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## Miscellaneous Notes on *Carex* (Cyperaceae) from Guangxi (Post-print)

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### Abstract

To achieve a more comprehensive understanding and recognition of the species diversity of the genus *Carex* in Guangxi, this paper systematically compiled the species diversity of *Carex* in Guangxi based on field investigations, herbarium specimen studies, and literature review, discovering and reporting 20 newly recorded species for Guangxi, namely *Carex bodinieri* Franch., *Carex dayuonensis* Z. P. Wang, *Carex foraminata* C. B. Clarke, *Carex gongshanensis* Tang & F. T. Wang ex Y. C. Yang, *Carex henryi* (C. B. Clarke) T. Koyama, *Carex jizhuangensis* S. Yun Liang, *Carex longipes* D. Don, *Carex manciformis* C. B. Clarke ex Franch., *Carex metallica* H. Lév., *Carex olivacea* Boott, *Carex orbicularinucis* L. K. Dai, *Carex oxyphylla* Franch., *Carex phoenicis* Dunn, *Carex pseudotristachya* X. F. Jin & C. Z. Zheng, *Carex remotistachya* Y. Y. Zhou & X. F. Jin, *Carex rugata* Ohwi, *Carex sinodissitiflora* Tang & F. T. Wang ex L. K. Dai, *Carex tsaiiana* F. T. Wang & Tang ex P. C. Li, *Carex tungfangensis* L. K. Dai & S. M. Huang, and *Carex wuyishanensis* S. Yun Liang. The discovery of these newly recorded species in Guangxi not only enriches the species diversity of *Carex* plants in Guangxi, but also provides more comprehensive baseline data for subsequent research and utilization of this genus.

### Full Text

## New Records of *Carex* L. (Cyperaceae) from Guangxi, China

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## Abstract

To achieve a more comprehensive understanding of species diversity within *Carex* in Guangxi, this study systematically compiled taxonomic data based on field investigations, herbarium specimen examinations, and literature reviews. We report 20 newly recorded *Carex* species from Guangxi: *Carex bodinieri* Franch., *C. dayuogensis* Z. P. Wang, *C. foraminata* C. B. Clarke, *C. gongshanensis* Tang & F. T. Wang ex Y. C. Yang, *C. henryi* (C. B. Clarke) T. Koyama, *C. jizhuangensis* S. Yun Liang, *C. longipes* D. Don, *C. manciiformis* C. B. Clarke ex Franch., *C. metallica* H. Lév., *C. olivacea* Boott, *C. orbicularinucis* L. K. Dai, *C. oxyphylla* Franch., *C. phoenicis* Dunn, *C. pseudotristachya* X. F. Jin & C. Z. Zheng, *C. remotistachya* Y. Y. Zhou & X. F. Jin, *C. rugata* Ohwi, *C. sinodisitiflora* Tang & F. T. Wang ex L. K. Dai, *C. tsaiana* F. T. Wang & Tang ex P. C. Li, *C. tungfangensis* L. K. Dai & S. M. Huang, and *C. wuyishanensis* S. Yun Liang. The discovery of these species enriches the documented diversity of *Carex* in Guangxi and provides valuable baseline data for future research and utilization of this genus.

**Keywords:** Cyperaceae, *Carex*, new record, Guangxi, flora

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## Introduction

*Carex* L. is the largest genus in the family Cyperaceae Juss., comprising approximately 2,000 species worldwide (Dai et al., 2010; Roalson et al., 2021). According to recent research, China hosts 632 recorded *Carex* species, making it the most species-rich genus in the family (Li Bangze and Zhang Shuren, 2024). Previous reports documented 100 *Carex* species from Guangxi, including eight endemic to the region (Lu Zhaoen et al., 2023). In recent years, large-scale scientific surveys conducted in Guangxi, including the fourth national census of traditional Chinese medicine resources and comprehensive scientific investigations of protected areas, have drawn increasing attention to the rich species diversity of *Carex*. Notably, a new species, *C. duanensis* Z. C. Lu, Y. F. Lu & X. F. Jin, was recently described from the Guangxi section of the Southwest Karst National Park creation area (Lu et al., 2024). Systematic examination of *Carex* specimens housed at the Guangxi Herbarium (IBK) has revealed an additional 20 species previously unrecorded from the region, which we report herein.

## 1. Materials and Methods

Our research on *Carex* in Guangxi integrated field surveys with laboratory specimen identification. Fieldwork was conducted alongside various research and survey projects, during which we collected *Carex* specimens, recorded geographic coordinates, documented habitat and species characteristics, photographed plants in situ and their morphological details, and prepared herbarium specimens. Laboratory identification involved morphological observation of herbarium specimens and consultation of relevant literature (Dai Lunkai et al., 2000; Dai et al., 2010; Qin Haining and Liu Yan, 2010; Jin & Zheng, 2013; Huang De' ai and Wei Yigang, 2016; Chen Wenli and Zhang Shuren, 2018; Jin Xiaofeng and Lu Yifei, 2021), as well as specimen images and distribution information from the Chinese Virtual Herbarium (<https://www.cvh.ac.cn/>).

### 2.1 *Carex bodinieri* Franch.

*Bull. Soc. Philom. Paris, sér. 8, 7: 85, 1895. L. K. Dai in L. K. Dai & S. Y. Liang, Fl. Reipubl. Popularis Sin. 12: 445, pl. 91: 5~7. 2000. L. K. Dai & T. Koyama in C. Y. Wu, P. H. Raven & D. Y. Hong, Fl. China 23: 436. 2010.*

Morphologically similar to *C. sendaica* Franch., but distinguished by its taller stature (culms 35-100 cm), absence of stolons, utricles 4-4.5 mm long with sparse ciliate margins.

**Voucher specimens:** Guangxi, Liujiang County, Ligao Township, Weijia Village, under broad-leaved forest on limestone, altitude 345 m, 13 August 2018, Liujiang County Census Team, 450221180813020LY (IBK); Guangxi, Leye County, Huaping Township, Zhongjing, Xiaodongwan tiankeng, under broad-leaved forest on limestone, altitude 889 m, 15 May 2019, Lu Zhaocen, Chen Hailing, Wei Sujuan, Qin Ying et al., YC4026 (IBK).

**Distribution:** Guangdong, Hunan, Guizhou, Fujian, Zhejiang, Jiangsu, Anhui, Taiwan; Japan. First record for Guangxi, China.

### 2.2 *Carex dayuogensis* Z. P. Wang

*Acta Bot. Yunnan. 11: 166. 1989. L. K. Dai, T. Koyama & G. C. Tucker in C. Y. Wu, P. H. Raven & D. Y. Hong, Fl. China 23: 341. 2010.*

Morphologically similar to *C. cardiolepis* Nees, but differs in having oblong female glumes that are pale brown and awnless, and ligulate male glumes.

**Voucher specimen:** Guangxi, Huanjiang County, Minglun Township, Baoshan Village, Xialei Tun, on limestone grassland, 25 May 2020, Qin Ying, Li Xitao, Li Jianling, Huang Jinquan, JWSQY119 (IBK).

**Distribution:** Hunan, Guizhou. First record for Guangxi.

### 2.3 *Carex foraminata* C. B. Clarke

*J. Linn. Soc. Bot.* 36: 285, 1903. Y. C. Tang in L. K. Dai & S. Y. Liang, *Fl. Reipubl. Popularis Sin.* 12: 151, pl. 31: 5~8. 2000. Y. C. Tang, S. R. Zhang, T. Koyama, et al. in C. Y. Wu, P. H. Raven & D. Y. Hong, *Fl. China* 23: 321. 2010.

Morphologically similar to *C. tungfangensis* L. K. Dai & S. M. Huang, but distinguished by lateral female spikes 5–8 cm long, utricles ca. 2 mm long with an extremely short beak, and achenes with acute apex and no annular disc.

**Voucher specimens:** Guangxi, Hezhou City, Gupo Mountain Scenic Area, en route from entrance to Gupo Summit, in valley forest, 2 April 2019, Li Jianling, Su Yulan, Liu Zhirong et al., GPS190402068 (IBK); Guangxi, Gongcheng County, Xiling Township, Fei Village, Dalinshan, on limestone hill slope, 18 February 2023, Xu Weibin, Lu Zhaoen, 15361 (IBK).

**Distribution:** Hunan, Guizhou, Fujian, Zhejiang, Jiangxi, Anhui; South Korea. First record for Guangxi, China.

### 2.4 *Carex gongshanensis* Tang & F. T. Wang ex Y. C. Yang

*Fl. Xizang* 5: 404, 1987. L. K. Dai in L. K. Dai & S. Y. Liang, *Fl. Reipubl. Popularis Sin.* 12: 444, pl. 89: 9~10. 2000. L. K. Dai & T. Koyama in C. Y. Wu, P. H. Raven & D. Y. Hong, *Fl. China* 23: 435. 2010.

Morphologically similar to *C. brunnea* Thunb., but distinguished by spikes typically 3–4 arising from the same bract sheath with sparse female flowers, elliptic utricles with a medium-length beak about 1/3 the length of the utricle, and veins and margins pubescent.

**Voucher specimen:** Guangxi, Leye County, Tongle Township, Yanglin Village, roadside, on limestone shrubby slope, altitude 1,060 m, 30 July 2023, Xu Weibin, Lu Zhaoen, Mo Minglin, Chang Shili, Huang Jinqian, 16791 (IBK).

**Distribution:** Yunnan, Xizang. First record for Guangxi.

### 2.5 *Carex henryi* (C. B. Clarke) T. Koyama

*Jap. J. Bot.* 15: 175. 1956. L. K. Dai in L. K. Dai & S. Y. Liang, *Fl. Reipubl. Popularis Sin.* 12: 439, pl. 89: 5~8. 2000. L. K. Dai & T. Koyama in C. Y. Wu, P. H. Raven & D. Y. Hong, *Fl. China* 23: 433. 2010.

Morphologically similar to *C. gentilis* Franch., but distinguished by robust stature (culms 80–140 cm), linear-cylindrical spikes 10–25 mm long arranged in a loose panicle, and ovate female glumes with acute apex.

**Voucher specimens:** Guangxi, Jingxi City, Renzhuang, Bangliang Protected Area, altitude 730 m, 18 August 2008, Sino-Plant Union Guangxi Team, 2863 (IBK); Guangxi, Tianlin County, Cenwanglaoshan Nature Reserve, Langping Station, Xia' ao Village, Longmie Tun, roadside on slope, altitude 1,380 m, 25

July 2021, Yang Ping, Pan Lunju, CWA0510 (IBK); Guangxi, Leye County, Huaping Township, Yanpeng Village, Dadongzi, dense forest on limestone slope, altitude 1,390 m, 11 October 2023, Xu Weibin, Lu Zhaoen, Chang Shili, Huang Jinquan, 17785 (IBK).

**Distribution:** Yunnan, Guizhou, Sichuan, Zhejiang, Anhui, Hubei, Shaanxi. First record for Guangxi.

## 2.6 *Carex jizhuangensis* S. Yun Liang

In L. K. Dai & S. Y. Liang, *Fl. Reipubl. Popularis Sin.* 12: 522, pl. 44: 1-4. 2000. S. Y. Liang, T. Koyama & G. C. Tucker in C. Y. Wu, P. H. Raven & D. Y. Hong, *Fl. China* 23: 350. 2010.

Morphologically similar to *C. perakensis* C. B. Clarke, but distinguished by female glumes equaling the utricles in length with obtuse apex and no awn, utricles 3-3.5 mm long densely covered with small prickles, and achenes with a curved stipe at the base.

**Voucher specimen:** Guangxi, Yizhou City, Anma Township, Latan Village, sparse forest on limestone slope, altitude 250 m, 1 May 2021, Xu Weibin, Lin Chunrui, Lu Zhaoen, 14458 (IBK).

**Distribution:** Guangdong. First record for Guangxi.

## 2.7 *Carex longipes* D. Don

*Philos. Mag. J.* 62: 455. 1823. L. K. Dai in L. K. Dai & S. Y. Liang, *Fl. Reipubl. Popularis Sin.* 12: 452, pl. 90: 4-6. 2000. L. K. Dai & T. Koyama in C. Y. Wu, P. H. Raven & D. Y. Hong, *Fl. China* 23: 438. 2010.

Morphologically similar to *C. ereica* Tang & F. T. Wang ex L. K. Dai, but distinguished by leaf blades 2-3.5 mm wide, one spike per node at the inflorescence, occasionally branched basal spikes, slender stipes on lower spikes, utricles ca. 6 mm long, and biconvex achenes.

**Voucher specimens:** Guangxi, Leye County, Huaping Township, Baiyan Dang tiangkeng and vicinity, on limestone slope, altitude 1,359 m, 17 May 2019, Lu Zhaoen, Chen Hailing, Wei Sujuan, Qin Ying et al., YC4091 (IBK); Guangxi, Leye County, Yachang Protected Area, Caowangshan, on hilltop grassland, altitude 1,341 m, 18 May 2019, Lu Zhaoen, Chen Hailing, Wei Sujuan, Qin Ying et al., YC4158 (IBK); Guangxi, Leye County, Yachang Protected Area, Caowangshan, on hilltop grassland, altitude 1,821 m, 18 May 2019, Lu Zhaoen, Chen Hailing, Wei Sujuan, Qin Ying et al., YC4193 (IBK); Guangxi, Leye County, Yachang Protected Area, Caowangshan, on hilltop grassland, altitude 1,819 m, 18 May 2019, Lu Zhaoen, Chen Hailing, Wei Sujuan, Qin Ying et al., YC4200 (IBK); Guangxi, Leye County, Yachang Protected Area, Caowangshan, on hilltop grassland, altitude 1,824 m, 18 May 2019, Lu Zhaoen, Chen Hailing, Wei Sujuan, Qin Ying et al., YC4203 (IBK); Guangxi, Leye County,

Luosha Township, Renlong Village, Dayou Tun, shrubby slope on limestone, altitude 1,330 m, 27 July 2023, Xu Weibin, Lu Zhaoen, Mo Minglin, Chang Shili, Huang Jinquan, 16661 (IBK).

**Distribution:** Yunnan, Sichuan, Hubei; Nepal, India, Indonesia. First record for Guangxi, China.

### 2.8 *Carex manciformis* C. B. Clarke ex Franch.

*Nov. Arch. Mus. Hist. Nat., sér. 3. 10: 62. 1898. S. Y. Liang, T. Koyama & G. C. Tucker in C. Y. Wu, P. H. Raven & D. Y. Hong, Fl. China 23: 388. 2010.*

Morphologically similar to *C. austrosinensis* Tang & F. T. Wang ex S. Yun Liang, but distinguished by 4-5 spikes with a terminal male spike linear, 2-3 cm long, sessile, and level with the uppermost female spike, and lateral female spikes cylindrical, 2-3.5 cm long with loosely arranged flowers.

**Voucher specimen:** Guangxi, Leye County, Huaping Township, Jiajiawan, Xuanyan tiankeng, on limestone slope, altitude 1,195 m, 16 May 2019, Lu Zhaoen, Chen Hailing, Wei Sujuan, Qin Ying et al., YC4083 (IBK).

**Distribution:** Guizhou, Sichuan, Hubei. First record for Guangxi.

### 2.9 *Carex metallica* H. Lév.

*Repert. Spec. Nov. Regni Veg. 5: 239, 1908. L. K. Dai in L. K. Dai & S. Y. Liang, Fl. Reipubl. Popularis Sin. 12: 271, pl. 51: 10-13. 2000. L. K. Dai, T. Koyama & G. C. Tucker in C. Y. Wu, P. H. Raven & D. Y. Hong, Fl. China 23: 369. 2010.*

Morphologically similar to *C. doniana* Spreng., but distinguished by terminal spikes androgynous (rarely male), elliptic utricles ca. 7 mm long with reddish-brown spots, and achenes loosely enclosed, ovate or suborbicular.

**Voucher specimens:** Guangxi, Guilin City, Seven Star Park, on limestone hill, 17 April 1992, Dian-Qian-Gui Floristic Team, 90114 (IBK); Guangxi, Guilin City, Guilin National Forest Park, on sparse forest slope, 28 March 2021, Lu Zhaoen, LZC221 (IBK), LZC222 (IBK); Guangxi, Yangshuo County, Putao Township, Bao' an Village, in dense forest, 24 April 2024, Chang Shili, Mo Minglin, Huang Jinquan, LZC2512 (IBK); Guangxi, Liujiang County, Tubo Township, Longdao Village, in sparse forest on limestone hill, altitude 330 m, 23 April 2023, Xu Weibin, Lu Zhaoen, Lin Chunrui, 15656 (IBK).

**Distribution:** Fujian, Zhejiang, Jiangsu, Taiwan; Korea, Japan. First record for Guangxi, China.

### 2.10 *Carex olivacea* Boott

*Proc. Linn. Soc.* 1: 286, 1845. *L. K. Dai in L. K. Dai & S. Y. Liang, Fl. Reipubl. Popularis Sin.* 12: 292, 2000. *L. K. Dai, T. Koyama & G. C. Tucker in C. Y. Wu, P. H. Raven & D. Y. Hong, Fl. China* 23: 376. 2010.

Morphologically similar to *C. retrofracta* Kük., but distinguished by mid-culm position, ferruginous female glumes, utricles nearly horizontally spreading when mature, inflated trigonous and densely arranged, achenes loosely enclosed with densely micro-papillate surface, very short stipe at base, and recurved short mucro at apex.

**Voucher specimens:** Guangxi, Yongfu County, Baishou Township, vicinity, shrubby slope on limestone hill, altitude 260 m, 25 March 2013, Yongfu County Census Team, 450326130325111LY (IBK); Guangxi, Yongfu County, Yong' an Township, Yong' an Village, Xiaocun Tun, roadside grassland, altitude 278 m, 14 October 2013, Yongfu County Census Team, 450326131014020LY (IBK).

**Distribution:** Yunnan, Sichuan, Zhejiang; Bhutan, India. First record for Guangxi, China.

### 2.11 *Carex orbicularinucis* L. K. Dai

*Acta Phytotax. Sin.* 37 (2): 183, fig. 3 [Figure 3: see original paper]: 1~4, 1999. *L. K. Dai in L. K. Dai & S. Y. Liang, Fl. Reipubl. Popularis Sin.* 12: 450, pl. 92: 1~4. 2000. *L. K. Dai & T. Koyama in C. Y. Wu, P. H. Raven & D. Y. Hong, Fl. China* 23: 437. 2010.

Morphologically similar to *C. longipes* D. Don, but distinguished by lower spikes with numerous densely packed female flowers 0.8–1.5 cm long, female glumes ovate or narrowly ovate, suborbicular utricles ca. 4 mm long, and achenes broadly obovate or suborbicular, plano-convex.

**Voucher specimens:** Guangxi, Leye County, Huaping Township, Zhongjing, Shizikou tiankeng, on limestone slope in sparse forest, altitude 1,325 m, 15 May 2019, Lu Zhaocen, Chen Hailing, Wei Sujuan, Qin Ying et al., YC4045 (IBK); Guangxi, Leye County, Huaping Township, Nangan Village, Xiayandong, on sparse forest slope, altitude 1,085 m, 22 May 2019, Lu Zhaocen, Chen Hailing, Wei Sujuan, Qin Ying et al., YC4313 (IBK); Guangxi, Leye County, Huaping Township, Nangan Village, Xiayandong, on sparse forest slope, altitude 1,252 m, 22 May 2019, Lu Zhaocen, Chen Hailing, Wei Sujuan, Qin Ying et al., YC4316 (IBK).

**Distribution:** Yunnan, Sichuan. First record for Guangxi.

### 2.12 *Carex oxyphylla* Franch.

*Novv. Arch. Mus. Hist. Nat., sér. 3* 10: 57, 1898. *S. Y. Liang in L. K. Dai & S. Y. Liang, Fl. Reipubl. Popularis Sin.* 12: 318, 2000. *S. Y. Liang, T.*

*Koyama & G. C. Tucker in C. Y. Wu, P. H. Raven & D. Y. Hong, Fl. China 23: 390. 2010.*

Morphologically similar to *C. blinii* H. Lév. & Vaniot., but distinguished by mid-culm position (culms 20–40 cm tall), bracts with conspicuous sheaths, and lower spikes widely spaced.

**Voucher specimens:** Guangxi, Leye County, Luosha Township, Pangguwang, Dazhai Ditch, on sparse forest slope, altitude 1,400 m, 11 March 2016, Li Shuwan, Qin Ying, YC3165 (IBK); Guangxi, Napo County, Baisheng Township, Nongmiao, in dense forest on limestone hill, altitude 1,120 m, 12 June 2021, Xu Weibin, Huang Jinqun, Li Jiahui, 14780 (IBK); Guangxi, Xing' an County, Mao' er Mountain, Jiuniutang, on sparse forest slope, altitude 1,130 m, 13 April 2023, Lu Zhaoen, Xu Weibin, LZC1260 (IBK); Guangxi, Xing' an County, Liyuan Waterfall, on sparse forest slope, altitude 445 m, 14 April 2023, Lu Zhaoen, Xu Weibin, LZC1281 (IBK).

**Distribution:** Yunnan, Sichuan, Zhejiang. First record for Guangxi.

### 2.13 *Carex phoenicis* Dunn (Phoenix *Carex*)

*Bull. Misc. Inform. Kew, Addit. Ser. 10: 305. 1912. Carex chaofangii C. Z. Zheng & X. F. Jin, Acta Phytotax. Sin. 42: 548. 2004. S. Y. Liang, T. Koyama & G. C. Tucker in C. Y. Wu, P. H. Raven & D. Y. Hong, Fl. China 23: 395. 2010.*

Morphologically similar to *C. brevicuspis* C. B. Clarke, but distinguished by lateral spikes female, female glumes ovate-elliptic with a rough long awn at apex, utricles glabrous, and achene beak straight.

**Voucher specimens:** Guangxi, Xing' an County, Mao' er Mountain, Jiuniutang Protection Station, on sparse forest slope, altitude 1,100 m, 13 April 2022, Xu Weibin, 15271 (IBK); Guangxi, Xing' an County, Liyuan Waterfall, on sparse forest slope, altitude 570 m, 14 April 2023, Lu Zhaoen, Xu Weibin, LZC1288 (IBK).

**Distribution:** Guangdong, Fujian, Zhejiang. First record for Guangxi.

### 2.14 *Carex pseudotristachya* X. F. Jin & C. Z. Zheng

*Acta Phytotax. Sin. 42: 543. 2004. Y. C. Tang, S. R. Zhang, T. Koyama, et al. in C. Y. Wu, P. H. Raven & D. Y. Hong, Fl. China 23: 325. 2010.*

Morphologically similar to *C. tristachya* Thunb., but distinguished by leaf blades with small papillae and rough texture, lateral spikes often with a terminal male section, male glumes with connate lateral margins, and utricles 4.5–5 mm long.

**Voucher specimens:** Guangxi, Wuming County, Liangjiang Township, Damingshan, Tianping Station, under broad-leaved forest, altitude 1,284 m, 20 May 2020, Yang Ping, Su Yulan et al., 450110200520015LY (IBK); Guangxi,

Xing' an County, Mao' er Mountain summit, in summit scrub, altitude 2,009 m, 13 April 2023, Lu Zhaoen, Xu Weibin, LZC1271 (IBK); Guangxi, Xing' an County, Mao' er Mountain summit, in summit scrub, altitude 2,009 m, 13 April 2023, Lu Zhaoen, Xu Weibin, LZC1272 (IBK); Guangxi, Xing' an County, Mao' er Mountain summit, in summit scrub, altitude 2,009 m, 13 April 2023, Lu Zhaoen, Xu Weibin, LZC1275 (IBK); Guangxi, Xing' an County, Liyuan Waterfall, on sparse forest slope, altitude 570 m, 14 April 2023, Lu Zhaoen, Xu Weibin, LZC1289 (IBK).

**Distribution:** Guangdong, Fujian, Zhejiang. First record for Guangxi.

### 2.15 *Carex remotistachya* Y. Y. Zhou & X. F. Jin

*Phytotaxa*, 164 (2): 133, pl. 1. 2014.

Morphologically similar to *C. doniana* Spreng., but distinguished by leaf width 3–6 mm, widely spaced spikes, male spikes with peduncles 3–5 cm long, and shorter styles.

**Voucher specimen:** Guangxi, Xing' an County, Mao' er Mountain, Jiuniutang Protection Station, on sparse forest slope, altitude 1,100 m, 13 April 2022, Xu Weibin, 15282 (IBK).

**Distribution:** Zhejiang, Anhui. First record for Guangxi.

### 2.16 *Carex rugata* Ohwi

*Acta Phytotax. Geobot. 1: 76. 1932. Y. C. Tang, S. R. Zhang, T. Koyama, et al. in C. Y. Wu, P. H. Raven & D. Y. Hong, Fl. China 23: 323. 2010.*

Morphologically similar to *C. sociata* Boott, but distinguished by lateral spikes female, linear-cylindrical, 2–2.5 mm wide with loosely arranged flowers, and achenes with a rib depression formed in the middle of the ribbed surface.

**Voucher specimen:** Guangxi, Xing' an County, Mao' er Mountain summit, in summit scrub, altitude 2,009 m, 13 April 2023, Lu Zhaoen, Xu Weibin, LZC1268 (IBK).

**Distribution:** Fujian, Zhejiang, Anhui; Japan. First record for Guangxi, China.

### 2.17 *Carex sinodissitiflora* Tang & F. T. Wang ex L. K. Dai

*Acta Phytotax. Sin. 32: 177. 1994. L. K. Dai & T. Koyama in C. Y. Wu, P. H. Raven & D. Y. Hong, Fl. China 23: 438. 2010.*

Morphologically similar to *C. longipes* D. Don ex Tillich & Taylor, but distinguished by spikes up to 6 cm long, female glumes pale greenish-yellow, utricles oblong-lanceolate ca. 7 mm long with base gradually narrowed into a short stipe and smooth-margined beak, and achenes oblong.

**Voucher specimens:** Guangxi, Leye County, Huaping Township, Baiyan Dang tiankeng and vicinity, in sparse forest on limestone, altitude 1,359 m, 17 May 2019, Lu Zhaocen, Chen Hailing, Wei Sujuan, Qin Ying et al., YC4091 (IBK); Guangxi, Leye County, Yachang Protected Area, Pangguwang, on sparse forest slope, altitude 1,664 m, 19 May 2019, Lu Zhaocen, Chen Hailing, Wei Sujuan, Qin Ying et al., YC4234 (IBK).

**Distribution:** Yunnan. First record for Guangxi.

### 2.18 *Carex tsaiiana* F. T. Wang & Tang ex P. C. Li

*Acta Phytotax. Sin.* 37 (2): 169, fig. 8 [Figure 8: see original paper], 1999. P. Q. Li in L. K. Dai & S. Y. Liang, *Fl. Reipubl. Popularis Sin.* 12: 180, pl. 36: 8~10. 2000. L. K. Dai & T. Koyama in C. Y. Wu, P. H. Raven & D. Y. Hong, *Fl. China* 23: 332. 2010.

Morphologically similar to *C. funhuangshanica* F. T. Wang & Tang ex P. C. Li, but distinguished by leaf margins revolute and linear, 1-1.5 mm wide, utricles obovate-oblong 4-4.2 mm long, and achenes 2.3-2.5 mm long with granular surface.

**Voucher specimens:** Guangxi, Jingxi County, Wuping Township, Xunma Village, Longbang Tun, on limestone slope in broad-leaved forest, altitude 800 m, 17 June 2010, Xu Weibin, Huang Yusong, 10715 (IBK); Guangxi, Jingxi County, Yuexu Township, Quantun, on limestone hilltop in sparse forest, altitude 750 m, 1 June 2021, Yang Ping, Li Xitao, ZYA00187 (IBK); Guangxi, Napo County, Chengxiang Township, Bailing Village vicinity, on limestone slope in dense forest, altitude 1,160 m, 15 April 2021, Xu Weibin, Lin Chunrui, Huang Xueyu, 14280 (IBK); Guangxi, Napo County, Baisheng Township, Nongmiao, in dense forest on limestone hill, altitude 1,120 m, 12 June 2021, Xu Weibin, Huang Jinquan, Li Jiahui, 14766 (IBK); Guangxi, Napo County, Baisheng Township, Nongmiao, in dense forest on limestone hill, altitude 1,120 m, 12 June 2021, Xu Weibin, Huang Jinquan, Li Jiahui, 14767 (IBK); Guangxi, Napo County, Baisheng Township, Pozhe Village, Nongmiao Tun, 523 boundary marker, on hilltop beside sparse forest, altitude 1,270 m, 22 June 2021, Yang Ping, Huang Xueyu, Li Xitao, ZYA00458 (IBK); Guangxi, Napo County, San-Na line, under sparse forest on slope, altitude 920 m, 27 June 2021, Yang Ping, Li Xitao, Huang Xueyu, ZYA00602 (IBK); Guangxi, Tianlin County, Cenwanglaoshan Nature Reserve, Langping Station, Langping Township to Xiaodong Tun, on hilltop in sparse forest, altitude 1,370 m, 1 August 2021, Yang Ping, Dong Jiaqin, Zhang Qiang, CWA0707 (IBK); Guangxi, Tianlin County, Cenwanglaoshan National Nature Reserve, Langping Station, Tanghe Village, Bading Tun, in limestone scrub, altitude 1,290 m, 18 September 2021, Su Chunlan, Dong Jiaqin, CWB0899 (IBK); Guangxi, Leye County, Tongle Township, Longmen Village, on limestone slope, altitude 1,130 m, 27 July 2023, Xu Weibin, Lu Zhaocen, Mo Minglin, Chang Shili, Huang Jinquan, 16639 (IBK); Guangxi, Leye County, Tongle Township, Fengdong Village, Longbao Tun, in scrub on limestone slope,

altitude 1,110 m, 30 July 2023, Xu Weibin, Lu Zhaocen, Mo Minglin, Chang Shili, Huang Jinquan, 16833 (IBK); Guangxi, Leye County, Tongle Township, Yanglin Village, Lalai Tun, in sparse forest on limestone slope, altitude 1,220 m, 10 October 2023, Xu Weibin, Lu Zhaocen, Chang Shili, Huang Jinquan, 17705 (IBK); Guangxi, Tian' e County, Bamu Township, Raodong Village, on limestone slope, altitude 1,083 m, 23 August 2021, Xu Weibin, Lu Zhaocen, Huang Jinquan, 14997 (IBK); Guangxi, Dahua County, Qibainong Township, Nongjing Village, Baxiang, in scrub on limestone slope, altitude 880 m, 4 October 2023, Xu Weibin, Lu Zhaocen, Mo Minglin, Chang Shili, Huang Jinquan, 17496 (IBK).

**Distribution:** Yunnan. First record for Guangxi.

### 2.19 *Carex tungfangensis* L. K. Dai & S. M. Huang

*Fl. Hainan. 4: 536, 343, fig. 1165 [Figure 1165: see original paper], 1977. Y. C. Tang in L. K. Dai & S. Y. Liang, Fl. Reipubl. Popularis Sin. 12: 152, 2000. Y. C. Tang, S. R. Zhang, T. Koyama, et al. in C. Y. Wu, P. H. Raven & D. Y. Hong, Fl. China 23: 322. 2010.*

Morphologically similar to *C. foraminata* C. B. Clarke, but distinguished by lateral female spikes 3–3.5 cm long, utricles ca. 3.5 mm long with apex gradually narrowed into a short beak ca. 1 mm long.

**Voucher specimens:** Guangxi, Yangshuo County, Gaotian Township, Longcheng Village, under broad-leaved forest on limestone hill, altitude 203 m, 14 April 2018, Yangshuo County Census Team, 450321180414031LY (IBK); Guangxi, Rong' an County, Qiaoban Township, Gudan Village, under broad-leaved forest on limestone hill, altitude 456 m, 8 April 2019, Rong' an County Census Team, 450224190408016LY (IBK).

**Distribution:** Hainan, Zhejiang. First record for Guangxi.

### 2.20 *Carex wuyishanensis* S. Yun Liang

*Acta Phytotax. Sin. 34: 94. 1996. Y. C. Tang in L. K. Dai & S. Y. Liang, Fl. Reip. Popularis Sin. 12: 218, pl. 43: 9~11. 2000. Y. C. Tang, S. R. Zhang, T. Koyama, et al. in C. Y. Wu, P. H. Raven & D. Y. Hong, Fl. China 23: 348. 2010.*

Morphologically similar to *C. grandiligulata* Kük., but distinguished by spikes 2–5 cm long with peduncles 3–10 cm long that are long, slightly drooping, and extend beyond the bract sheath, and utricles adaxially raised with multiple raised ribs on the beak.

**Voucher specimen:** Guangxi, Lingchuan County, Haiyangshan, under sparse forest on slope, 10 April 2023, Lin Chunrui, LZC1299 (IBK).

**Distribution:** Hunan, Fujian, Zhejiang. First record for Guangxi.

### 3. Discussion and Conclusion

In recent years, intensive field surveys and systematic herbarium curation have led to continuous reports of new species and new records of *Carex* from Guangxi (Yu Liying et al., 2012; Jin et al., 2012; Jin & Zheng, 2013; Zhou & Jin, 2014; Deng, 2014; Jin et al., 2015; Zhao Xiaochao et al., 2016; Lu et al., 2020; Lu Zhaocen et al., 2023; Lu et al., 2023; Lu et al., 2024), significantly enhancing our understanding of the genus' s diversity in the region. Based on the 20 newly recorded species reported here and comprehensive literature review, the *Carex* flora of Guangxi has increased to 129 species (including 10 endemics), making it the largest monocot genus in Guangxi. This substantially enriches the floristic data for Guangxi and provides crucial baseline information for taxonomic and biogeographic studies of the genus.

Synthesizing relevant literature and field survey data reveals that *Carex* species in Guangxi are primarily distributed in several key mountainous regions: the Mao'er Mountain, Yinzhulaoshan, and Huaping forest areas of the Yuechengling Range in northeastern Guangxi; the Haiyangshan, Qianjiadong, and Yindianshan areas of the Dupangling Range; and the Jiuwanshan and Yuanbaoshan areas of the Damiaoling Range in northern Guangxi. These mountains harbor the highest *Carex* diversity. Additionally, relatively rich *Carex* diversity is found in the Cenwanglaoshan, Jinzhongshan, and Yachang forest areas of western Guangxi, as well as the Dayaoshan and Damingshan areas in central Guangxi. These high-diversity mountainous regions are characterized by mid-subtropical or south-subtropical mountain climates with abundant rainfall, high relative humidity, massive mountain bodies, high elevations, and soils primarily consisting of yellow earth, yellow-brown earth, and red earth. *Carex* does not show exceptionally high diversity in karst areas of Guangxi, though species numbers are relatively elevated in border areas such as Napo and Jingxi. Notably, several recently described *Carex* endemics originate from karst regions, including *C. bamaensis* X. F. Jin & W. J. Chen and *C. duanensis*. Overall, Guangxi *Carex* species prefer acidic, moist environments in montane forests or along streams, growing in clumps or scattered distributions, with maximum diversity at mid-elevations.

Geographically, many of the 20 newly recorded species were collected from the transition zone between the Yunnan-Guizhou Plateau and Guangxi hills, indicating close floristic connections between these regions. Other new records were collected from key biodiversity areas at relatively high elevations, such as Mao'er Mountain, Cenwanglaoshan, and Yachang forest areas, demonstrating that *Carex* species are well-adapted to high-elevation montane habitats and exhibit rich diversity there.

It is noteworthy that Guangxi's extensive karst landforms have fostered adaptive evolution in *Carex* species. Karst-dwelling species such as *C. bamaensis*, *C. daxinensis* Y. Y. Zhou & X. F. Jin, *C. pengii* X. F. Jin et C. Z. Zheng, and *C. esquiroliana* H. Lév. exhibit dwarf stature, coriaceous or pubescent leaves,

and well-developed root systems adapted to drought and poor soils. Given that the diversity and evolution of *Carex* in Guangxi' s karst regions have long been overlooked, unexplored or even unknown species likely remain in microhabitats such as karst caves, tiankengs, or gorges, awaiting thorough field investigation and research.

With increasing attention to *Carex* in Guangxi, we recommend focusing future efforts on karst regions and high-elevation mountains in western Guangxi. Through comprehensive field surveys, systematic specimen collection, and accurate species identification, we can further improve the species inventory and understand the geographic distribution patterns of *Carex* in Guangxi, providing a clearer and more comprehensive knowledge base for future research and utilization.

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