



Notes on *Carex* (Cyperaceae) from China: three new species

YING-YING ZHOU & XIAO-FENG JIN*

College of Life & Environment Sciences, Hangzhou Normal University, Hangzhou, Zhejiang 310036, People's Republic of China.
Corresponding author (docxfjin@163.com)

Abstract

Carex remotistachya, *C. daxinensis* and *C. fangiana*, three new species from China, are described and illustrated. *Carex remotistachya* resembles *C. doniana* (sect. *Molliculae*), differing by having spikes remote, staminate spikes with a 3–5 cm long peduncle at the base, leaves 3–6 mm wide, and stigmas shorter than perigynia. *Carex daxinensis* is similar to *C. caudispicata* (sect. *Radicales*), but differs in having perigynia ellipsoid-ovoid, 4–4.5 mm long, staminate parts of spikes shorter than pistillate ones, and leaves 2–3.5 mm wide. *Carex fangiana* is similar to *C. nitiditriculata* (sect. *Hymenochlaenae*), differing by having leaves 6–9 mm wide, staminate spike solitary, and perigynia glabrous.

Key words: *Carex daxinensis*, *C. fangiana*, *C. remotistachya*, Cyperaceae, new species, taxonomy

Introduction

The genus *Carex* Linnaeus (1753: 972), a group of perennial grass-like plants, contains four subgenera: subg. *Vigneastra* (Tuckerman 1843: 10) Kükenthal (1899: 516), subg. *Vigneae* (B. Beauvois in T. Lestiboudois 1819: 22) Petermann (1849: 602), subg. *Psyllophora* (Degland 1828: 285) Petermann (1849: 581) and subg. *Carex* (Waterway & Starr, 2007). Recent studies show these subgenera to be largely polyphyletic or paraphyletic, with the exception of subg. *Vigneae* (Waterway & Starr, 2007). In China, the genus is represented by 527 species, of which 260 species are endemic (Dai *et al.*, 2010). It is one of the largest genera of seed plants in China (Wu *et al.*, 2011). Our ongoing field collection and specimen examination in China have resulted in the discovery of fourteen new taxa of *Carex* (Jin 2009, Jin & Zheng 2008, 2010, Jin *et al.* 2003, 2004, 2005a, 2005b, 2011, 2012), as well as a few distribution provincial records (Zhao *et al.* 2011, 2012). In the present paper, we describe three new species from eastern and south-western China, and name them *Carex remotistachya*, *C. daxinensis* and *C. fangiana*. All three are narrow endemics, and may be appropriate for listing as threatened taxa, following IUCN guidelines.

Taxonomic treatment

Carex remotistachya Y. Y. Zhou & X. F. Jin, *sp. nov.* (Figure 1)

Species nova C. donianae Spreng. *affinis est, a qua spikes inter se remotis, spikes staminatis pedunculos 3–5 cm longos gerentibus, foliis 3–6 mm latis, stigmatibus perigyniis brevioribus differt.*

Type:—CHINA. Zhejiang Province: Pan'an County, Shanghu Township, Sanhuang, 120°36'18.75"E, 29°07'17.09"N, along stream beside forests, elevation 450 m, 16 May 2012, X. F. Jin 2872 (holotype HTC!, isotype ZM!).

Perennial herbs. Rhizomes indurate, with slender stolons. Culms 40–60 cm tall, acutely trigonous, scabrous, with brownish bladeless sheaths at base (aphyllopodic). Leaves shorter than culms, or nearly equal in length; blades 3–6 mm wide, flat, scabrous on upper margins. Involucral bracts leaflike or shortly leaflike, lower ones longer than spikes, uppers nearly equaling spikes, not sheathed. Spikes 3 or 4, remote; terminal spike staminate, clavate, 3–4.5 cm long, ca. 3 mm wide, with a 3–5 cm long peduncle at base; lateral spikes pistillate, cylindrical, 2.5–5 cm long, 6–8 mm wide, densely flowered, the lowest long pedunculata, upper ones shorter. Staminate scales oblong-

oblanceolate, pale brown, 4–4.5 mm long, acute at apex, green 1-veined costa. Pistillate scales oblong-ovate, pale green or whitish green, 2–2.5 mm long, acuminate at apex, green 1-veined costa excurrent into a mucronate. Perigynia longer than pistillate scales, horizontally patent at maturity, ovoid, trigonous, slightly inflated, 3.5–4 mm long, yellowish green, glabrous, distinctly veined, base broadly cuneate, gradually contracted into a short beak at apex; orifice 2-lobed with short teeth. Achenes loosely enveloped, obovoid-ellipsoid, trigonous, castaneous, ca. 1.5 mm long, not stipitate at base; style not thickened at base; stigmas 3, slender, 1.5–2 mm long, persistent.

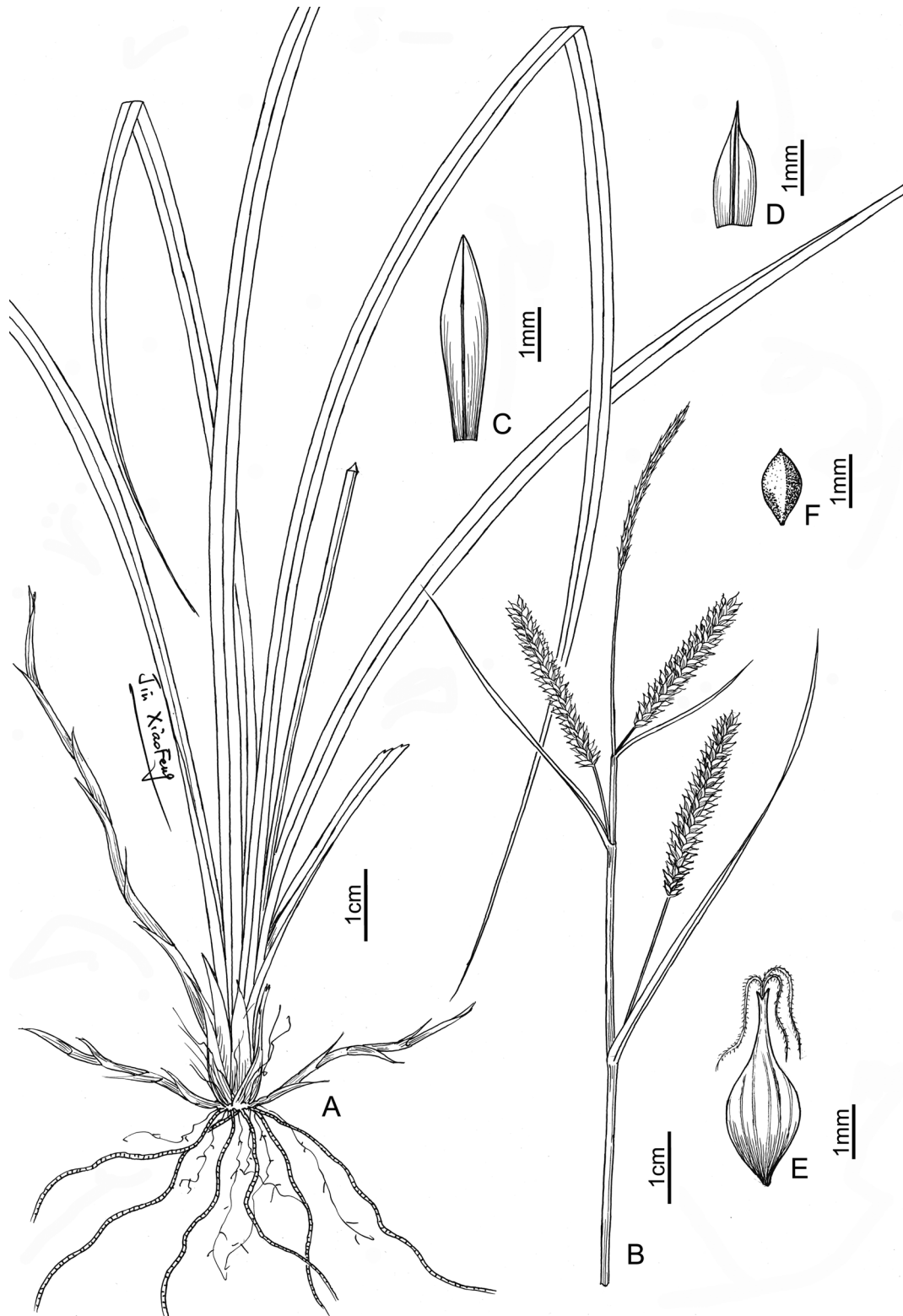


FIGURE 1. *Carex remotistachya* Y. Y. Zhou & X. F. Jin, *sp. nov.* (A) habit, lower part with rhizomes, roots and leaves; (B) inflorescence; (C) staminate scale; (D) pistillate scale; (E) perigynium; (F) achene (drawn by Xiao-Feng Jin from holotype in HTC).

Distribution & Habitat:—Endemic to China. The species is known only from Shanghu Township, Pan'an County of central Zhejiang Province (Figure 2). It grows in moist places along streams at ca. 450 m elevation.

Phenology:—Flowers and fruits of *Carex remotistachya* were collected from mid-May to early June.

Etymology:—The specific epithet refers to the remote spikes, not aggregated at the top of culms.

Additional collections (paratypes):—CHINA. Zhejiang Province: Pan'an County, Shanghu Township, Sanhuang, 120°36'18.75"E, 29°07'17.09"N, along stream, elevation 450 m, 2 June 2012, *X. F. Jin* 2880 (HTC!), 2881 (HTC!), 2882 (HTC!), the same locality, 17 May 2013, *X. F. Jin & Y. Y. Zhou* 3016 (HTC!, ZM!), 3017 (HTC!, ZM!).

Similar species:—*Carex remotistachya* belongs to *C. sect. Molliculae* Ohwi (1936: 450), characterized by having medium-sized perigynium beaks, rhizomes stoloniferous, spikes densely flowered and perigynia yellowish green or stramineous. It is morphologically similar to *C. doniana* Spreng. (1826: 825), but differs in having spikes remote, peduncles of staminate spikes 3–5 cm long, leaves 3–6 mm wide, persistent stigmas shorter than perigynia. In contrast, *C. doniana* has approximate spikes, peduncles of staminate spikes only 0.5–3 cm long, leaves 6–12 mm wide, persistent stigmas nearly equaling to perigynia.



FIGURE 2. Distribution map of *Carex remotistachya* (■), *C. daxinensis* (◆) and *C. fangiana* (●) *sp. nov.*

***Carex daxinensis* Y. Y. Zhou & X. F. Jin, *sp. nov.* (Figure 3)**

Species nova est proxima C. caudispicatae F. T. Wang & Tang ex P. C. Li, a qua perigyniis ellipsoideo-ovoidis, 4–4.5 mm longis, spicae partibus florum staminatorum e ejus apice exertis, eis florum pistillatorum brevioribus, foliis 2–3.5 mm latis recedit.

Type:—CHINA. Guangxi Zhuangzu Autonomous Region: Daxin County, Leiping Township, Mt. Xiaoxuan, 107°05'29.18"E, 22°38'39.65"N, in thickets, elevation 220 m, 19 May 2013, *X. F. Jin & Y. Y. Zhou* 3026 (holotype, HTC!, isotype, ZM!).

Perennial herbs. Rhizomes short, indurate. Culms loosely caespitose, (3-)10–50 cm tall, trigonous, 0.5–1 mm thick, smooth. Leaves longer to slightly shorter than culms; blades 2–3.5 mm wide, flat, stiff, with dark brown sheaths at base. Involucral bracts linear, nearly equaling or slightly shorter than inflorescence, sheathless. Spikes 1–3,

androgynous, cylindrical, 1–2 cm long, 3–4 mm wide, densely flowered, staminate parts shorter than pistillate ones; lateral spikes exerted from middle part of culms, with erect short peduncles. Staminate scales ovate, ca. 2 mm long, acute at apex, subleathery, green 1-veined. Pistillate scales ovate, ca. 3 mm long, acute at apex, subleathery, membranous at margins, pale green laterally, green 1-veined costa. Perigynia longer than pistillate scales, green, ovoid, trigonous, 4–4.5 mm long, subleathery, distinctly veined, sparsely pubescent at margins, cuneate at base, gradually contracted into a short beak at apex; orifice shortly 2-lobed with minute teeth. Achenes dark brown at maturity, obovoid, compressed trigonous, 2.5–3 mm long, abruptly contracted into a short stipe at base; style slightly thickened at base, trigonous, conic, sparsely pubescent; stigmas 3.

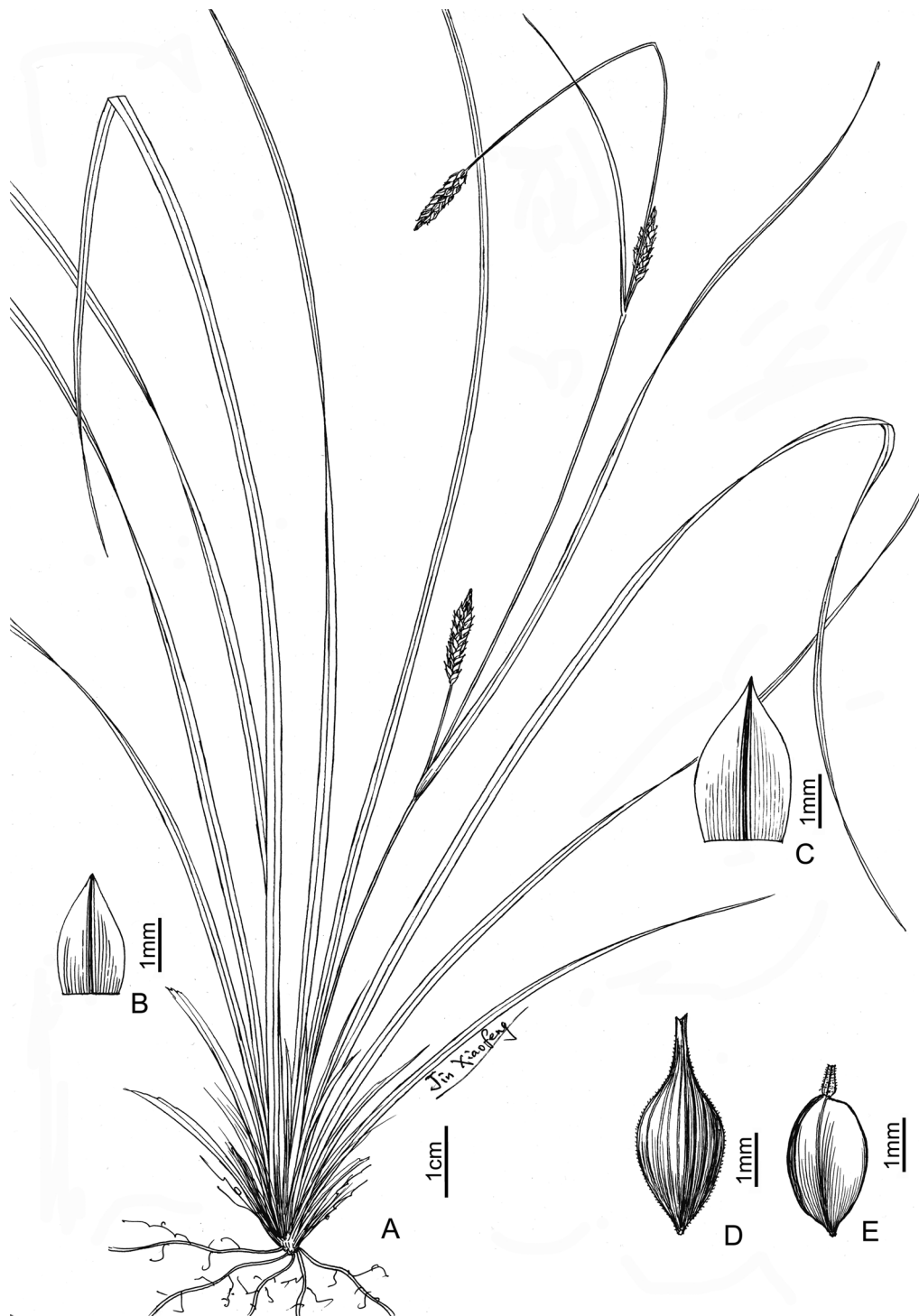


FIGURE 3. *Carex daxinensis* Y. Y. Zhou & X. F. Jin, *sp. nov.* (A) habit; (B) staminate scale; (C) pistillate scale; (D) perigynium; (E) achene (drawn by Xiao-Feng Jin from holotype in HTC).

Distribution & Habitat:—Endemic to China. The species is known from the limestone mountains of the back of Leiping Township, Daxin County of Guangxi Zhuangzu Autonomous Region (Figure 2), and it grows in thickets on slope at 190–260 m elevation.

Phenology:—Flowers and fruits of *Carex daxinensis* were collected in May.

Etymology:—The specific epithet refers to “Daxin”, the locality of the collection.

Additional collections (paratypes):—CHINA. Guangxi Zhuangzu Autonomous Region: Daxin County, Leiping Township, Mt. Xiaoxuan, 107°05'32.72"E, 22°38'39.22"N, in thickets on slope, elevation 200 m, 19 May 2013, X. F. Jin & Y. Y. Zhou 3023 (HTC!, ZM!).

Similar species:—*Carex daxinensis* evidently belongs to *C.* sect. *Radicales* (Kükenthal 1909: 480) Nelmes (1951: 389), characterized by having short perigynium beaks, involucre bracts leaf-like, spikes androgynous, styles thickened at base. It is similar to *C. caudispicata* F. T. Wang & Tang ex P. C. Li (1999: 170) in having leaf-like involucre bracts, leaves and culms stiff, spikes cylindrical, but differs by perigynia ellipsoid-ovoid, 4–4.5 mm long, staminate parts of spikes shorter than pistillate ones, leaves 2–3.5 mm wide. Characters distinguishing *C. daxinensis* from the related species from China are summarized in the key. The related species distribute from Hengduan Mountains to south-eastern Yunnan, with the exception of *C. funhuangshanica* F. T. Wang & Tang ex P. C. Li (1999: 168), which indicates this new species is allopatric.

Key to *Carex daxinensis* and the related species of sect. *Radicales* in China

1. Leaves subleathery, stiff; culms stiff..... 2
- Leaves herbaceous, soft; culms thin..... 5
2. Spikes ovoid; perigynia 6–6.5 mm long *C. pterocaulos*
- Spikes cylindrical; perigynia 4–5.5 mm in length 3
3. Leaves ca. 1 mm wide; achenes granular-punctate on surfaces..... *C. anningensis*
- Leaves 2–4 mm wide; achenes smooth on surfaces 4
4. Perigynia ellipsoid-ovoid, 4–4.5 mm long; spikes with a staminate part shorter than pistillate one..... *C. daxinensis*
- Perigynia ovoid, 5–5.5 mm long; spikes with a staminate part slightly shorter or equaling pistillate one..... *C. caudispicata*
5. Perigynia obovoid, glabrous; styles thickened and conic at base; leaves 2–4 mm wide *C. funhuangshanica*
- Perigynia oblong, pubescent; styles slightly thickened at base; leaves 4–10 mm wide *C. speciosa*

Carex fangiana X. F. Jin & Y. Y. Zhou, *sp. nov.* (Figure 4)

Haec species nova C. nitidiutriculatae L. K. Dai similis est, sed foliis 6–9 mm latis, spicis staminatis solitariis, perigyniis glabris distingitur.

Type:—CHINA. Sichuan: Baoxing County, Fengtongzhai, Qingshangou, roadside, elevation ca. 1800 m, 7 June 1982, Z. B. Cheng, Y. T. Wu & M. G. Gao 116458 (holotype SZ!, isotype SZ!).

Rhizome short, ligneous, stiff, with many fibrous adventitious roots. Culms 40–65 cm tall, trigonous, smooth, with brown short-bladed sheaths at base. Leaves shorter than culms, or nearly equal in length, 6–9 mm wide, flat, adaxially scabrous, abaxially smooth but scabrous on upper parts. Involucral bracts leaflike, nearly equaling inflorescence, sheathed; sheaths 1–6 cm long, with the lowest longer than others. Spikes 6 or 7; terminal spike staminate, linear-cylindrical, 4–5 cm long, 2.5–3 mm wide, with a 2–2.5 cm long peduncle at base; lateral spikes androgynous, cylindrical, 3–8 cm long, 6–7 mm wide, with a 1–2 cm long staminate part at apex, pedunculate at base. Staminate scales, elliptic-lanceolate, pale brown, 6–6.5 mm long, acuminate and short-awned at apex, greenish brown 1-veined costa. Pistillate scales, narrowly ovate, 5–6 mm long, lower ones to 7 mm long (including awn), pale brown, acuminate at apex, with a 2.5–3 mm long scabrous awn. Perigynia nearly equaling pistillate scales, ellipsoid-obovoid, obtusely trigonous, brown, shiny, glabrous, distinctly veined, 7–7.5 mm long, cuneate and shortly stipitate at base, gradually contracted into a ca. 3 mm long beak at apex; orifice 2 lobed with short teeth. Achenes obovoid, trigonous, yellow, 2.5–3 mm long, ca. 1.5 mm wide, cuneate at base, abruptly contracted into a short beak at apex; style not thickened at base; stigmas 3.

Distribution & Habitat:—The species is only known from type locality, Fengtongzhai, Baoxing County of Sichuan Province (Figure 2). It grows by roadside at ca. 1800 m elevation.

Phenology:—According to the collection notes, flowers and fruits of *Carex fangiana* were in early June.

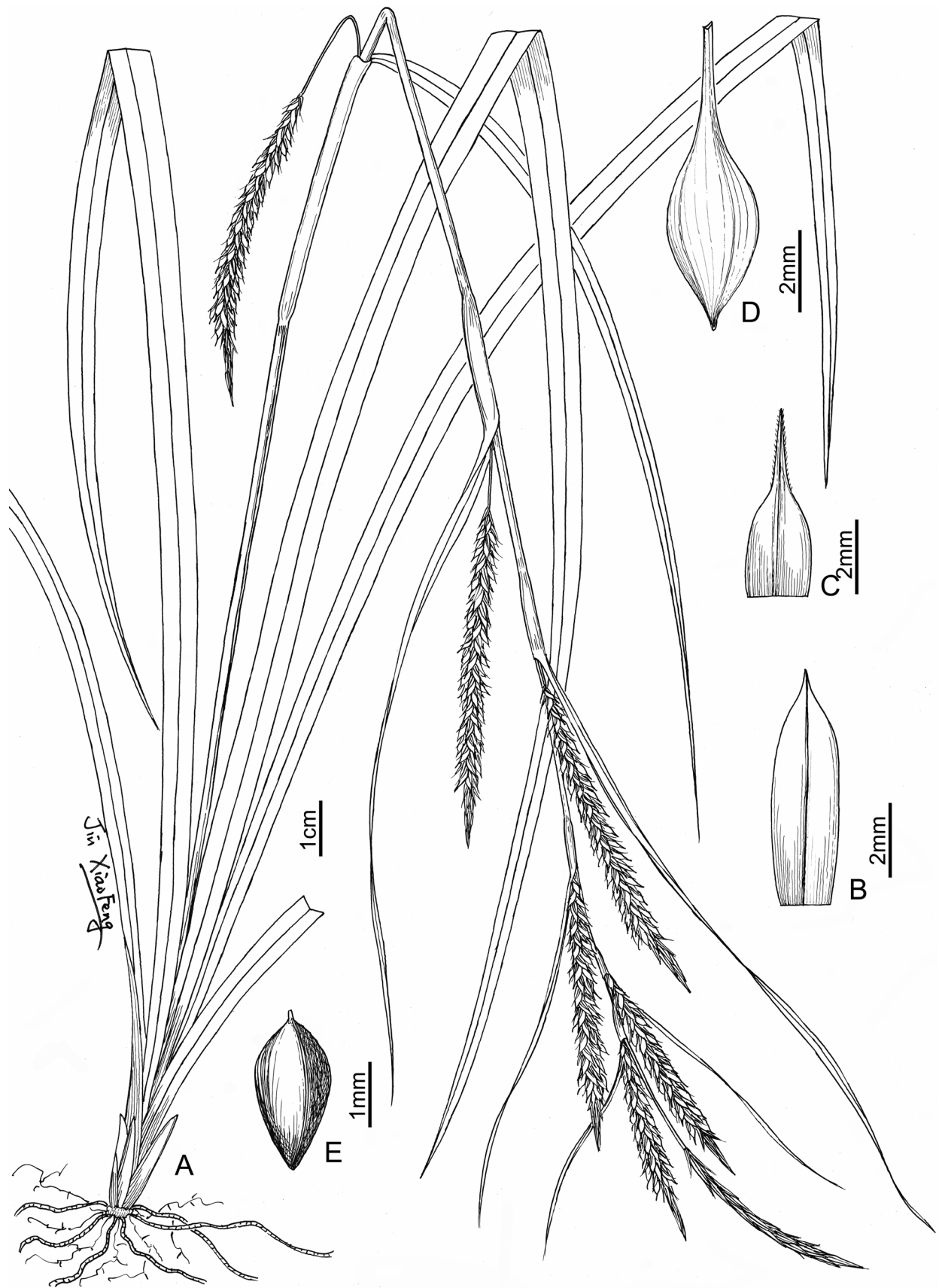


FIGURE 4. *Carex fangiana* X. F. Jin & Y. Y. Zhou, *sp. nov.* (A) habit; (B) staminate scale; (C) pistillate scale; (D) perigynium; (E) achene (drawn by Xiao-Feng Jin from holotype in SZ).

Etymology:—The species is named in honor of Professor Wen-Pei Fang (1899-1983), who devoted his professional life to the study of Chinese *Rhododendron* L. (Ericaceae) and *Acer* L. (Aceraceae). Prof. Fang was one of the early founders of Herbarium of Sichuan University (SZ).

Similar species:—*Carex fangiana* belongs to *C.* sect. *Hymenochlaenae* (Drejer 1844: 10) L. H. Bailey (in Coulter 1885: 379), characterized by having long perigynium beaks, culms central, perigynia frequently membranaceous, shiny, style not thickened at base. It is morphologically similar to *C. nitidiutriculata* L. K. Dai (1999: 186), a species endemic to eastern Yunnan of China, but differs in having staminate spike solitary, perigynia glabrous, and leaves 6–9 mm wide. Characters distinguishing *C. fangiana* from *C. nitidiutriculata* are summarized in Table 1.

TABLE 1. Diagnostic characters distinguishing *Carex fangiana* from *C. nitidiutriculata*.

| Characters | <i>C. fangiana</i> | <i>C. nitidiutriculata</i> |
|-------------------|---|--|
| leaf | 6–9 mm wide, adaxially scabrous | 3–5 mm wide, adaxially smooth |
| involucral bracts | nearly equaling inflorescence | longer than inflorescence |
| staminate spike | solitary, 4–5 cm long | one or two, 1–3 cm long |
| perigynium | nearly equaling pistillate scale, brown, glabrous | much longer than pistillate scale, pale yellowish green, spinulose on beak margins |
| achene | obovoid | obovoid-ellipsoid |

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