less equaling the base of the blade, whitish hyaline; ligules 3.2–6.8 mm long, obtuse, the free portion entire to finely erose and up to 0.4 mm long. Vegetative culms annual, few, fully developed only after perigynia are largely shed, ca. 12–15 cm tall with ca. 5–9 leaves mostly clustered near the summit of the culm. Inflorescences ca. 2.5–3.8 cm long, erect, the spikes overlapping or the lowermost slightly separate, the lowest spikes ca. 7–12 mm distant, spikes single at nodes, sessile; lowermost bracts bristle-like, ca. 0.8–5.4 cm long, often inconspicuous, sheathless, upper bracts much reduced; spikes 3–4 (5), gynandrous, orbicular to ovoid with rounded bases or the uppermost with a short-clavate base, 9–14 mm long, pistillate portion 8–11 × 8.5–11.5 mm, ca. 20–40-flowered, staminate portion 1–3 × 1.5–2 mm, ca. 3–6-flowered. Pistillate scales 3.8–4 × 1.5–1.7 mm, ± reaching the base of the beak, narrowly ovate, acute, the midvein excurrent as a scabrous awn 0.1–0.6 mm long, whitish hyaline with a pale brown or stramineous, 1-veined center. Staminate scales ca. 3.8–4.4 × 1.6–2 mm, ovate, acute, the midvein excurrent as a scabrous awn 0.2–1.2 mm long, whitish hyaline with a pale brown or stramineous, 1-veined center. Perigynia glabrous, sessile, ca. 5.2–5.8 × 2.9–3.5 mm wide, 1.6–1.8 times as long as wide, ± spreading, herbaceous, ± translucent
over achene; bodies broadly elliptic or ± orbicular, 3.6–4 mm long, 1–1.2 times as long as wide, 1.9–2.7 times as long as the beak, and widest 1.6–2 mm above base, broadly thin-winged with wings 0.8–1.2 mm wide, finely serrulate-marginated above the middle, contracted into a beak, yellowish green to stramineous with paler margins, nerveless adaxially and abaxially over the achene, 1–2-nerved in the wings; beaks 1.4–1.9 mm long, strongly flattened and serrulate-marginated to apex, the apex bidentate with scabrous-marginated teeth 0.6–1.1 mm long. Achenes 2.4–2.7 × 1.1–1.35 mm, 1.8–2.5 times as long as wide, biconvex, narrowly ovate to narrowly oblong, pale brown to brown, short-stipitate at base, apiculum 0.4–0.5 mm long; style straight; stigmas 2. Anthers 3, ca. 0.4–0.9 mm long, strongly flattened and serrulate-marginated to apex, the apex bidentate with scabrous-margined teeth 0.6–0.9 mm long.

With its very large perigynia with ± orbiculate bodies, C. michoacana resembles no known Mexican species of Carex sect. Ovales (except for C. tetrastachya Scheele, recently discovered in Coahuila; Mora-Olivo, unpubl.). In overall appearance, this species closely resembles a small individual of C. tetrastachya, and the details of vegetative features and perigynia and scales also are similar (sheaths smooth, with a prominent hyaline zone on the inner band, staminate and pistillate scales with a scabrous awn formed by the excurrent midvein, and very broad, ± orbicular perigynium bodies nerveless over the achene on both faces); however, C. michoacana has smaller, especially narrower, perigynia: only 5.2–5.8 mm long and 2.9–3.5 mm wide, versus 5.5–8 (–8.7) mm long and 3.5–6 mm wide in C. tetrastachya and also distinctly narrower achenes 2.4–2.7 long, 1.1–1.35 mm wide, and 1.8–2.5 times as long as wide versus achenes 2–2.8 mm long, 1.4–2.2 mm wide, and 1–1.8 times as long as wide in C. tetrastachya. Carex michoacana differs from all other species in the C. brevior group of sect. Ovales (as used by Rothrock & Reznicek, 2001; see also Hipp et al., 2006) with large perigynia (routinely longer than 5 mm and with wide bodies) and smooth sheaths with which it might be confused (C. opaca (F. J. Herm.) P. Rothr. & Reznicek, C. missouriensis P. Rothr. & Reznicek, C. shinnersii P. Rothr. & Reznicek, and C. hyalina Boott) in having staminate and pistillate scales with a scabrous awn formed by the excurrent midvein, perigynia nerveless over the achene adaxially, and narrow achenes (except for C. hyalina, which has achenes 1.6–2 times as long as wide but only 0.9–1.2 mm wide).

From a molecular phylogenetic standpoint, placement of this species is equivocal. Total genomic DNA was extracted from one individual of C. michoacana (Rzedowski 54150, MICH) and sequenced for the nuclear ribosomal DNA external transcribed spacer (ETS; GenBank accession EF635436) and internal transcribed spacer (ITS; GenBank accession EF635435) regions. A new ETS sequence was also generated for C. tetrastachya (Reznicek 10411; GenBank accession EF681761). Sequences were analyzed in conjunction with previously published sequences for sect. Ovales using the Bayesian method implemented in MrBayes 3.0b4 (Huelsenbeck & Ronquist 2001). Taxa analyzed included all members of the eastern North American clade identified in previous research on the group (Hipp et al. 2006) and a subsample of western North American taxa.

Sequence data from the ETS region place C. michoacana within a strongly supported clade composed of C. brevior (Dewey) Mack. ex Lunell, C. hyalina, C. molestiformis Reznicek & P. Rothr., C. reniformis (L. H. Bailey) Small, C. shinnersii, and C. tetrastachya (posterior probability = 0.97; Fig. 2). The sequence for C. michoacana differs from that of all other species in the clade by at least three base pairs, and in fact the sequence is less similar to C. tetrastachya than C. tetrastachya is to C. reniformis and C. molestiformis. Likewise, the ITS sequence for C. michoacana differs from all other ITS sequences analyzed by at least nine base pairs; however, ITS data
suggest a phylogenetic position for this species outside of the well supported core group of eastern North American taxa (“ENA I,” posterior probability = 1.00; Fig. 3) that includes the Carex brevior clade. Combined analysis of the two datasets with C. michoacana included (not shown) breaks up the Carex brevior clade, places C. michoacana sister to ENA I, and embeds the western North American and Eurasian taxa C. feta L. H. Bailey and C. ovalis Gooden. within the broader eastern North American clade. These rearrangements stand at odds with previous, strongly supported results (Hipp et al. 2006). Incongruence between ITS and ETS is not uncommon in much of Carex subg. Vignea (Ford et al. 2006), but it is rare in sect. Ovales. Pending further study, the best estimate of the phylogenetic position of C. michoacana is within the Carex brevior clade, based both on morphology and the ETS tree.
FIG. 3. Majority-rule consensus of trees retained in Bayesian analysis of the internal transcribed spacer region of nuclear ribosomal DNA. Posterior probability estimates are indicated above the branches.

NEOTYPIFICATION OF CAREX TETRASTACHYA

The name *Carex tetrastachya* was published by Scheele based on a collection that Carl Ferdinand von Roemer gathered near New Braunfels, Comal County, Texas. The whereabouts of Scheele’s herbarium is unknown, and inquiries to find original Roemer material have been fruitless. Although the specimen Scheele saw was obviously very immature, he clearly described diagnostic features of *C. tetrastachya*, including the typically four spikes, the whitish hyaline, 1-veined scales, and the awn formed by the excurrent midvein. The application of the name is clear, and it has been used in *Flora of North America* (Mastrogiuseppe et al. 2002), *Illustrated Flora of East Texas* (Diggs et al. 2006), and a number of recent papers.
Carex tetrastachya ranges from southwestern Louisiana to west-central and southernmost Texas, and easternmost Coahuila, Mexico, north to southernmost Oklahoma. Stanley D. Jones (pers. comm.) noted that *C. tetrastachya* is variable. Material from the western, drier portion of its range tends to have more spreading perigynia at maturity, with longer beaks, and more eastern material has shorter, more appressed beaks. Preliminary study of this variation is consistent with it being clinal, but it only seems prudent to select a neotype from the western portion of the range of the species, where New Braunfels is located, and which clearly shows the awned scales and typically four spikes, matching the protologue.


Note: Wright 719 was also the collection upon which the *nomen nudum* Carex wrightii S. T. Olney was based (not *C. wrightii* Dewey ex Torr., Bot. Mex. Bound. 232. 1859, nor *C. wrightii* Franchet, Bull. Soc. Philom. Paris 7:47. 1895).

**LITERATURE CITED**


