Carex mckittrickensis (Cyperaceae), a New Species from Western Texas

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ABSTRACT. *Carex* (sect. *Albae*) *mckittrickensis* is described as a new species from Guadalupe Mountains National Park, Texas. It is similar to *C. eburnea* but has larger staminate and pistillate scales and larger perigynia with a longer beak. It is over 1000 km disjunct from the nearest known stations of *C. eburnea* in Arkansas and Nebraska.

Carex sect. *Albae* Ascherson & Graebner consists of three allopatric species that occur in the cool temperate regions of the Northern Hemisphere. They are small, caespitose plants with a few long rhizomes, very narrow filiform or inrolled leaves, separate staminate and pistillate spikes, long-sheathing but usually bladeless bracts, glabrous perigynia with a short entire beak, the style enlarged proximally but deciduous in fruit, three stigmas, and the achene almost filling the perigynium.

Carex alba Scopoli occurs in Europe and cool temperate Asia. The European plants can be recognized by the pedunculate staminate spike usually 10–15 mm long and the perigynia 3.5–4 mm long. The descriptions of this species based on Asian specimens (Charkevicz, 1988; Voroschilov, 1965) are similar, but the perigynia (2.8–3.5(–4.0) mm long) and the staminate spikes ((5–)7–10(–15) mm long) are on average smaller. Voroschilov (1965) described one collection as a new species, *Carex ajanensis*, but he did not differentiate it from *C. alba*, and the protologue does not contain any information distinguishing it from that species. Charkevicz (1988) treated *Carex ajanensis* as a synonym of *C. alba*. *Carex ussuriensis* Komarov, from extreme northeast Asia, sometimes treated as a subspecies of *C. alba*, has the perigynia mostly 3–3.3 mm long and a long and lax inflorescence. *Carex eburnea* Boott is widespread in North America, ranging from Alaska, British Columbia, Montana, and Nebraska eastward to Newfoundland and New Jersey, and southward to South Carolina and Arkansas at higher elevations. It is readily distinguished from the Eurasian species by the sessile or subsessile staminate spike 3–10 mm long and the perigynia 1.5–2.2(–2.4) mm long.

Plants determined as *Carex eburnea* were first collected in western Texas in 1931 and again in 1958, but Correll and Johnston (1970) noted that they differed from typical *C. eburnea* in having larger pistillate scales and larger perigynia. These collections were made in late July, when the fruits were fully mature; consequently, once dried, the perigynia and pistillate scales had mostly fallen off the plants. Fortunately, in some of the mounted specimens this material had been preserved in packets. Enquiries sent to herbaria in Texas revealed that this plant had been collected on two subsequent occasions, probably from the same station, the south branch of McKittrick Canyon in Guadalupe Mountains National Park, by T. L. Burgess (flowering material in March 1975 and fruiting material in July 1976 (TEX)). These additional collections made it possible to more thoroughly compare the Texas population with *C. eburnea* from elsewhere in North America.

Throughout North America *Carex eburnea* shows relatively little geographic variation. Plants from the extremes of its range are essentially indistinguishable from each other. However, the Texas population differs from *Carex eburnea* in a number of quantitative characters. The most important of these are the staminate scales 3.5–6.5 mm long (vs. 2.8–4 mm), the anthers 2–2.2 mm long (vs. 1.3–1.8 mm), the pistillate scales 2.1–3.5 mm long (vs. 1.0–2.0 mm), the perigynia 2.2–2.9 mm long (vs. 1.5–2.2(–2.4) mm), and the perigynium beak 0.5–0.7 mm long (vs. 0.2–0.4(–0.5) mm). The Texas plants are generally more robust than *Carex eburnea*, but in vegetative features they are not consistently distinguishable. There are two qualitative characters that may aid in distinguishing the Texas plants, although they do not give an absolute separation. The pistillate scales about equal or are only slightly shorter than the perigynia in the Texas plants, while in *Carex eburnea* the scales are usually much shorter than the perigynia. The perigynia are also distinctly nerved in the Texas plants, while in *Carex eburnea* mature perigynia range from almost nerveless to moderately strongly nerved. It

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Table 1. List of characters and acronyms used in Principal Components Analysis.

Achene length (mm)	ACHL
Achene width (mm)	ACHW
Perigynium beak length (mm)	BKL
Perigynium length (mm)	PERL
Perigynium width (mm)	PERW
Perigynium widest point (mm from base)	PERWP
Pistillate scale length (mm)	PSCL
Pistillate scale width (mm)	PSCW
Staminate scale length (mm)	STSCL
Staminate scale width (mm)	STSCW
Stem height (cm)	STHT

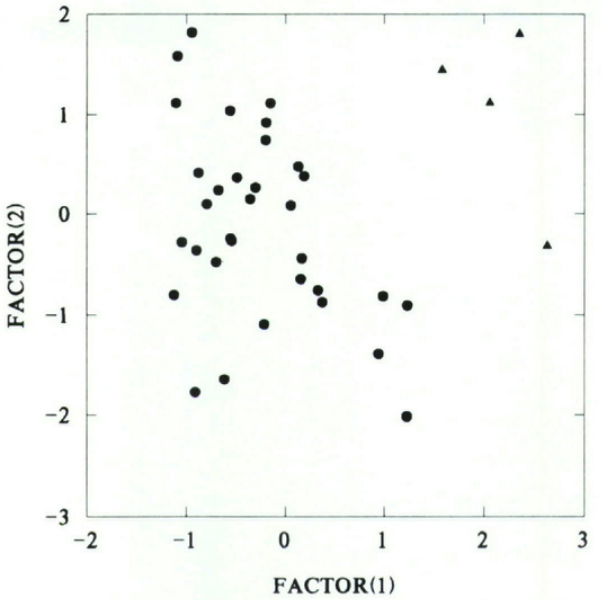

Figure 1. Bivariate plot of scores of OTUs of *Carex eburnea* (circles) and *C. mckittrickensis* (triangles) on principal components 1 and 2.

should be noted that the anther length measurements reported here are based on limited samples. The size for the Texas plants is based entirely on one collection, *Burgess 3002* (TEX), a collection of flowering plants taken in March. The difference between the Texas plants and *Carex eburnea* in staminate scale size suggests that there is probably a significant difference between the two in anther size, but it is not yet certain that this is an absolute difference which can reliably distinguish them.

In order to obtain an overall evaluation of the Texas population, a principal components analysis, utilizing the characters listed in Table 1, was undertaken using SYSTAT 5.0 (Wilkinson, 1990). The data used in this analysis were standardized to zero mean and unit variance. The analysis included 4 specimens of *Carex eburnea* from Texas and 33 specimens from Alberta, Montana, and western Northwest Territories east and south to Newfoundland, North Carolina, Alabama, and Arkansas. A bivariate plot of the scores of individual specimens on the first two components is shown in Figure 1. The first component accounted for over 44% of the variance in the data set with PERL, PSCL, STHT, PERWP, ACHL, and STSCL having high loadings. The second component accounted for a further 14% of the variance with PSCW, ACHW, and PERW with high loadings. These latter characters for the most part do not distinguish the Texas plants from *Carex eburnea*.

It seems reasonable to conclude that the Texas plants should be treated as a distinct species. They consistently differ from *Carex eburnea* in several morphological characters, and in some respects seem to be intermediate between this species and the Eurasian species of section *Albae*. The only known locality is over 1000 km disjunct from the nearest station for *C. eburnea* to the east in northern Arkansas, and further still from the nearest stations to the north in southern British Columbia, Montana, and northern Nebraska.

Carex (sect. *Albae*) **mckittrickensis** P. W. Ball, sp. nov. TYPE: U.S.A. Texas: Culberson Co., Guadalupe Mountains, S fork of McKittrick Canyon, 2 July 1958, *D. S. Correll & I. M. Johnston 19187* (holotype, TEX (LL); isotypes, BRIT, MICH, NC). Figure 2.

Plantae cespitosae, rhizomatibus; culmi 22–35 cm alti. Folia 3–4; laminae ad 17 cm longae, 0.5–1 mm latae, filiformes. Spicae 3–5; spica terminalis 4.5–7 mm longa, 0.7–0.9 mm lata, omnino mascula, subsessilis, spicas superas laterales non superans; spicae laterales 6–7 mm longae, 1.5–3 mm latae, omnino femineae, in pedunculis erectis ad 16 mm longis portatae. Squamae masculae 3.5–6.5 mm longae, 1.2–1.8 mm latae; antherae 2.0–2.2 mm longae. Squamae femineae 2.1–3.5 mm longae, 0.9–1.4 mm latae, oblongo-ovatae ad late ovatae. Perigynia 2.2–2.9 mm longa, 0.9–1.1(–1.2) mm lata, in rostrum 0.5–0.7 mm longum abrupte contracta. Achenium 1.6–1.9 mm longum, 0.8–1.1 mm latum, late obovoideo-ellipsoideum.

Plant caespitose with a few long rhizomes; glabrous. Fruiting stems 22–35 cm high, erect, exceeding the leaves, covered with light brown to reddish brown bladeless sheaths at the base; essentially round in cross section, 0.5–1 mm diam., with slender ridges, smooth, with 3–4 blade-bearing leaves in the lower ⅕. Leaf blades up to 17 cm long, 0.5–1 mm wide, filiform or inrolled, smooth except for teeth near the apex; sheaths up to 20 mm long, the inner band white or pale brown, membranous; ligule truncate to shortly triangular. Inflorescence with 3–5 spikes, the terminal staminate,

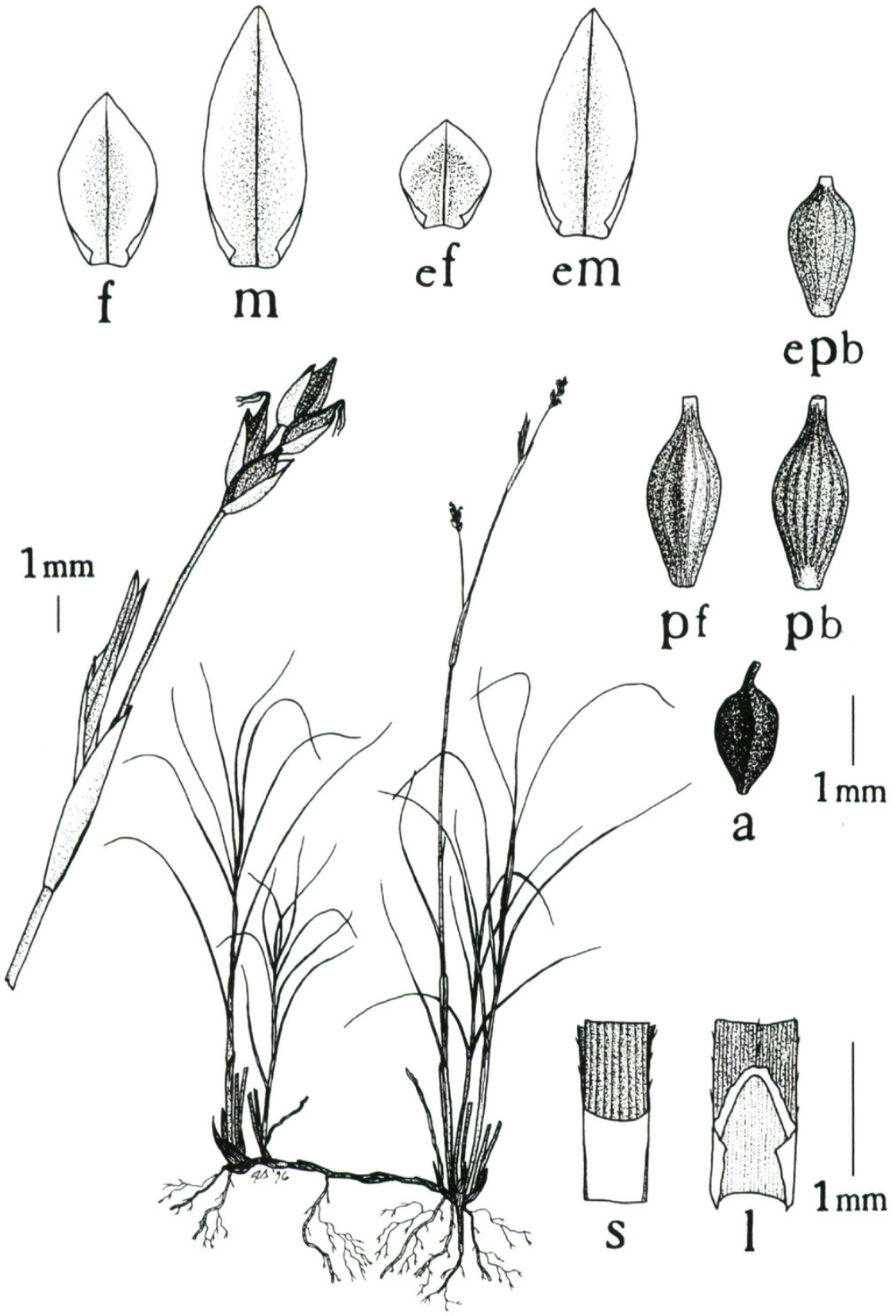

Figure 2. *Carex mckittrickensis* P. W. Ball. Habit, inflorescence, female (pistillate) scale (f), male (staminate) scale (m), perigynium front (adaxial face) (pf), perigynium back (abaxial face) (pb), achene (a), sheath front (s), ligule (l). *Carex eburnea.* Female (pistillate) scale (ef), male (staminate) scale (em), perigynium back (abaxial face) (epb).

Table 2. Comparison of characters of species of *Carex* sect. *Albae*.

Characters	*C. eburnea*	*C. mckittrickensis*	*C. ussuriensis*	*C. alba*	*C. alba* (Siberia)
Bract length (mm)	usually 0	usually 0	0–30	0–10	0
Staminate spike peduncle length (mm)	0–1	0–1	10–50	7–20	2–9
Staminate spike length (mm)	3–10	4.5–7	9–14	(5–)10–15	7–10
Staminate scale length (mm)	2.6–4	3.5–6.5	3.7–6.0	5.0–6.0	ca. 5.5
Anther length (mm)	1.3–1.8	2.0–2.2	3.1–4	3.0–5.0	n/a
Pistillate scale length (mm)	1.0–2.0	2.1–3.5	2.2–3.0	2.6–3.6	1.5–1.7
Perigynium length (mm)	1.5–2.2(–2.4)	2.2–2.9	(2.5–)3–3.3(–3.7)	2.8–4.0	2.1–2.5
Perigynium beak length (mm)	0.2–0.4(–0.5)	0.5–0.7	0.4–0.6	0.4–0.7	0.1–0.2
Achene length (mm)	1.4–1.8	1.6–1.9	1.7–2.2	2.1–2.5	ca. 1.7

appearing sessile, with the peduncle included in or exserted not more than 1 mm from the sheath of the distal bract; lateral spikes pistillate with peduncles up to 10–16 mm long; bracts bladeless, sheaths 4–10 mm long. Staminate spikes 4.5–7 mm long, 0.7–0.9 mm wide, with 3–4 flowers, usually overtopped by the distal pistillate spikes; staminate scales 3.5–6.5 mm long, 1.2–1.8 mm wide, oblong-ovate, acute or subobtuse, membranous, white-hyaline, with a thin brown midvein; anthers 2.0–2.2 mm long. Pistillate spikes with 3–5 flowers, the proximal spike 6–7 mm long, 1.5–3 mm wide, erect; pistillate scales 2.1–3.5 mm long, 0.9–1.4 mm wide, elliptic-obovate to broadly ovate, acute or subobtuse, white hyaline to light brown with a hyaline margin, with a green to brown midvein, slightly shorter than to about equaling the perigynia. Perigynia 2.2–2.9 mm long, 0.9–1.1(–1.2) mm wide, elliptic-obovate, widest above the middle of the body, tapering to the base, abruptly contracted to the beak, light to medium brown or black when mature, ± trigonous with rounded angles, distinctly 12–15-nerved; beak 0.5–0.7 mm long, straight or bent, entire or emarginate, smooth. Achenes 1.6–1.9 mm long, 0.8–1.1 mm wide, broadly obovoid-ellipsoid, trigonous, dark brown to black, minutely papillose, ± filling the perigynium body; style enlarged in the proximal half, deciduous. Stigmas 3.

A comparison of the Texas plants with *Carex eburnea*, *C. alba*, and *C. ussuriensis* is shown in Table 2. The data for *Carex alba* and *C. ussuriensis* were derived from Anon. (1976), Chater (1980), Charkevicz (1988), Voroschilov (1965), and Kreczetowicz (1935), and a limited number of specimens available in TRT and MICH. The single Asian specimen of *Carex alba* that was seen is shown separately, as it differed in a number of important characters from the descriptions of Asiatic Russian plants (particularly Charkevicz (1988) and Voroschilov (1965)) and from European specimens. In some features, particularly staminate and pistillate scale lengths and perigynium beak length, *Carex mckittrickensis* is more similar to the Eurasian species than to *C. eburnea*. In other characters, such as anther length and perigynium length, it is intermediate between *Carex eburnea* and the Eurasian species. Finally, in characters such as staminate peduncle length, staminate spike size, and achene size, *Carex mckittrickensis* and *C. eburnea* are identical and differ from the Eurasian species.

The single Asian specimen of *Carex alba* that was seen is intermediate between European *C. alba* and *C. eburnea* in a number of characters (Table 2), although it can still be distinguished from both *C. eburnea* and *C. mckittrickensis*. It seems desirable to further investigate *Carex alba* in Asia to determine whether these populations should be afforded taxonomic recognition.

Ecologically, *Carex mckittrickensis* appears to be very similar to *C. eburnea*. It occurs on the sides of steep ravines and in the herb layer of riparian forest dominated by *Acer* and *Quercus* species. *Carex eburnea* often occurs in similar situations, although more usually in mixed forest or conifer forest, especially that dominated by *Thuja*. However, it can also occur in more open habitats such as on stabilized sand dunes and on alvars. Generally, *Carex eburnea* is associated with calcareous substrata. While no information is directly available on the soil in which *Carex mckittrickensis* occurs, the fact that one of the dominant trees in the forest is reported to be *Quercus muehlenburgii* suggests that the soil is neutral or base-rich. Another, possibly significant, feature of the forest in which *Carex mckittrickensis* occurs is that the two apparently dominant trees are elsewhere allopatric, their distributions overlapping only in western Texas and in a few places in Nevada and the adjacent areas of

northern Mexico. *Carex mckittrickensis* should be searched for in these areas and perhaps also further south in Mexico where other eastern North American trees occur.

Paratypes. U.S.A. **Texas:** Culberson Co.: Guadalupe Mountains National Park, South McKittrick Canyon, ca. 0.4 km SW of Turtle Rock, ca. 2.4 km S, 0.9 km W of Pratt Lodge, elev. 5500 ft., 20 Mar. 1975, *T. L. Burgess 3002* (TEX); 2.3 km S, 0.8 km W of Pratt Lodge. elev. 5500 ft., 23 July 1976, *T. L. Burgess 4158* (TEX); along creek, alt. 1980 m, 22 July 1931, *Moore & Steyermark 3575* (MICH).

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