

Eleocharis cryptica (Cyperaceae), a dwarf new species from Durango, Mexico

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Abstract. *Eleocharis cryptica* (Cyperaceae), known from pine-oak forest in Durango, Mexico, is described and illustrated. It belongs to *Eleocharis* subg. *Eleocharis* ser. *Tenuissimae* and can be distinguished by its diminutive size, with culms 2–13 mm long (including spikelets 1.3–1.7 mm long), and the folliform prolongations of its upper sheaths. It is the smallest species of *Eleocharis* thus far known.

Key Words: conservation, *Eleocharis nigrescens*, Sierra Madre Occidental, *Tenuissimae*.

Resumen. Se describe e ilustra *Eleocharis cryptica* (Cyperaceae), de bosque de pino-encino en el estado de Durango, México. Pertenece a *Eleocharis* subg. *Eleocharis* ser. *Tenuissimae* y se distingue por su diminuto tamaño, con tallos 2–13 mm de largo incluyendo las espiguillas de 1.3–1.7 mm de largo, así como por la prolongación de la vaina superior folliforme. Es la especie más pequeña de *Eleocharis* que se conoce hasta ahora.

Eleocharis R. Brown (Cyperaceae) is a large genus of sedges with 200–250+ species widely distributed in temperate, subtropical and tropical regions (González Elizondo & Peterson, 1997; Goetghebeur, 1998; Govaerts & Simpson, 2007). *Eleocharis* is distinguished from other sedge genera by the following combination of characters: leaves that are basal and reduced to tubular sheaths, inflorescences reduced to a single spikelet, and a stylopodium (“tubercle”) that is persistent on the achene. Only a single world-wide taxonomic study of *Eleocharis* has been attempted (Svenson, 1929, 1932, 1934, 1937, 1939), in which nine series and six subseries were recognized. Additional morphology-based classifications for the genus have since been proposed, including those of

Kukkonen (1990; five subgenera, 13 sections, three series) and González Elizondo and Peterson (1997; four subgenera, five sections, eight series, seven subseries). Preliminary molecular phylogenetic studies have provided support for some aspects of these classifications and have identified groups that are not monophyletic in their current circumscription (Roalson & Friar, 2000; Yano et al., 2004). Substantial work remains to clarify the evolutionary history of *Eleocharis* and to produce a natural classification for it.

Taxonomic discovery in *Eleocharis* remains high, which likely is a function of the highly reduced morphology of the genus, the subtle and often minute differences that characterize its many species, and an absence of comprehensive and critical study for many species

complexes and higher taxa. More than 30 new species of *Eleocharis* have been described from the New World in the last 25 years (e.g., González Elizondo, 1985; Simpson, 1987, 1988a, 1993; Zavaro Pérez & Pabón Garcés, 1995; González Elizondo & Reznicek, 1996, 2005; Roalson, 1999; Strong & González Elizondo, 2000; Haines, 2001; Smith, 2001; Mereles and González-Elizondo, 2003; Mereles, 2004a, 2004b; González Elizondo et al., 2005, 2007, 2008a, 2008b, 2009; Trevisan & Boldrini, 2006; Rosen & Hatch, 2007) and the taxonomy, nomenclature and/or known distributions of several species and species complexes have recently been clarified (e.g., González Elizondo & Peterson, 1996; Simpson, 1988b; Smith, 2001; Rosen & Hatch, 2006; Rosen et al., 2007, 2008). Here, we describe a dwarf new species of *Eleocharis* from Durango, Mexico.

Eleocharis cryptica Saarela, P. M. Peterson, S. González & D. J. Rosen, **sp. nov.** Type: Mexico. Durango: Sierra Madre Occidental, 2.1 mi S of Tableteros on road towards La Flor, 23°40'07"N 104°43'15"W, 2563 m, 2 Oct 2007, P. M. Peterson, J. M. Saarela, M. S. González Elizondo, D. J. Rosen & C. S. Reid 21212 (holotype: CAN-591881; isotypes: CIIDIR, US). (Fig. 1).

Eleocharis nigrescens (Nees) Steudel affinis sed ab ea caulibus gracilibus brevioribus, vagina superiore ad apicem plerumque prolongatione foliiformi quam longitudine vaginae longiore praedita, spiculis minoribus et paucifloribus differt.

Plant annual, caespitose; roots fibrous, cream-colored; culms 2–10(–13) mm long (as measured to spikelet apex), 0.1–0.2(–0.25) mm wide, (8–) 12–22 per plant, soft, capillary, erect to slightly curved, sometimes twisted, quadrangular-sulcate, often compressed; leaf sheaths sometimes grooved adaxially, white to cream-colored proximally, green distally, apex scarious or herbaceous and often extended into a ± appressed, involute, attenuate, light green, punctulate, foliiform prolongation 0.5–3.2 mm long. Spikelets 1.3–1.7×0.8–1.2 mm, 3–6(–7)-flowered, ovoid; floral scales 0.8–1.1×0.4–0.5 mm in lateral view, proximal scales fertile, ca. 2/3 the length of the spikelet, polystichous to subdistichous, loosely keeled, membranous, acute, entire, with a green (young) to reddish-brown

(mature) mid-vein and broad purple or hyaline margins 0.3 mm wide; styles trifid; stamens 1, filaments translucent; anthers ca. 0.25 mm long. Achenes 0.5–0.6(–0.7) mm long (including the stylopodium), 0.3–0.4 mm wide, trigonous, obovoid or broadly ellipsoid, almost smooth to obscurely striolate-reticulated, light olivaceous-brown and somewhat translucent, whitish when immature, the angles prominently white costate, 0.05 mm wide; stylopodium 0.1×0.2 mm near base, pyramidal to depressed-pyramidal, trigonous; bristles absent.

Distribution and habitat.—*Eleocharis cryptica* is known only from a single population (the type locality) located in a private ranch, where it was growing intermittently in gravelly, seasonally-wet grassy flats among open oak-pine forest. The forest was moderately disturbed by some logging and grazing. Because *E. cryptica* grows in open areas temporarily flooded in which the dominant herbs are very low, it is not likely to be severely affected by the main disturbances. Endemic species are common in the Sierra Madre Occidental and also in *Eleocharis*, but narrow endemics are rather uncommon in both cases, so additional populations of *E. cryptica* are expected in similar habitats of the Sierra Madre Occidental. Associated species at the type locality include *Arctostaphylos pungens* Kunth (Ericaceae); *Bulbostylis funckii* (Steud.) C. B. Clarke, *B. juncooides* (Vahl) Kük. ex Osten, *Cyperus bipartitus* Torr., *C. flavescens* L. var. *piceus* (Liebm.) Fernald, *Eleocharis svensoniana* S. González, *Rhynchospora durangensis* Kral & W. W. Thomas (Cyperaceae); *Eriocaulon jaliscanum* S. Wats. (Eriocaulaceae); *Halenia brevicornis* (Kunth) G. Don (Gentianaceae); *Pinus engelmannii* Carrière, *P. teocote* Schltdl. & Cham. (Pinaceae); *Quercus arizonica* Sarg., *Q. eduardii* Trel. (Fagaceae); *Tagetes micrantha* Cav. and *Urbinnella palmeri* Greenm. (Asteraceae).

Etymology.—The species is named in reference to its dwarf stature and the unknown nature of the foliiform prolongations of its sheaths.

IUCN Red List category.—Because *Eleocharis cryptica* is known only from the type location, and there is no data on population trends for the taxon, it therefore can be considered Data Deficient according to the International Union for Conservation of

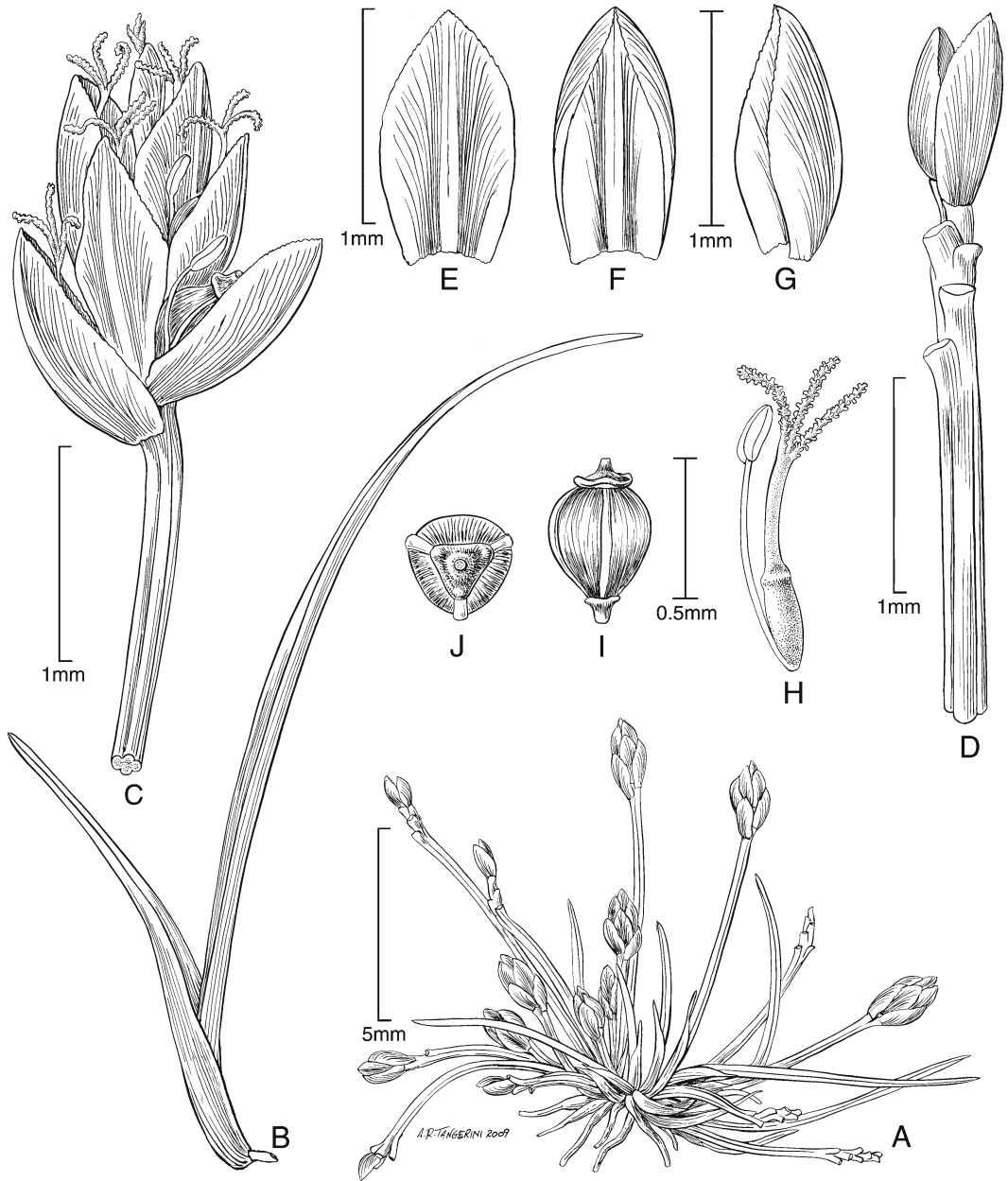


FIG. 1. *Eleocharis cryptica*. A. Habit. B. Leaf sheaths. C. Spikelet and culm. D. Culm (senescent with floral scales). E. Floral scale, abaxial view. F. Floral scale, adaxial view. G. Floral scale, lateral view. H. Ovary with trifid style, stamen attached. I. Achene, lateral view. J. Achene, top view. (Drawn from P. M. Peterson et al. 21212, US isotype.)

Nature (IUCN) Red List criteria (IUCN, 2001). Additional populations of the taxon should be looked for in similar habitats in Durango and adjacent areas.

Additional specimens examined. MEXICO. Durango: Sierra Madre Occidental, 2.1 mi S of Tableteros on road towards La Flor, 23°40'07"N 104°43'15"W, 2563 m, 2 Oct 2007, S. González et al. 7331 (CIIDIR), D. J. Rosen et al. 4495 (TEX).

We follow the genus-level classification of González Elizondo and Peterson (1997). *Eleocharis cryptica* is a member of *Eleocharis* subg. *Eleocharis* sect. *Eleocharis* ser. *Tenuissimae* (C. B. Clarke) Svenson, a heterogeneous group of more than 50 species characterized by punctulate culms, usually trigonous achenes that are either nearly smooth or deeply cancellate, and three-branched styles. Two subseries are recognized in ser. *Tenuissimae*: subser. *Chaetariae* (C. B. Clarke) Svenson (>40 species) and subser. *Sulcatae* (C. B. Clarke) S. González & P. M. Peterson (>12 species). *Eleocharis cryptica* belongs to the former group, which is characterized by having low, capillary culms (vs. filiform to more or less coarse), variously colored achenes (vs. whitish to pale-colored) either nearly smooth to deeply cancellate (vs. never deeply cancellate), and sometimes chasmogamous basal spikelets present (vs. not present). *Eleocharis cryptica* is unusual in the genus in having folliform prolongations of the sheaths that resemble leaf blades more so than do the leaf sheath prolongations rarely observed in other species such as in the *E. nigrescens* complex and *E. subcancellata* C. B. Clarke. There are other species that have almost leaf-like projections at the distal end of the upper leaf sheath, such as *E. spiralis* (Rottb.) Roem. & Schult. and *E. kleinii* Barros, both of *Eleocharis* subg. *Limnochloa* (P. Beauv. ex Lestib.) Torr., and *Eleocharis atacamensis* Phil., a member of *Eleocharis* subg. *Zinzerlingia* T. V. Egorova. It is possible that in *E. cryptica* these represent a reversal to a well developed

lamina, perhaps to provide a greater photosynthetic surface area.

No contemporary treatment of *Eleocharis* for all of Mexico exists. Thus to identify species that are morphologically similar to *E. cryptica*, we examined Svenson's (1937) *Eleocharis* monograph and multiple treatments of *Eleocharis* for areas in the general vicinity of Durango, Mexico, including González Elizondo (1994; Mesoamerica), McVaugh (1993; western Mexico), and Smith et al. (2002; North America north of Mexico). In Svenson's (1937) key to *E. ser. Tenuissimae*, *E. cryptica* keys to a group of three species with small achenes, including *E. nigrescens*, *E. barrosii* Svenson and *E. microcarpa* Torr. In Flora Mesoamericana *E. cryptica* keys to *E. urceolata* (Liebm.) Svenson (González Elizondo, 1994). In McVaugh's (1993) flora of western Mexico, it keys to a group of three taxa, including *E. subcancellata*, *E. minima* Kunth and *E. nigrescens*; in Smith et al. (2002) it also keys to *E. nigrescens*. It is also morphologically similar to *E. microlepis* (Griseb.) D. A. Simpson and *E. setifolia* (A. Richard) A. Raynal (Simpson, 1988b). Because of its diminutive size, *E. cryptica* could be confused with the Cuban species *E. minutissima* Britton and with the North American species *E. uncinata* Chapm. ex Small, the latter considered by Svenson (1937) as a synonym of *E. minima* but which differs in having polystichous floral scales. A key to separate *Eleocharis cryptica* from each of these taxa is presented here. (Achene measurements include the stylopodium.)

Key distinguishing *Eleocharis cryptica* and morphologically similar species

- 1. Culms 0.2–1(–1.3) cm long (to spikelet apex), 0.1–0.2(–0.25) mm wide; at least some of the sheaths extended into an attenuate folliform prolongation that exceeds the sheath length; spikelets 1.3–1.7 mm long. *E. cryptica*
- 1. Culms 1–22(40) cm long (to spikelet apex), 0.1–0.7 mm wide; folliform prolongations of upper sheaths absent, at most a prolongation shorter than the sheath present; spikelets (1–)2–10.7 mm long.
 - 2. Spikelets with proximal scale clearly different from floral scales, usually longer and resembling an involucre bract, often with excurrent midrib. *E. microcarpa*
 - 2. Spikelets with proximal scale similar to floral scales or smaller.
 - 3. Small, whitish tubers present at the base of the plant; achene apex constricted and broadening again below the stylopodium. *E. setifolia*
 - 3. Small, whitish tubers absent at the base of the plant; achene apex not or rarely constricted and broadening again below the stylopodium.
 - 4. Achene surfaces with pitted reticulation.

5. Spikelets 1–2 mm long, with up to 8 floral scales; achene surfaces with oblong, horizontal pits *E. minutissima*
5. Spikelets 2–5 mm long, with up to 40 floral scales; achene surfaces with circular or subquadrangular pits.
 6. Achenes 0.6–0.8 mm long; bristles rudimentary, united to form a cup-like base. *E. subcancellata*
 6. Achenes 0.5–0.6 mm long; bristles absent. *E. microlepis*
4. Achene surfaces nearly smooth to faintly striolate or reticulate.
 7. Floral scales polystichous; achenes 0.5–0.8 mm long.
 8. Floral scales 20–65, appressed, 1–1.3 mm long; achenes obovoid or broadly ellipsoid, 0.5–0.65 mm long. *E. nigrescens*
 8. Floral scales 3–25, spreading to subappressed, 1.2–2.1 mm long; achenes urceolate to broadly obovoid, 0.6–0.8 mm long.
 9. Culms 3–8 cm long; floral scales 1.6–2.1 mm long; bristles absent. *E. cf. urceolata*
 9. Culms 1–3 cm long; floral scales 1.2–1.6 mm long; bristles absent or 1–4, much shorter than achenes *E. uncinialis*
 7. Floral scales subdistichous; achenes 0.6–1(–1.3) mm long.
 10. Achenes obovoid or broadly ellipsoid, 0.7–1(–1.3) mm long; stylopodium pyramidal; spikelets often proliferous, sometimes longer ones present at the base of the plant. *E. minima*
 10. Achenes urceolate to broadly obovoid, 0.6–0.8 mm long; stylopodium depressed, short apiculate; spikelets proliferous or not so, absent at the base of the plant.
 11. Spikelets proliferous; achenes 0.6 mm long. *E. barrosii*
 11. Spikelets not proliferous; achenes 0.8 mm long. *E. urceolata*

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