

Post-print of the Taxonomic Revision of Brachytheciaceae from Guangxi

Authors: 李腾, Tang Qiming, Wei Yumei, Zhao Jiancheng, Li Min

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Abstract

Through systematic identification of 1,147 Brachytheciaceae specimens collected from 24 counties (cities) in Guangxi and review of relevant literature, it is confirmed that the Brachytheciaceae flora of Guangxi comprises 11 genera and 44 species, including one newly recorded genus, namely *Pseudokindbergia*, and seven newly recorded species, namely *Pseudokindbergia dumosa*, *Brachythecium procumbens*, *Oxyrrhynchium latifolium*, *Oxyrrhynchium vagans*, *Rhynchostegiella sinensis*, *Sciuro-hypnum populeum*, and *Sciuro-hypnum reflexum*. This paper provides a revised checklist of Brachytheciaceae in Guangxi and presents detailed descriptions of the main morphological identification characteristics, habitat, and geographical distribution of the newly recorded genus and species.

Full Text

Preamble

A Taxonomic Revision of Brachytheciaceae (Bryophyta) in Guangxi, China

LI Teng¹, TANG Qiming², WEI Yumei², ZHAO Jiancheng¹, LI Min^{1*}

(1. College of Life Sciences, Hebei Normal University, Shijiazhuang 050024, China;

2. Guangxi Key Laboratory of Plant Conservation and Restoration Ecology in Karst Terrain, Guangxi Institute of Botany, Guangxi Zhuang Autonomous Region and Chinese Academy of Sciences, Guilin 541006, Guangxi, China)

Abstract

Through systematic identification of 1,147 Brachytheciaceae specimens collected from 24 counties (cities) in Guangxi and comprehensive literature review, we

confirm that Guangxi' s Brachytheciaceae flora comprises 11 genera and 44 species. This includes one newly recorded genus (*Pseudokindbergia*) and seven newly recorded species: *Pseudokindbergia dumosa*, *Brachythecium procumbens*, *Oxyrrhynchium latifolium*, *O. vagans*, *Rhynchostegiella sinensis*, *Sciuro-hypnum populeum*, and *S. reflexum*. This paper provides a revised checklist of Brachytheciaceae in Guangxi, with detailed descriptions of the morphological diagnostic characters, habitats, and geographical distributions of the newly recorded taxa.

Keywords: Brachytheciaceae, *Pseudokindbergia*, *Oxyrrhynchium*, *Rhynchostegiella*, *Sciuro-hypnum*

Introduction

Guangxi Zhuang Autonomous Region is located in southern China (20°54' - 26°24' N, 104°26' - 112°04' E), bordering the Beibu Gulf to the south with a highly indented coastline. The region is predominantly mountainous, with mountains covering more than three-quarters of its total area, and features extensive karst topography that accounts for over one-third of the region' s landmass. This complex and distinctive terrain has fostered rich and unique biological resources (Su et al., 2014).

Based on previously published literature, Wei et al. (2018) compiled an annotated checklist of Guangxi bryophytes, which included 11 genera and 65 species of Brachytheciaceae. In the same year, Wei et al. (2018) reported 25 families, 36 genera, and 47 species of mosses as new records for Guangxi, including two genera and three species of Brachytheciaceae. Consequently, the total number of reported Brachytheciaceae species in Guangxi reached 11 genera and 68 species, representing more than half of China' s total Brachytheciaceae flora (120 species) (Li et al., 2015b).

Given Guangxi' s rich Brachytheciaceae resources yet lack of systematic taxonomic research, we collected 1,147 Brachytheciaceae specimens from 24 counties (cities) in Guangxi between 2017 and 2018, including voucher specimens from previously published literature on Guangxi Brachytheciaceae. Based on these materials, we conducted a comprehensive taxonomic revision of the family in the region. Through detailed morphological examination of all specimens and integration with the latest Guangxi bryophyte checklist and recent literature (Wei et al., 2018; Wei et al., 2018), we confirmed that Guangxi' s Brachytheciaceae flora comprises 11 genera and 44 species, including one newly recorded genus and seven newly recorded species. This paper provides detailed descriptions of the main morphological diagnostic characters and geographical distributions of these newly recorded taxa. Voucher specimens are deposited in the herbaria of Hebei Normal University (HBNU), Guangxi Institute of Botany (IBK), East China Normal University (HSNU), Institute of Botany, Chinese Academy of Sciences (PE), Shanghai Normal University (SHNU), and Guizhou University (GACP).

1. Revised Checklist of Brachytheciaceae in Guangxi

Based on systematic taxonomic study of 1,147 Brachytheciaceae specimens from Guangxi, the revised flora comprises 11 genera and 44 species (Table 1).

Table 1 Revised checklist of Brachytheciaceae in Guangxi, China

| Genus name | Species name | Genus name | Species name |
|----------------------|---|-------------------------|---|
| <i>Aerobryum</i> | <i>A. speciosum</i> Dozy. et Molk. | <i>Myuroclada</i> | <i>M. longiramea</i> (Müll. Hal.) M. Li, Y. F. Wang, Ignatov & Huttunen |
| <i>Brachythecium</i> | <i>B. buchananii</i> (Hook.) A. Jaeger | | <i>M. maximowiczii</i> (G. G. Borshch.) Steere & W. B. Schofield |
| | <i>B. formosanum</i> Takaki | <i>Oxyrrhynchium</i> | <i>O. hians</i> (Hedw.) Loeske |
| | <i>B. garovaglioides</i> Müll. Hal. | | <i>O. latifolium</i> (Cardot) Podp. |
| | <i>B. glauculum</i> C. Muell. | | <i>O. laxirete</i> (Broth.) Broth. |
| | <i>B.</i> <i>helminthocladum</i> Broth. & Paris | | <i>O. savatieri</i> (Besch.) Broth. |
| | <i>B. homocladum</i> Müll. Hal. | | <i>O. vagans</i> (A. Jaeger) Ignatov & Huttunen |
| | <i>B. moriense</i> Besch. | <i>Palamocladium</i> | <i>P. leskeoides</i> (Hook.) E. G. Britt. |
| | <i>B. novae-angliae</i> (Sull. & Lesq.) A. Jaeger | <i>Pseudokindbergia</i> | <i>P. dumosa</i> (Mitt.) Min Li, Y. F. Wang, Ignatov & B. C. Tan |
| | <i>B. pendulum</i> Takaki | <i>Rhynchostegiella</i> | <i>R. japonica</i> Dix. et Thér. |
| | <i>B. pinnirameum</i> Müll. Hal. | | <i>R. laeviseta</i> Broth. |
| | <i>B. piligerum</i> Cardot | | <i>R. leptoneura</i> Dix. & Thér. |
| | <i>B. procumbens</i> (Mitt.) A. Jaeger | | <i>R. menadensis</i> (Sande Lac.) E. B. Bartram |

| Genus name | Species name | Genus name | Species name |
|----------------------|--|-----------------------|--|
| | <i>B. rivulare</i> Schimp. | | <i>R. sinensis</i> Broth. & Paris |
| | <i>B. rotaceum</i> De Not | <i>Rhynchostegium</i> | <i>R. celebicum</i> (Sande Lac.) A. Jaeger |
| | <i>B. rutabulum</i> (Hewd.) B. S. G. | | <i>R. contractum</i> Cardot |
| <i>Eurhynchium</i> | <i>E. kirishimense</i> Takaki | | <i>R. duthiei</i> Müll. Hal. et Dixon |
| <i>Homalothecium</i> | <i>H. laevisetum</i> Lac. | | <i>R. inclinatum</i> (Mitt.) A. Jaeger |
| | | | <i>R. ovalifolium</i> S. Okamura |
| | | | <i>R. pallenticaule</i> Müll. |
| | | | <i>R. pallidifolium</i> (Mitt.) A. Jaeger |
| | | | <i>R. riparioides</i> Hedw. |
| | | | <i>R. serpentinae</i> (Müll. Hal.) Broth. |
| <i>Sciuro-hypnum</i> | <i>S. plumosum</i> (Hedw.) Ignatov & Huttunen | | |
| | <i>S. populeum</i> (Hedw.) Ignatov & Huttunen | | |
| | <i>S. reflexum</i> (Starke) Ignatov & Huttunen | | |

Note: Information on voucher specimens and geographical distribution of each species in Guangxi is detailed in the Appendix.

2. Descriptions of Newly Recorded Taxa

2.1 Genus *Pseudokindbergia*

Pseudokindbergia Min Li, Y. F. Wang, Ignatov & B. C. Tan, Cryptog. Bryol. 36(1): 61. 2015.

A monotypic genus; generic characteristics are detailed in the species description (Li et al., 2015a).

2.1.1 *Pseudokindbergia dumosa* (Plate I) *Pseudokindbergia dumosa* (Mitt.) Min Li, Y. F. Wang, Ignatov & B. C. Tan, Cryptog. Bryol. 36(1): 61.

Diagnostic characters: Plants large; stem leaves and branch leaves distinctly dimorphic. Pseudoparaphyllia semicircular or triangular-semicircular. Stem leaves acuminate or acute at apex, forming a long hair-point; costa robust, extending beyond mid-leaf; median cells rhombic to linear; base broadly cordate to triangular, decurrent, with rectangular alar cells. Branch leaves smaller, ovate-lanceolate to triangular-lanceolate, acuminate at apex, margins coarsely serrate; costa ending in a prorate tip; median cells long-rhombic to linear.

Specimens examined: Rongshui County: Wang Meizhi 46939 (misidentified as *Brachythecium brotheri*) (PE). Longsheng County: Guo Shuiliang & Yu Jing 110619523 (SHNU). Xing' an County: Liu Qian & Zuo Qin 965; Liu Qian, Zhu Yongqing & Wang Youfang 1684, 609 (HSNU).

Distribution: China (Gansu, Shaanxi, Tibet, Sichuan, Chongqing, Hunan, Yunnan, Guangxi, Taiwan), Nepal, Bhutan, India (Li et al., 2015a).

2.2 *Brachythecium procumbens* (Plate II: 1-4)

Brachythecium procumbens (Mitt.) A. Jaeger, Ber. Thätigk. St. Gallischen Naturwiss. Ges. 1876-77: 341 (Gen. Sp. Musc. 2: 409). 1878.

Diagnostic characters: Pseudoparaphyllia triangular. Stem leaves ovate to triangular-ovate, long-acuminate at apex, costa reaching 1/2-2/3 of leaf length; median cells long-rhombic, sharply pointed at ends; leaf base shallowly cordate, alar cells differentiated, quadrate or rectangular. Branch leaves similar to stem leaves but slightly smaller, other characteristics identical.

Specimens examined: Leye County: Tang Qiming & Zhang Shiyan 20181001-213 (HBNU, IBK).

Distribution: China (Xinjiang, Shaanxi, Shanxi, Hebei, Jiangsu, Zhejiang, Tibet, Sichuan, Guizhou, Jiangxi, Yunnan, Guangxi, Taiwan), South Korea, Japan, India, Nepal, Sri Lanka (Jia & He, 2013).

2.3 *Oxyrrhynchium latifolium* (Plate II: 5-9)

Oxyrrhynchium latifolium (Cardot) Podp., Spisy Přír. Fak. Univ. v Brně 116: 33. 1929.

Diagnostic characters: Plants robust, stems prostrate, irregularly branched. Pseudoparaphyllia semicircular, obtuse. Stem leaves broadly ovate, apex mucronate, costa robust, reaching 4/5 of leaf length, ending in a prorate tip; median cells rhombic or long-rhombic, basal cells relatively broad and short, often porose; alar differentiation indistinct. Branch leaves similar to stem leaves but smaller.

Specimens examined: Leye County: Tang Qiming 20171020-064, 20171021-010, 20180409-34, 20180409-75, 20180413-436, 20180416-735, 20180609-199, 20180609-202, 20180609-203 (HBNU, IBK); Tang Qiming & Zhang Shiyan 20181001-210, 20181008-608 (HBNU, IBK). Jingxi County: Wei Yumei 8-389A (HBNU, IBK). Longzhou County: Wei Yumei 5654A (HBNU, IBK). Shangsi County: Wang Youfang et al. 2014183 (HSNU). Rongshui County: Long Guangri 91075a (PE). Xing'an County: Wang Youfang & Zuo Qin 1317 (misidentified as *Eurhynchium longirameum*) (HSNU).

Distribution: China (Guizhou, Zhejiang, Guangdong, Guangxi), North Korea, Japan (Liu, 2010; Jia & He, 2013).

Discussion: *Oxyrrhynchium latifolium* and *O. hians* are similar species within *Oxyrrhynchium* with relatively broad leaves. The primary difference lies in leaf shape: *O. latifolium* has broadly ovate leaves with the widest portion near the base, whereas *O. hians* has broadly elliptical leaves with the widest portion at the middle.

2.4 *Oxyrrhynchium vagans* (Plate II: 10-13)

Oxyrrhynchium vagans (A. Jaeger) Ignatov & Huttunen, Arctoa 11: 273. 2002.

Diagnostic characters: Stems prostrate. Pseudoparaphyllia semicircular. Stem leaves ovate-orbicular, acuminate at apex, rounded at base, margins finely serrate, costa reaching 0.7 of leaf length; median cells linear, basal cells rectangular. Branch leaves elliptical, costa reaching 0.6-0.75 of leaf length, with prorate tip.

Specimens examined: Jingxi County: Wei Yumei et al. 20141208-18 (HBNU, IBK). Xing'an County: Wang Youfang & Zuo Qin 356 (HSNU).

Distribution: China (Anhui, Zhejiang, Sichuan, Guizhou, Hunan, Yunnan, Taiwan), India, Nepal, Pakistan, Myanmar, Vietnam, Thailand, Sri Lanka, Laos, Malaysia, Indonesia, Philippines, USA (Hawaii) (Ignatov et al., 2005).

Discussion: This species is similar to *O. hians* and *O. savatieri*, but differs in having long, thin-walled cells near the leaf apex. The species was not included in the latest Chinese moss checklist (Jia & He, 2013), but Ignatov et al. (2005) documented its distribution in Hunan, Anhui, Guizhou, Sichuan, Taiwan, Yunnan, and Zhejiang. Its discovery in Guangxi not only confirms its presence in China but also expands its known distribution within the country.

2.5 *Rhynchostegiella sinensis* (Plate III: 1-4)

Rhynchostegiella sinensis Broth. & Paris, Rev. Bryol. 35: 128. 1908.

Diagnostic characters: Plants slender. Stem leaves ovate-lanceolate or ovate, acuminate at apex, costa reaching 2/3 of leaf length or longer. Median cells rhombic or short-rhombic, alar cells quadrate or rectangular. Branch leaves

ovate, costa ending in a prorate tip; median cells short-rhombic, alar cells distinctly differentiated, quadrate. Capsules inclined, elliptical-cylindrical, setae reddish-brown, smooth.

Specimens examined: Napo County: Wang Jian et al. 20130817-124, 201308017-126 (HSNU).

Distribution: Endemic to China (Shanghai, Jiangsu, Zhejiang, Guangxi) (Jia & He, 2013).

2.6 *Sciuro-hypnum populeum* (Plate III: 5-9)

Sciuro-hypnum populeum (Hedw.) Ignatov & Huttunen, *Arctoa* 11: 270. 2002 [2003].

Diagnostic characters: Plants medium-sized, irregularly branched. Pseudoparaphyllia triangular, margins minutely toothed. Stem leaves slightly broad ovate-lanceolate to ovate-lanceolate, acuminate at apex, costa strong, percurrent; median cells vermicular, alar cells quadrate to rectangular, walls slightly thickened. Branch leaves ovate-lanceolate, other characteristics consistent with stem leaves.

Specimens examined: Napo County: Wang Jian et al. 20130818-36A (HSNU); Jia Peng et al. NP091024144 (GACP). Tian' e County: Lai Mingzhou KS89-218 (PE).

Distribution: China (Xinjiang, Tibet, Inner Mongolia, Heilongjiang, Jilin, Liaoning, Gansu, Shaanxi, Hebei, Beijing, Shandong, Henan, Sichuan, Hubei, Hunan, Jiangxi, Anhui, Jiangsu, Shanghai, Zhejiang, Yunnan, Guizhou, Chongqing, Guangxi, Taiwan), South Korea, Japan, Bhutan, India, Pakistan, Nepal, Indonesia (Java), Russia, Europe, North America (Jia & He, 2013).

2.7 *Sciuro-hypnum reflexum* (Plate III: 10-14)

Sciuro-hypnum reflexum (Starke) Ignatov & Huttunen, *Arctoa* 11: 270. 2002[2003].

Diagnostic characters: Pseudoparaphyllia semicircular, truncate or obtuse. Stem leaves broadly ovate to triangular-ovate, long-acuminate at apex, costa nearly reaching leaf tip; median cells rhombic to linear-rhombic, base decurrent, alar differentiation not reaching costa, long-rectangular. Branch leaves ovate-lanceolate, base slightly decurrent, other characteristics similar to stem leaves.

Specimens examined: Xing' an County: Tang Qiming 20180907-20 (HBNU, IBK).

Distribution: China (Xinjiang, Tibet, Inner Mongolia, Heilongjiang, Jilin, Liaoning, Ningxia, Shaanxi, Shanxi, Hebei, Shandong, Henan, Anhui, Jiangsu, Shanghai, Zhejiang, Sichuan, Chongqing, Guizhou, Hunan, Jiangxi, Fujian, Yun-

nan, Guangxi, Guangdong), Japan, India, Russia, Pakistan, Tajikistan, Europe, North America (Jia & He, 2013).

Discussion: *Sciuro-hypnum reflexum* is similar to *S. populeum*. The differences are: *S. reflexum* has ovate-triangular to broad ovate-lanceolate leaves, while *S. populeum* has lanceolate to ovate-lanceolate leaves; *S. reflexum* has larger alar regions, mostly long-rectangular or rectangular, whereas *S. populeum* has quadrate or rectangular alar cells.

3. Merged Species, Questionable Species, and Excluded Species

After detailed morphological examination of 1,147 Brachytheciaceae specimens from Guangxi, our revised flora contains 11 genera and 44 species. This result differs substantially from the 68 species reported in previous literature. We therefore re-examined previous publications and voucher specimens, analyzing each discrepant taxon. These were ultimately categorized into three groups:

3.1 Merged Species

Over the past two decades, the application of molecular phylogenetic methods to Brachytheciaceae has led to changes in the family's classification system and species concepts, resulting in the merger of several species.

3.1.1 Based on morphological and molecular phylogenetic evidence, *Brachythecium amnicola* Müll. Hal., *B. campylothallum* C. Muell., *B. fasciculirameum* C. Muell., *B. planiusculum* C. Muell., and *B. viridefactum* C. Muell. have been treated as synonyms of *B. buchananii* (Geng, 2015).

3.1.2 *B. plumosum* var. *striato-plumosum* has been treated as a synonym of *Sciuro-hypnum plumosum* (Zhai, 2008).

3.1.3 *Homalothecium leucodonticaule* (C. Muell.) Broth. has been treated as a synonym of *H. laevisetum* (Ignatov et al., 2005).

3.1.4 Liu (2010) treated *Rhynchostegium divaricatifolium* as *Kindbergia divaricatifolia*. In this study, morphological examination of the cited voucher specimens revealed that their plant size, morphology, leaf shape, alar cells, and pseudoparaphyllia all fall within the variation range of *Pseudokindbergia dumosa*. Therefore, *R. divaricatifolium* is treated as a synonym of *P. dumosa*.

3.2 Questionable Species

Questionable species in Guangxi Brachytheciaceae fall into two categories: (1) voucher specimens cited in previous literature have been lost entirely, or (2) only partial voucher specimens were borrowed, but these were all misidentified.

For specimens that were not borrowed, species identity cannot be confirmed. Moreover, none of the Guangxi Brachytheciaceae specimens we examined match the characteristics of these taxa. Therefore, the distribution of these species in Guangxi requires further investigation, and they are temporarily classified as questionable.

3.2.1 Species with lost voucher specimens from previous literature include: *Brachythecium brotheri* (Wang & Jia, 1993; Jia et al., 1995; Xie et al., 2012b; Zuo et al., 2010), *B. coreanum* (Jia et al., 1995; Xie et al., 2013; Hu & Wang, 2005; Hu et al., 2008; Wang & Jia, 1993; Jia et al., 1995), *B. propinatum* (Zhu et al., 2000), *Cirriphyllum piliferum* (Xie et al., 2013; Zhu et al., 2000), *Eurhynchium coarctum* (Cai, 2016), *E. squarriifolium* (Zuo et al., 2010), *Rhynchostegium fauriei* (Zuo et al., 2010), and *Okamuraea hakoniensis* (Wu, 2002; Wu, 2002).

3.2.2 Species mentioned in previous literature for which we borrowed only partial voucher specimens that proved to be misidentified include: *Brachythecium salebrosum* (Xie et al., 2012a, 2013; Hu & Wang, 2005; Hu et al., 2008), *B. trichomitrium* (Zuo et al., 2010), and *B. velutinum* (Xu, 1989; Xie et al., 2013; Hu & Wang, 2005; Hu et al., 2008). Borrowed specimens were misidentified, and the identity of unborrowed specimens cannot be determined. None of our examined specimens match these species, so their distribution in Guangxi remains questionable.

3.3 Excluded Species

Some species mentioned in previous literature were confirmed as misidentifications after examination of borrowed voucher specimens. These are therefore excluded from the Guangxi Brachytheciaceae flora: *Brachythecium albicans* (Xie et al., 2013), *B. glaciale* (Zuo et al., 2010), *B. kuroishicum* (Xie et al., 2013), *B. noguchii* (Zhai, 2008; Xie et al., 2012a), *B. perscabrum* (Zhai, 2008; Zuo et al., 2010), *B. pulchellum* (Xie et al., 2013), *B. uncinifolium* (Xie et al., 2013), *Eurhynchium angustirete* (Zuo et al., 2010), *E. eustegium* (Zuo et al., 2010; Xie et al., 2012a), *Camptothecium lutescens* (Jia et al., 2010), *Rhynchostegium sub-speciosum* (Zuo et al., 2010), and *Palamocladium euchloron* (Jia et al., 2010; Xie et al., 2012a).

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Plates

Plate I. *Pseudokindbergia dumosa*

1-2. Stem leaves; 3-4. Branch leaves; 5. Tip of stem leaf; 6. Tip of branch leaf; 7. Base of stem leaf; 8. Base of branch leaf; 9. Alar cells of stem leaf; 10. Alar cells of branch leaf; 11. Median laminal cells of stem leaf; 12. Median laminal cells of branch leaf; 13. Pseudoparaphyllia; 14. Plant. (Voucher specimen: Shuiliang Guo & Jing Yu 110619523)

Plate II.

1-4. *Brachythecium procumbens*: 1. Stem leaf; 2. Median laminal cells of branch leaf; 3. Alar cells of stem leaf; 4. Pseudoparaphyllia.
5-9. *Oxyrrhynchium latifolium*: 5. Stem leaf; 6. Branch leaf; 7. Median laminal cells of stem leaf; 8. Alar cells of stem leaf; 9. Pseudoparaphyllia.

10–13. *Oxyrrhynchium vagans*: 10. Stem leaf; 11. Median laminal cells of stem leaf; 12. Tip cells of branch leaf; 13. Pseudoparaphyllia.
(Voucher specimens: 1–4. Qiming Tang & Shiyan Zhang 20181001-213; 5–9. Qiming Tang 20180609-203; 10–13. Yumei Wei et al. 20141208-18)

Plate III.

1–4. *Rhynchostegiella sinensis*: 1. Stem leaf; 2. Branch leaf; 3. Median laminal cells of stem leaf; 4. Alar cells of stem leaf.

5–9. *Sciuro-hypnum populeum*: 5. Stem leaf; 6. Branch leaf; 7. Median laminal cells of branch leaf; 8. Alar cells of branch leaf; 9. Pseudoparaphyllia.

10–14. *Sciuro-hypnum reflexum*: 10. Stem leaf; 11. Median laminal cells of stem leaf; 12. Base of stem leaf; 13. Alar cells of stem leaf; 14. Pseudoparaphyllia.

(Voucher specimens: 1–4. Jian Wang et al. 20130817-126; 5–9. Mingzhou Lai KS89-218; 10–14. Qiming Tang 20180907-20)

Appendix: Species Accounts

1. *Aerobryum Dozy. et Molk. Nederl. Kruidk. Arch. 2(4): 279. 1851.*

1.1 *Aerobryum speciosum Dozy. et Molk., Ned. Kruidk. Arch., 2(4): 279. 1851. Species description:* See Hu & Wang (2005).

Specimens examined: Napo County, Defu Nature Reserve: Wei Yumei et al. 20141203-47 (HSNU). Napo County: Wei Yumei 20141206-60 (HSNU); Jia Peng et al. NPPH100510027, NPPH100510024, NPPH100510030, NPPH100510036, NPPH100510061, NPPH100510073 (GACP). Mao' ershan National Nature Reserve: Wang Youfang & Zuo Qin 702, 1113, 1188, 1352 (HSNU); Tang Qiming 20180508-364; Tang Qiming, Wei Yumei & He Si 20180908-112; He Si & Wei Yumei 48703. Jinxiu County, Dayaoshan National Nature Reserve: Tang Qiming 20180515-642, 20180506-206A.

Distribution: Baise, Laibin, Guilin; China (Tibet, Sichuan, Yunnan, Chongqing, Guizhou, Hubei, Hunan, Guangxi, Hainan, Jiangxi, Taiwan). India, Sri Lanka, Bhutan, Vietnam, Thailand, Laos, Philippines, Indonesia, Japan, Papua New Guinea.

2. *Brachythecium B. S. G. Bryol. Eur. 6: 5. 1853.*

2.1 *Brachythecium buchananii* (Hook.) A. Jaeger, Ber. Thätigk. St. Gallischen Naturwiss. Ges. 1876-77: 341 (Gen. Sp. Musc. 2: 1159). 1878. *Hypnum buchananii* Hook., Trans. Linn. Soc. London 9: 320. 28 f. 3. 1808.

Brachythecium amnicolum Müll. Hal., Nuovo Giorn. Bot. Ital., n. s. 3: 125. 1896.

Brachythecium campylothallum Müll. Hal., Nuovo Giorn. Bot. Ital., n. s. 3: 124. 1896.

Brachythecium fasciculirameum Müll. Hal., Nuovo Giorn. Bot. Ital., n. s. 4:

269. 1897.

Brachythecium planiusculum Müll. Hal., Nuovo Giorn. Bot. Ital., n. s. 4: 268. 1897.

Brachythecium thraustum C. Muell., Nuov. Giorn. Bot. Ital. n. s. 5: 270, 1897.

Brachythecium viridefactum C. Muell., Nuov. Giorn. Bot. Ital. n. s. 4: 270. 1897.

Brachythecium perminusculum Müll. Hal., Nuovo Giorn. Bot. Ital., n. s. 5: 200. 1898.

Brachythecium yunnanense Herzog, Hedwigia 65: 167. 1925.

Specimens examined: Longlin County: Wei Yumei 8-335, 8-349, 8-359. Longlin County, Dahongbao Nature Reserve: Wei Yumei 8-118B. Leye County, Yachang Orchid National Nature Reserve: Tang Qiming & Zhang Shiyan 20181003-364A, 20181001-178. Leye County: Tang Qiming 20140608-149, 20180411-217, 20180411-221, 20180409-70; Tang Qiming & Zhang Shiyan 20181002-264, 20181003-354A. Tian' e County, Lingdang Mountain: Lai Mingzhou KS89-419a, KS89-421 (PE). Tian' e County: Long Guangri, Zhang Canming et al. 167a; Lai Mingzhou KS89-80 (PE). Longsheng County: Guo Shuiliang & Yu Jing 110620002 (SHNU). Mao' ershan National Nature Reserve: Wang Youfang & Liu Qin 681; Wang Youfang & Zuo Qin 167, 328, 346, 358, 601, 617, 619, 623, 682, 684, 698, 717, 720, 739, 1363, 1369, 1370, 1918 (HSNU); Zhao Fangfang 865 (PE); He Si & Wei Yumei 48616, 48600. Napo County, Baiyunshan Laohutiao Nature Reserve: Wei Yumei 10-305, 10-335, 10-707, 10-776. Napo County: Pei Linying 2154, 2183, 2186, 2524, 2529, 2540, 2581 (PE), 2596; Xie Qiang et al. Nongnei 14, Nongmo 06, Shuinong 04; Wei Yumei et al. 20141204-94, 20141205-67, 20141206-17 (HSNU); Jia Peng et al. NPPH100510076, NPPH100510137, NPPH100510184 (GACP). Jingxi County: Wei Yumei 5-316A; Xie Qiang et al. Guangba 26, Hongshan 14. Jingxi County, Bangliang Nature Reserve: Wei Yumei 5-313, 8-527, 8-544. Daxin County, Encheng National Nature Reserve: Tang Qiming 20180113-152, 20180113-154B, 20180113-163, 20180113-165. Wuming County, Daming Mountain National Nature Reserve: Tang Qiming 20181106-104, 20181107-133. Longzhou County, Paotaishan: Wei Yumei 5-444A, 5-445, 5-447, 10-162. Luzhai County: Long Riguang 91007b (PE). Jinxiu County, Dayaoshan National Nature Reserve: Tang Qiming 20180504057.

Distribution: Baise, Hechi, Laibin, Guilin; China (Xinjiang, Tibet, Qinghai, Heilongjiang, Jilin, Liaoning, Inner Mongolia, Gansu, Shaanxi, Shanxi, Hebei, Beijing, Henan, Shandong, Sichuan, Chongqing, Hubei, Anhui, Jiangsu, Shanghai, Yunnan, Guizhou, Hunan, Jiangxi, Zhejiang, Guangxi, Guangdong, Fujian, Taiwan). Russia, Bhutan, North Korea, South Korea, Japan, Laos, Myanmar, Thailand, Vietnam, Nepal, Sri Lanka, Pakistan.

2.2 *Brachythecium formosanum* Takaki, J. Hattori Bot. Lab. 15: 2. 1955. Species description: See Zhai (2008).

Specimens examined: Xilin County, Maojie Nature Reserve: Jia Peng

XLMJ091020009 (GACP).

Distribution: Baise; China (Tibet, Inner Mongolia, Jilin, Liaoning, Ningxia, Shaanxi, Hebei, Sichuan, Chongqing, Guizhou, Anhui, Jiangsu, Hunan, Jiangxi, Zhejiang, Yunnan, Guangxi, Guangdong, Taiwan), Japan, Nepal.

2.3 *Brachythecium garovaglioides* Müll. Hal., Nuovo Giorn. Bot. Ital., n. s. 4: 270. 1897. Species description: See Zhai (2008).

Specimens examined: Leye County: Tang Qiming 20180413-427, 20180417-838. Leye County, Yachang Orchid National Nature Reserve: Tang Qiming & Zhang Shiyang 20181001-163, 20181001-219, 20181003-346. Xilin County, Nazuo Nature Reserve: Jia Peng et al. NZ100506067, NZ100506253, NZ100507010, NZ100507013, NZ100507028, NZ100507040, NZ100507062, NZ100507067, NZ100507072, NZ100507074, NZ100507092, XLNZ091019049 (GACP). Xilin County: Jia Peng et al. XLMB091021058, XLMB091021085, XLMB091021152 (GACP). Napo County, Baiyunshan: Wei Yumei 20140916-12, 10-668, 10-725. Napo County: Wang Jian et al. 20130816-54, 20130816-56, 20130818-80 (HSNU); Wei Yumei et al. 20141206-12 (HSNU); Pei Linying 2351 (PE); Jia Peng et al. NP091024077, NPPH100510165 (GACP). Napo County, Defu Nature Reserve: Jia Peng et al. NP091025031 (GACP). Jingxi County: Xie Qiang et al. Guoba 26, Hongshan 01, Madong 07; Wei Yumei 8-456A, 20140914-25. Daxin County, Encheng National Nature Reserve: Tang Qiming 20180113-152, 20180113-154B, 20180113-163, 20180113-165. Wuming County, Daming Mountain National Nature Reserve: Tang Qiming 20181106-104, 20181107-133. Longzhou County, Paotaishan: Wei Yumei 5-444A, 5-445, 5-447, 10-162. Luzhai County: Long Riguang 91007b (PE). Jinxiu County, Dayaoshan National Nature Reserve: Tang Qiming 20180507297.

Distribution: Baise, Chongzuo, Nanning, Liuzhou, Laibin; China (Xinjiang, Tibet, Inner Mongolia, Jilin, Gansu, Shaanxi, Shandong, Sichuan, Hubei, Hunan, Anhui, Jiangxi, Jiangsu, Zhejiang, Yunnan, Chongqing, Guizhou, Guangxi, Guangdong, Fujian, Hong Kong, Taiwan), Russia (Far East, Altai), North Korea, South Korea, Japan, Myanmar, Nepal, Pakistan, India, Bhutan.

2.4 *Brachythecium glauculum* C. Muell., Nuov. Giorn. Bot. Ital. n. s. 5: 199. 1897. Species description: See Hu & Wang (2005).

Specimens examined: Mao' ershan National Nature Reserve: Wang Youfang & Zuo Qin 2007715850 (HSNU).

Distribution: Guilin; Endemic to China (Shaanxi, Shanghai, Guizhou, Guangxi).

2.5 *Brachythecium helminthocladum* Broth. & Paris, Rev. Bryol. 31: 63. 1904. Species description: See Zhai (2008).

Specimens examined: Maojie Nature Reserve: Jia Peng et al. XLMJ091021133 (GACP).

Distribution: Baise; China (Inner Mongolia, Heilongjiang, Liaoning, Shaanxi, Shandong, Henan, Sichuan, Yunnan, Guizhou, Hunan, Anhui, Zhejiang, Guangxi, Taiwan), Japan.

2.6 *Brachythecium homocladum* Müll. Hal., Nuovo Giorn. Bot. Ital., n. s. 3: 126. 1896. Species description: See Hu & Wang (2005); Zhai (2008).

Specimens examined: Tian' e County: Long Guangri, Zhang Canming et al. 187b (PE).

Distribution: Hechi; Endemic to China (Liaoning, Shaanxi, Hubei, Anhui, Jiangxi, Guangxi).

2.7 *Brachythecium moriense* Besch., Ann. Sci. Nat., Bot., sér. 7, 17: 375. 1893. Species description: See Hu & Wang (2005).

Specimens examined: Mao' ershan National Nature Reserve: Wang Youfang & Liu Qin 681, 1569; Liu Qin & Zuo Qin 672 (HSNU).

Distribution: Guilin; China (Tibet, Heilongjiang, Jilin, Shaanxi, Shanxi, Hebei, Sichuan, Guizhou, Chongqing, Hubei, Hunan, Jiangxi, Anhui, Yunnan, Guangdong, Guangxi, Hong Kong), Japan.

2.8 *Brachythecium novae-angliae* (Sull. & Lesq.) A. Jaeger, Ber. Thätigk. St. Gallischen Naturwiss. Ges. 1876-77: 328 (Gen. Sp. Musc. 2: 328). 1878. *Hypnum novae-angliae* Sull. & Lesq., Manual (ed. 2) 676-677. 1856.

Bryhnia novae-angliae (Sull. & Lesq.) Grout, Bull. Torrey Bot. Club 25(5): 229. 1898.

Species description: See Noguchi (1991); Hu & Wang (2005); Li (2004).

Specimens examined: Wuming County, Daming Mountain National Nature Reserve: Tang Qiming 20181105-164. Mao' ershan National Nature Reserve: Wang Youfang & Zuo Qin 1640 (HSNU); He Si & Wei Yumei 48586. Jinxiu County, Dayaoshan National Nature Reserve: Tang Qiming 20180515-661.

Distribution: Nanning, Laibin, Guilin; China (Xinjiang, Tibet, Jilin, Shaanxi, Shanxi, Gansu, Hebei, Shandong, Shanghai, Jiangsu, Anhui, Hubei, Hunan, Jiangxi, Fujian, Sichuan, Guizhou, Chongqing, Yunnan, Guangxi), Japan, Europe, North America, Pakistan.

2.9 *Brachythecium pendulum* Takaki, J. Hattori Bot. Lab. 15: 27. 1955. Species description: See Hu & Wang (2005).

Specimens examined: Napo County: Jia Peng NPPH100510125 (GACP).

Distribution: Baise; China (Hebei, Anhui, Jiangxi, Zhejiang, Hunan, Sichuan, Guizhou, Chongqing, Fujian, Guangxi), Japan.

2.10 *Brachythecium pinnirameum* Müll. Hal., Nuovo Giorn. Bot. Ital., new series 3: 126. 1896. *Brachythecium camptothecioides* Takaki J. Hattori Bot. Lab. 15: 4, f. 9, 1-7. 1955.

Species description: See Noguchi (1991); Zhai (2008); Hu & Wang (2005).

Specimens examined: Mao' ershan National Nature Reserve: Wang Youfang & Zuo Qin 1379 as *Brachythecium camptothecioides* (HSNU).

Distribution: Guilin; China (Xinjiang, Tibet, Ningxia, Shaanxi, Shandong, Henan, Zhejiang, Anhui, Fujian, Sichuan, Guizhou, Yunnan, Guangxi), Japan.

2.11 *Brachythecium piligerum* Cardot, Bull. Soc. Bot. Genève, Sér. 2, 3: 290. 1911. **Species description:** See Hu & Wang (2005).

Specimens examined: Napo County: Jia Peng NPPH100510162 (GACP).

Distribution: Baise; China (Inner Mongolia, Heilongjiang, Jilin, Liaoning, Shaanxi, Beijing, Shandong, Tibet, Sichuan, Guizhou, Chongqing, Hubei, Hunan, Anhui, Jiangsu, Zhejiang, Jiangxi, Fujian, Yunnan, Guangxi), Japan.

2.12 *Brachythecium procumbens* (Mitt.) A. Jaeger, Ber. Thätigk. St. Gallischen Naturwiss. Ges. 1876-77: 341 (Gen. Sp. Musc. 2: 409). 1878. *Hypnum procumbens* Mitt., J. Proc. Linn. Soc., Bot., Suppl. 1: 70. 1859.

Species description: See Hu & Wang (2005); Zhai (2008).

Specimens examined: Leye County: Tang Qiming & Zhang Shiyan 20181001-213.

Distribution: Baise; China (Xinjiang, Shaanxi, Shanxi, Hebei, Jiangsu, Zhejiang, Tibet, Sichuan, Guizhou, Jiangxi, Yunnan, Guangxi, Taiwan), South Korea, Japan, India, Nepal, Sri Lanka.

2.13 *Brachythecium rivulare* Schimp., Bryol. Eur. 6: 17. pl. 546 (fasc. 52-56. Monogr. 13. pl.12). 1853. **Species description:** See Hu & Wang (2005); Zhai (2008).

Specimens examined: Leye County: Tang Qiming 20180409-52. Tian' e County: Long Guangri, Zhang Canming 190 (PE).

Distribution: Baise, Hechi; China (Xinjiang, Inner Mongolia, Heilongjiang, Jilin, Liaoning, Gansu, Shaanxi, Shanxi, Beijing, Hebei, Henan, Shandong, Tibet, Sichuan, Hubei, Hunan, Anhui, Zhejiang, Yunnan, Guangxi, Guizhou,

Chongqing, Fujian, Taiwan) and other Asian countries, Europe, Russia, North America, South America.

2.14 *Brachythecium rotaeanum* De Not, Comment. Soc. Crittog. Ital. 2(3): 285-286. 1867. Species description: See Hu & Wang (2005).

Specimens examined: Xilin County: Jia Peng XLMB091021240 (GACP).

Distribution: Baise; China (Jilin, Shaanxi, Sichuan, Chongqing, Hunan, Anhui, Zhejiang, Yunnan, Guizhou, Guangxi), Europe, Russia, Japan, North America.

2.15 *Brachythecium rutabulum* (Hewd.) B. S. G., Bryol. Eur. 6: 15. pl. 543 (fasc. 52-56 Monogr. 11. pl. 9). *Hypnum rutabulum* Hedw., Sp. Musc. Frond. 276. 1801.

Species description: See Hu & Wang (2005); Zhai (2008).

Specimens examined: Leye County: Tang Qiming 20180411-296, 20180609-209. Jingxi County: Wei Yumei 8-756. Longzhou County, Nonggang National Nature Reserve: Wei Yumei 5-644B. Shangsi County, Shiwandashan National Nature Reserve: Wang Youfang et al. 2014176 (HSNU). Longsheng County: Zhao Fangfang 882 (PE). Xilin County: Jia Peng XLMB091021209 (GACP).

Distribution: Baise, Chongzuo, Fangchenggang, Guilin; China (Xinjiang, Inner Mongolia, Heilongjiang, Jilin, Liaoning, Gansu, Ningxia, Shaanxi, Hebei, Beijing, Shandong, Tibet, Qinghai, Sichuan, Guizhou, Chongqing, Hubei, Hunan, Zhejiang, Anhui, Jiangsu, Yunnan, Guangxi, Taiwan), Europe, Russia (Siberia), Japan, Pakistan, Algeria, Papua New Guinea, Australia, Caucasus, Kazakhstan, New Zealand, Tanzania, Chile, Syria.

3. *Eurhynchium* Bruch & Schimp. Bryologia Europaea 5: 217. 1854.

3.1 *Eurhynchium kirishimense* Takaki, Journal of the Hattori Botanical Laboratory 16: 34. 41 f. 1-10. 1956. Species description: See Hu & Wang (2005); Liu (2010).

Specimens examined: Longsheng County: Guo Shuiliang & Yu Jing 110620166 (SHNU).

Distribution: Guilin; China (Liaoning, Shaanxi, Shanxi, Hunan, Sichuan, Guizhou, Yunnan, Fujian, Guangxi, Guangdong), Japan.

4. *Homalothecium* B. S. G. Bryol. Eur. 5: 91. 1851.

4.1 *Homalothecium laevisetum* Lac., Ann. Mus. Bot. Lugd. Bat. 2: 298. 1866; Wang in Wu, Bryofi. Hengduan Mts. 592. 2000. *Homalothecium leucodonticaule* (C. Muell.) Broth., Nat. Pfl. 1(3):

1135. 1908. *Ptychodium leucodoticaule* C. Muell., Giorn. Bot. Ital. n. ser. 4: 268. 1897. Species description: See Hu & Wang (2005).

Specimens examined: Xilin County: Jia Peng et al. XLMB091021242 (GACP). Leye County: Tang Qiming 20180409-39, 20180411-211, 20180411-222, 20180413-344, 20180414-488, 20180415-644, 20180416-774, 20180416-775, 20180607-62, 20180609-161. Leye County, Yachang Orchid National Nature Reserve: Tang Qiming & Zhang Shiyan 20181001-112, 20181007-536. Tian' e County: Li Zhenyu 90027 (PE). Tian' e County, Lingdang Mountain: Lai Mingzhou KS-89-401 (PE). Napo County: Xie Qiang et al. Longhe 11, Nongman 08, Nongman 15, Nongwang 19; Wei Yumei 5-337, 5-341B, 5-347, 5-352A, 5-356; Pei Linying 2192. Napo County, Laohutiao Nature Reserve: Wei Yumei 10-281. Jingxi County: Xie Qiang et al. Donghe 25, Zuzhi 17, Boyuan 06, Sanhe 27, Baliu 07, Zuzhi 18, Yuexu 21; Wei Yumei 5-293A, 8-648A, 8-742B. Jingxi County, Bangliang Nature Reserve: Wei Yumei 8-504, 1866. Jingxi County, Guwen Water Source Forest Reserve: Wei Yumei 8-716, 8-742B. Baise City, Dahongbao Nature Reserve: Wei Yumei 1514. Daxin County, Encheng National Nature Reserve: Tang Qiming 20180113-94, 20180113-104A, 20180113-105B, 20180113-132, 20180115-222, 20180115-233, 20180115-235B, 20180115-244. Daxin County, Xialei Water Source Forest Reserve: Wei Yumei 10-204; Pei Linying 2099, 2133, 2140. Long' an County, Pingshan: Wei Yumei 5-133, 5-134A, 5-148D, 5-154C, 5-156B. Longlin County, Dahongbao Nature Reserve: Wei Yumei 5-106A, 8-113A, 8-114. Longzhou County, Bageng Mountain: Zhang Boyuan et al. 2014632, 2014633, 2014629E (HSNU). Pingxiang City, Dalian City Scenic Area: Wei Yumei 5-718B, 5-735C.

Distribution: Baise, Chongzuo, Hechi, Nanning; China (Xinjiang, Tibet, Gansu, Shaanxi, Liaoning, Hebei, Shandong, Henan, Sichuan, Hubei, Hunan, Chongqing, Guizhou, Anhui, Jiangsu, Shanghai, Zhejiang, Jiangxi, Yunnan, Fujian, Guangdong, Guangxi), Japan, North Korea.

5. *Myuroclada* Besch. Ann. Sc. Nat. Ser. 7. 17: 379. 1893.

5.1 *Myuroclada longiramea* (Müll. Hal.) M. Li, Y. F. Wang, Ignatov & Huttunen, J. Bryol. 36(1): 15. 2014. *Eurhynchium longirameum* (C. Muell.) Y. F. Wang et R. L. Hu, Acta Phytotax. Sin. 41(3): 277. 2003. Species description: See Hu & Wang (2005).

Specimens examined: Rongshui County, Jiuwandashan: Wang Meizhi 46391a. Mao' ershan National Nature Reserve: Wang Youfang & Zuo Qin 1936 as *Eurhynchium angustirete* (HSNU).

Distribution: Liuzhou, Guilin; China (Xinjiang, Jilin, Liaoning, Shaanxi, Hebei, Guangxi), Eastern Europe, Altai, southern Siberia, Yakutia, Russian Far East, Kamchatka and Commander Islands to Primorsky Territory and Sakhalin, Japan (rare).

5.2 *Myuroclada maximowiczii* (G. G. Borshch.) Steere & W. B. Schofield, Bryologist 59: 1. 1956. *Hypnum maximowiczii* G. G. Borshch. in Maximowicz, Prim. Fl. Amur. 467. 1859. Species description: See Hu & Wang (2005).

Specimens examined: Shangsi County: Gao Qian 2036 (GXMG).

Distribution: Fangchenggang; China (Heilongjiang, Jilin, Liaoning, Inner Mongolia, Gansu, Shaanxi, Shanxi, Shandong, Jiangsu, Shanghai, Zhejiang, Sichuan, Chongqing, Hunan, Jiangxi, Yunnan, Guangxi), North Korea, Japan, Russia, Europe, North America.

6. *Oxyrrhynchium* (Schimp.) Warnst. Kryptogamenflora der Mark Brandenburg, Laubmoose 2: 781. 1905.

6.1 *Oxyrrhynchium hians* (Hedw.) Loeske, Verhandlungen des Botanischen Vereins für die Provinz Brandenburg und die Angrenzenden Länder 49: 59. 1907. *Hypnum hians* Hedw., Species Muscorum Frondosorum 272. pl. 70: f. 11-14. 1801. Species description: See Liu (2010).

Specimens examined: Longlin County, Baise City, Dahongbao Nature Reserve: Wei Yumei 1501. Leye County: Tang Qiming 20171018-009, 20171018-025, 20171018-029, 20171018-030B, 20171018-032, 20171021-019B, 20171021-019b, 20171021-020, 20180409-46, 20180411-281, 20180411-294, 20180415-524, 20180415-560, 20180415-569, 20180415-581, 20180415-595, 20180415-648, 20180808-145; Tang Qiming & Zhang Shiyan 20181002-245. Leye County, Yachang Orchid National Nature Reserve: Tang Qiming & Zhang Shiyan 20181004-431A, 20181005-493, 20181007-563. Napo County: Wang Jian et al. 20130816-14 (HSNU); Jia Peng et al. NP091024136 (GACP). Napo County, Defu Nature Reserve: Jia Peng et al. NP091025051, NP091025052 (GACP). Jingxi County: Wei Yumei et al. 20141207-26 (HSNU). Daxin County: Wei Yumei et al. 20141208-31 (HSNU). Daxin County, Encheng National Nature Reserve: Tang Qiming 20180112-69B, 20180115-243. Shangsi County, Shiwandashan: 2014179-a, 2014180A (HSNU). Luocheng County, Jiuwandashan: Long Guangri, Zhang Canming L-89028 as *Eurhynchium savatieri*, L-89034 (PE). Rongshui County, Jiuwandashan: Jia Yu J49-b (PE); He Xiaolan H-00140 as *Eurhynchium savatieri* (PE). Mao'ershan National Nature Reserve: Wang Youfang & Zuo Qin 263, 321, 325, 676, 1316-2, 1672, 1675-1, 1913, 1973 (HSNU).

Distribution: Baise, Chongzuo, Fangchenggang, Hechi, Liuzhou, Guilin; China (Heilongjiang, Jilin, Liaoning, Inner Mongolia, Shaanxi, Shandong, Henan, Sichuan, Guizhou, Hunan, Hubei, Jiangsu, Zhejiang, Jiangxi, Yunnan, Fujian, Guangxi, Guangdong, Hong Kong), Japan, Pakistan, Bhutan, Nepal, Caucasus, Cameroon, Tanzania, Côte d' Ivoire.

6.2 *Oxyrrhynchium latifolium* (Cardot) Podp., Spisy Přírodovědecké Fakulty University v Brně 116: 33. 1929. *Eurhynchium latifolium* Cardot., Beihefte zum Botanischen Centralblatt 17: 35. 21. 1904. Species description: See Liu (2010).

Specimens examined: Leye County: Tang Qiming 20171020-064, 20171021-010, 20180409-34, 20180409-75, 20180413-436, 20180416-735, 20180609-199, 20180609-202, 20180609-203. Leye County, Yachang Orchid National Nature Reserve: Tang Qiming & Zhang Shiyan 20181001-210, 20181008-608. Jingxi County: Wei Yumei 8-389A. Longzhou County, Nonggang National Nature Reserve: Wei Yumei 5-654A. Shangsi County, Shiwandashan: 2014183 (HSNU). Rongshui County: Long Guangri 91075a (PE). Mao' ershan National Nature Reserve: Wang Youfang & Zuo Qin 1317 as *Eurhynchium longirameum* (HSNU).

Distribution: Baise, Chongzuo, Fangchenggang, Liuzhou, Guilin; China (Guizhou, Zhejiang, Guangdong, Guangxi), North Korea, South Korea, Japan.

6.3 *Oxyrrhynchium laxirete* (Broth.) Broth., Die natürlichen Pflanzenfamilien, Zweite Auflage 11: 377. 1925. *Eurhynchium laxirete* Broth., Bulletin de la Société Botanique de Genève 4: 380. 1912. Species description: See Liu (2010).

Specimens examined: Leye County: Tang Qiming 20171018-017, 20171018-021, 20171019-007, 20171019-012, 20171019-019B, 20171019-021, 20171019-027B, 20171019-034, 20171019-063, 20171019-071, 20171020-017, 20171020-020, 20171020-058, 20171020-074C, 20171021-008, 20171021-025, 20171021-050, 20171021-061, 20171023-009D, 20171024-010, 20171033-033, 20180410-146, 20180411-177, 20180411-178B, 20180411-179, 20180411-180, 20180411-195, 20180411-227, 20180411-235, 20180411-238, 20180411-257A, 20180411-265, 20180413-320, 20180413-322, 20180413-323, 20180413-326, 20180413-346, 20180413-348, 20180413-349, 20180413-351, 20180413-355, 20180413-376, 20180413-408, 20180414-470, 20180414-484, 20180415-528, 20180415-561, 20180415-562, 20180415-574, 20180415-580, 20180415-653, 20180416-708, 20180416-758, 20180417-806, 20180417-817, 20180607-1, 20180607-15, 20180607-26, 20180607-30, 20180607-33, 20180808-076, 20180809-83A, 20180809-95, 20180809-98; Tang Qiming & Zhang Shiyan 20181002-244. Leye County, Yachang Orchid National Nature Reserve: Tang Qiming 20181001-176, Tang Qiming & Zhang Shiyan 20180930-23. Xilin County, Nazuo Nature Reserve: Jia Peng et al. NZ100506010, NZ100506030, NZ100506065, NZ100506073, NZ100506074, NZ100506076, NZ100506079, NZ100506080, NZ100506101, NZ100506110, NZ100506121, NZ100506129, NZ100506130, NZ100506131, NZ100506139, NZ100506184, NZ100506210, NZ100506212, NZ100506229, NZ100507008, NZ100507042, NZ100507075 (GACP). Xilin County: Jia Peng et al. XLMB091021005, XLMB091021090, XLMB091021086, XLMB091021253 (GACP). Xilin County, Maojie Nature Reserve: Jia Peng et al. XLMJ091020086, XLMJ091020114, XLMJ091020144 (GACP). Napo County: Xie Qiang et

al. Hongshan 12, Hongshan 14, Pomatun 15, Niulangpo 13; Wei Yumei 20141206-37; Jia Peng et al. NP091024007, NP091024159 (GACP). Napo County, Laohutiao Nature Reserve: Wei Yumei 10-409, 10-452, 10-484, 10-604, 10-708. Napo County, Defu Nature Reserve: Jia Peng et al. NP091025014 (GACP). Jingxi County: Wei Yumei 5-299, 20140912-7, 20140914-1; Xie Qiang et al. Yongxing 41, Hongshan 11; 20141207-14 (HSNU). Jingxi County, Guwen Water Source Forest Reserve: Wei Yumei 8-725B. Jingxi County, Bangliang Nature Reserve: Wei Yumei 8-528, 8-541C, 1888 (PE). Daxin County, Encheng National Nature Reserve: Tang Qiming 20180115-220, 20180116-262C. Daxin County: Wei Yumei 5-207, 5-216, 5-220; Wang Jian et al. 20130813-32 (HSNU). Daxin County, Xialei Water Source Forest Reserve: Wei Yumei 5-406A, 5-407A, 10-219, 10-223. Long'an County, Longhushan Nature Reserve: Wei Yumei 5-94. Wuming County, Sanshiliulongjun Nature Reserve: Wei Yumei 5-25A, 5-46, 5-52. Longzhou County: Wei Yumei 5-514A, 5-562, 5-748A; Zhang Boyuan et al. 2014541B (HSNU); Wu Pengcheng, Lin Youxing et al. 1299 (PE). Longzhou County, Paotaishan: Wei Yumei 5-459, 20140921-7. Longzhou County, Nonggang National Nature Reserve: Zhang Boyuan et al. 2014704, 2014708, 2014717, 2014719, 2014721B, 2014723, 2014739, 2014757 (HSNU); Wei Yumei 5-574B, 5-591A, 5-642, 5-696; Pei Linying 1858 (PE); Zhang Boyuan 2014711 (HSNU). Longzhou County, Daqingshan: Wei Yumei 10-66. Ningming County: Zhang Boyuan et al. 2014546, 2014548, 2014545 (HSNU). Pingxiang City, Xiaoliancheng Scenic Area: Wei Yumei 10-30. Fangchenggang City: Zhang Boyuan et al. 2014508 (HSNU). Fangcheng District: Zhang Boyuan et al. 2014514 (HSNU). Rongshui County, Jiuwandashan: Wang Meizhi 46293-b (PE); 20180415-656; 20180808-148B; 20171021-029. Guilin City, Lingui District, Huaping National Nature Reserve: He Si & Wei Yumei 48888. Mao'ershan National Nature Reserve: Wang Youfang & Zuo Qin 1606, 1673, 1678, 1681 (HSNU).

Distribution: Baise, Chongzuo, Fangchenggang, Nanning, Liuzhou, Guilin; China (Tibet, Shaanxi, Shandong, Sichuan, Chongqing, Guizhou, Hunan, Hubei, Jiangsu, Zhejiang, Shanghai, Anhui, Jiangxi, Yunnan, Fujian, Guangxi, Guangdong, Hainan), North Korea, South Korea, Japan.

6.4 *Oxyrrhynchium savatieri* (Besch.) Broth., Annales des Sciences Naturelles; Botanique, sér. 7, 17: 378. 1893. *Eurhynchium savatieri* Schimp. ex Besch., Annales des Sciences Naturelles; Botanique, sér. 7, 17: 378. 1893. *Eurhynchium protractum* Müll. Hal., Nuovo Giornale Botanico Italiano, new series 3: 124. 1896. *Rhynchostegium gracilescens* Broth., Symbolae Sinicae 4: 108. 1929. Species description: See Liu (2010).

Specimens examined: Napo County: Wei Yumei 10-779.

Distribution: Baise; China (Xinjiang, Tibet, Qinghai, Inner Mongolia, Heilongjiang, Shaanxi, Shanxi, Shandong, Henan, Jiangsu, Shanghai, Zhejiang, Jiangxi, Anhui, Hunan, Hubei, Sichuan, Guizhou, Chongqing, Yunnan, Guangxi,

Guangdong, Hong Kong, Taiwan), North Korea, South Korea, Japan, Oceania (Vanuatu).

6.5 *Oxyrrhynchium vagans* (A. Jaeger) Ignatov & Huttunen Arctoa 11: 273. 2002. *Rhynchostegium vagans* A. Jaeger, Ber. Thätigk. Gallischen Naturwiss. Ges. 1867-1877: 369. 1878. Species description: See Ignatov (2005).

Specimens examined: Jingxi County: Wei Yumei et al. 20141208-18. Mao' ershan National Nature Reserve: Wang Youfang & Zuo Qin 356 (HSNU).

Distribution: Baise, Guilin; China (Anhui, Zhejiang, Sichuan, Guizhou, Hunan, Yunnan, Guangxi, Taiwan), India, Nepal, Pakistan, Myanmar, Vietnam, Thailand, Sri Lanka, Laos, Malaysia, Indonesia, Philippines, USA (Hawaii).

7. *Palamocladium* C. Müll. Flora 82: 465-466. 1896.

7.1 *Palamocladium leskeoides* (Hook.) E. G. Britt., Bull. Torrey Bot. Club 40: 673, 1931. *Hookeria leskeoides* Hook., Musci Exot., vol. 1, pl. 55, 1818. *Isothecium nilgeheniense* Mont., Ann. Sci. Nat., Bot., sér. 2, 17: 246. 1842. *Palamocladium nilgheriense* (Mont.) Müll. Hall., Flora 82: 465. 1896. Species description: See Hu & Wang (2005).

Specimens examined: Longlin County, Dahongbao Nature Reserve: Wei Yumei 8-150, 8-238. Longlin County: Wei Yumei 8-342, 8-348, 1528, 1538, 1593, 1594 (PE); Zhang Boyuan 2013817-26. Tian' e County: Zhang Canming T-008 (PE); Long Guangri, Zhang Canming et al. 187c, 191-a (PE); Lai Mingzhou KS89-235 (PE). Napo County: Pei Linying 2201, 2205, 2227, 2236, 2343, 2395, 2400, 2402, 2445, 2456, 2357, 2475, 2478, 2582, 2595, 2598 (PE); Wang Jian et al. 20130817-13, 20130817-25 (HSNU); Wei Yumei et al. 20141204-106, 20141204-132, 10-526; Xie Qiang et al. Guideng 17, Longhe 08, Niulangpo 11, Shuinong 11. Napo County, Laohutiao Nature Reserve: Wei Yumei 10-270, 10-345, 10-354, 10-413, 10-435, 10-443, 10-444, 10-451, 10-526, 10-550, 10-601, 10-661, 10-735, 10-778. Jingxi County: Wei Yumei 20140916-54, 5-323, 5-332, 8-463B, 8-666, 8-688; Xie Qiang et al. Guoba 27; Pei Linying 2739, 2746, 2582. Jingxi County, Guwen Water Source Forest Reserve: Wei Yumei 8-704, 8-719A, 8-723A, 8-730A, 8-743A. Jingxi County, Diding Nature Reserve: Xie Qiang et al. Sample 5D2-001, Sample 5D5-001, Sample 5E4-001, Sample 5E5-001. Ningming County, Shiwandashan National Nature Reserve: Zhang Boyuan et al. 2014373A (HSNU), 20140418. Rongshui County, Jiuwandashan: Jia Yu 00115 (PE). Rongshui County: Long Guangri 91085-a (PE); Jia Yu 00113 (PE); Wang Meizhi 46432-a (PE). Longsheng County: Jin Jianming, Hu Shunshi 521-B, 496 (PE). Mao' ershan National Nature Reserve: Liu Qian & Zuo Qin 1389 (HSNU).

Distribution: Baise, Chongzuo, Hechi, Liuzhou, Guilin; China (Xinjiang, Tibet, Inner Mongolia, Heilongjiang, Jilin, Liaoning, Shaanxi, Hebei, Shanghai,

Jiangsu, Zhejiang, Hubei, Hunan, Anhui, Sichuan, Guizhou, Chongqing, Yunnan, Guangxi, Fujian, Taiwan), North Korea, Japan, India, Indonesia, Vietnam, Philippines, Costa Rica, New Zealand, West Indies, Guatemala, Argentina, Brazil, Peru, Bolivia, Colombia, Ecuador, USA, Venezuela, Ethiopia, Somalia, Uganda, Kenya, Tanzania, Rwanda, South Africa, Madagascar, Swaziland.

8. *Pseudokindbergia* Min Li, Y. F. Wang, Ignatov & B. C. Tan, Cryptogamie, Bryologie 36(1): 61. 2015.

8.1 *Pseudokindbergia dumosa* (Mitt.) Min Li, Y. F. Wang, Ignatov & B. C. Tan, Cryptog. Bryol. 36(1): 61. *Hypnum dumosa* Mitt., J. Linn. Soc. Bot. Suppl. 1: 80. 1859. *Kindbergia dumosa* (Mitt.) Ignatov & Huttunen, Arctoa 11: 263. 2002. *Eurhynchium serricuspis* Müll Hal., Nuovo Giorn. Bot. Ital., n. s., 5: 197. 1898. *Bryhnia serricuspis* (Müll Hall.) Y. F. Wang & R. L. Hu, Acta Phytotax. Sin. 41: 272. 2003. *Rhynchostegium divaricatifolium* Renauld & Cardot, Bulletin de la Société Botanique de Belgique 41(1): 91. 1905. Species description: See Li et al. (2015a).

Specimens examined: Rongshui County: Wang Meizhi 46939 (PE) as *Brachythecium brotheri*. Longsheng County: Guo Shuiliang & Yu Jing 110619523 (SHNU). Mao' ershan National Nature Reserve: Liu Qian & Zuo Qin 965; Liu Qian, Zhu Yongqing & Wang Youfang 609, 1684 (HSNU).

Distribution: Liuzhou, Guilin; China (Gansu, Shaanxi, Tibet, Sichuan, Chongqing, Hunan, Yunnan, Guangxi, Taiwan), India, Nepal, Bhutan.

9. *Rhynchostegiella* (B. S. G) Limpr. Laubm. Deutschl. 3: 207. 1896.

9.1 *Rhynchostegiella japonica* Dix. et Thér., Rev. Bryol. n. ser. 4: 167. 1932. Species description: See Hu & Wang (2005).

Specimens examined: Jingxi County: Wei Yumei 8-625B, 5-308; Hu Shunshi Q-7 (PE). Daxin County: Wei Yumei 5-15, 5-202, 5-206A, 5-437A. Daxin County, Encheng National Nature Reserve: Tang Qiming 20180504-40. Longzhou County: Zhang Boyuan 2014660; Wei Yumei 5-469A, 5-477, 5-527A. Longzhou County, Nonggang National Nature Reserve: Zhang Boyuan 2014737B (HSNU).

Distribution: Baise, Chongzuo; China (Xinjiang, Shaanxi, Hunan, Guizhou, Chongqing, Yunnan, Guangxi, Guangdong), Japan.

9.2 *Rhynchostegiella laeviseta* Broth., Symb. Bin. 4: 109. 1929; Wang et al., Acta Phytotax. Sin. 36(3): 276. 1998. Species description: See Hu & Wang (2005).

Specimens examined: Longzhou County, Nonggang National Nature Reserve: Wang Jian et al. 20130812-26, 20130812-34, 20130812-50, 20130812-70A

(HSNU); Zhang Boyuan 2014727 (HSNU); Pei Linying 1793 (PE).

Distribution: Chongzuo; Endemic to China (Xinjiang, Shaanxi, Guizhou, Chongqing, Hunan, Jiangxi, Zhejiang, Yunnan, Guangxi).

9.3 *Rhynchostegiella leptoneura* Dix. & Thér. in Dix., Rev. Bryol., n. s. 4: 168. 1932. Species description: See Ignatov (2005).

Specimens examined: Jingxi County: Wei Yumei 8-574. Longzhou County, Nonggang National Nature Reserve: Zhang Boyuan 2014700; Wei Yumei et al. 20140422-65, 20140422-65A (HSNU). Longzhou County: Zhang Boyuan 20140423-31G (HSNU); Wei Yumei 5-601B. Fangcheng District, Shiwandashan National Nature Reserve: Tang Qiming et al. 20181112-143.

Distribution: Baise, Chongzuo, Fangchenggang; Endemic to China (Inner Mongolia, Jilin, Liaoning, Shandong, Sichuan, Guizhou, Yunnan, Guangxi, Taiwan).

9.4 *Rhynchostegiella menadensis* (Sande Lac.) E. B. Bartram, Philipp. J. Sci. 68: 302. 1933. *Hypnum menadense* Sande Lac., Bryol. Jav. 2: 156, tab. 255. 1866. *H. fissidentoides* Broth., Bot. Jahrb. 17: 479. 1893, hom. Illeg. *Rhynchostegium menadense* (Sande Lac.) A. Jaeger, Ber. S. Gall. Thät. Naturw. Ges. 1876-77: 371. 1878 (Ad. 2: 437). *Rhynchostegium fissidentoides* Paris, Ind. Bryol. 1128. 1898. Species description: See Ignatov (1999).

Specimens examined: Daxin County: Wei Yumei 10-253. Long' an County: Wei Yumei 5-96. Wuming County: Wei Yumei 5-30, 5-37, 5-43A. Longzhou County: Zhang Boyuan 20140422-65D, 20140423-31 (HSNU); Wei Yumei 5-575. Longzhou County, Nonggang National Nature Reserve: Zhang Boyuan 2014685A, 2014710, 2014713, 2014722, 2014725, 2014741, 2014754, 2014756 (HSNU); Wang Jian et al. 20130811-32, 20130812-70 (HSNU); Pei Linying 1781 (PE). Fangchenggang City, Fangcheng District: Zhang Boyuan 2014454 (HSNU). Daxin County, Encheng National Nature Reserve: Tang Qiming 20180113-155.

Distribution: Baise, Chongzuo, Fangchenggang, Nanning; China (Hunan, Guangxi), Philippines.

9.5 *Rhynchostegiella sinensis* Broth. & Paris, Rev. Bryol. 35: 1908. Species description: See Ignatov (2005).

Specimens examined: Napo County: Wang Jian et al. 20130817-124, 20130817-126 (HSNU).

Distribution: Baise; Endemic to China (Shanghai, Jiangsu, Zhejiang, Guangxi).

10. *Rhynchostegium* Bruch & Schimp. *Bryologia Europaea* 5: 197. 1852.

10.1 *Rhynchostegium celebicum* (Sande Lac.) A. Jaeger, Bericht über die Thätigkeit der St. Gallischen Naturwissenschaftlichen Gesellschaft 1876-77: 374. *Hypnum celebium* Sande Lac., *Bryologia Javanica* 2: 159. 1866. **Species description:** See Liu (2010).

Specimens examined: Leye County, Yachang Orchid National Nature Reserve: Tang Qiming & Zhang Shiyan 20180930-36. Xilin County, Nazuo Nature Reserve: Jia Peng et al. NZ100506075, NZ100506168, NZ100506196, NZ100506202, NZ100506232 (GACP). Xilin County: Jia Peng et al. XLMB091021010, XLMB091021239 (GACP). Xilin County, Maojie Nature Reserve: Jia Peng et al. XLMJ061020069, XLMJ091020080, XLMJ091020135, XLMJ091020136 (GACP). Napo County, Laohutiao Nature Reserve: Wei Yumei (no collection number). Napo County: Xie Qiang et al. Bai' ai 18. Jingxi County, Bangliang National Reserve: Wang Jian et al. 20130815-112 (HSNU); Wei Yumei 8-601, 8-635, 10-251. Daxin County, Xialei Water Source Forest Reserve: Wei Yumei 10-211. Daxin County: Wei Yumei 5-208, 10-238. Jingxi County: Wei Yumei 8-600A, 8-758A, 8-763, 8-769, 8-776. Wuming County: Wei Yumei 5-34. Wuming County, Daming Mountain National Nature Reserve: Tang Qiming 20181105-124. Longzhou County, Daqingshan: Zhang Boyuan et al. 2014564 (HSNU). Longzhou County, Nonggang National Nature Reserve: Wei Yumei 5-675. Longzhou County: Wei Yumei 5-534, 5-536A, 5-537, 5-538. Shiwandashan: Guo Shuiliang & Yu Jing (no collection number), a531 (SHNU). Shangsi County, Shiwandashan: Tang Qiming 20181113-214. Fangcheng District, Shiwandashan National Nature Reserve: Tang Qiming et al. 20181112-164A.

Distribution: Baise, Chongzuo, Fangchenggang, Nanning; China (Sichuan, Guizhou, Yunnan, Guangxi, Guangdong, Taiwan, Hainan), India, Indonesia, Sumatra, Vietnam, Philippines, Papua New Guinea, Malaysia, USA (Hawaii).

10.2 *Rhynchostegium contractum* Cardot, *Bulletin de la Société Botanique de Genève* 4: 381. 1912. **Species description:** See Liu (2010).

Specimens examined: Xilin County, Nazuo Nature Reserve: Jia Peng et al. NZ100506132, NZ100506135 (GACP). Leye County: Tang Qiming 20180414-455, 20180414-456. Tian'e County: Lai Mingzhou KS89-10 (PE). Napo County: Jia Peng et al. NPPH100510195 (GACP). Wuming County, Daming Mountain National Nature Reserve: Tang Qiming 20181105-116. Longsheng County: Guo Shuiliang & Yu Jing 110620148 (SHNU). Mao' ershan National Nature Reserve: Wang Youfang & Zuo Qin 686 as *R. fauriei* (HSNU); He Si & Wei Yumei 48671.

Distribution: Baise, Hechi, Nanning, Guilin; China (Shaanxi, Henan, Jiangsu, Zhejiang, Sichuan, Guizhou, Hunan, Anhui, Yunnan, Fujian, Guangxi, Guangdong, Taiwan), North Korea, South Korea, Japan.

10.3 *Rhynchosygium duthiei* Müll. Hal. et Dixon, Journal of the Bombay Natural History Society 39: 789. 1938. Species description: See Liu (2010).

Specimens examined: Longzhou County, Daqingshan: Zhang Boyuan et al. 2014565 (HSNU). Longzhou County, Nonggang National Nature Reserve: Zhang Boyuan et al. 2014696 (HSNU). Ningming County: Zhang Boyuan et al. 2014559 (HSNU).

Distribution: Chongzuo; China (Sichuan, Yunnan, Guangxi, Guangdong), India, Bhutan.

10.4 *Rhynchosygium inclinatum* (Mitt.) A. Jaeger, Bericht über die Thätigkeit der St. Gallischen Naturwissenschaftlichen Gesellschaft 1876-77: 366. *Hypnum inclinatum* Mitt., Journal of the Proceedings of the Linnean Society 8: 152. 1864. Species description: See Liu (2010); Hu & Wang (2005).

Specimens examined: Longzhou County: Zhang Boyuan et al. 2014683 (HSNU).

Distribution: Chongzuo; China (Xinjiang, Tibet, Shaanxi, Shandong, Jiangsu, Henan, Sichuan, Chongqing, Guizhou, Hunan, Anhui, Jiangsu, Yunnan, Guangxi, Taiwan), Japan.

10.5 *Rhynchosygium ovalifolium* S. Okamura, Journal of the College of Science, Imperial University of Tokyo 38(4): 94. pl. 41. 1926. Species description: See Liu (2010).

Specimens examined: Longlin County, Dahongbao Nature Reserve: Wei Yumei 8-175. Xilin County, Nazuo Nature Reserve: Jia Peng et al. NZ100506124, NZ100506157, NZ100506159, NZ100506215, NZ100506230, NZ100506248, NZ100506250, NZ100506251, NZ100507098 (GACP). Xilin County, Maojie Nature Reserve: Jia Peng et al. XLMJ091020081, XLMJ091020083 (GACP). Xilin County: Jia Peng et al. XLMB091021009, XLMB091021079, XLMB091021091, XLMB091021099, XLMB091021236, XLMB091021107, XLMB091021210, XLMB091021214, XLMB091021228, XLMB091021230, XLMB091021252, XLMB091021254, XLMB091021255, XLMB091021256 (GACP). Leye County: Tang Qiming 20171019-006, 20180417-836. Tian'e County: Long Guangri, Zhang Canming et al. 160a (PE); 20180504-015; 20180504-019. Napo County: Xie Qiang et al. Baxiongshan 22; Wei Yumei et al. 20141204-50 (HSNU); Jia Peng et al. NP091024092 (GACP). Napo County, Laohutiao Nature Reserve: Wei Yumei 10-674. Napo County, Defu Nature Reserve: Jia Peng et al. NP091025007 (GACP). Jingxi County, Bangliang Nature Reserve: Wei Yumei 8-599, 8-626A, 1952 (PE). Jingxi County: Wei Yumei 20140914-18, 5-331, 8-634A, 8-757C, 8-759, 8-760, 8-762, 8-765B, 8-772, 8-774, 8-775. Jingxi County, Guwen Water Source Forest Reserve: Wei Yumei 8-700. Daxin County, Xialei Water Source Forest Reserve:

Wei Yumei 10-226. Daxin County, Encheng National Nature Reserve: Tang Qiming 20180115-219. Wuming County, Sanshiliulongjun Nature Reserve: Wei Yumei 5-56. Wuming County, Daming Mountain National Nature Reserve: Tang Qiming 20181106-102. Longzhou County, Nonggang National Nature Reserve: Wei Yumei 5-597A. Longzhou County, Bageng Mountain: Zhang Boyuan et al. 2014676, 2014679 (HSNU). Longzhou County, Nonggang National Nature Reserve: Zhang Boyuan et al. 2014699A, 2014743 (HSNU); Pei Linying 176 (HSNU). Longzhou County, Daqingshan: Zhang Boyuan et al. 2014558, 2014567, 2014574B, 2014584 (HSNU). Ningming County, Shiwandashan National Nature Reserve: Zhang Boyuan et al. 2014379A, 2014381B, 2014387 (HSNU). Shangsi County, Shiwandashan National Nature Reserve: Wang Youfang et al. 2014184-a, 2014197, 2014207B. Fangchenggang City, Shiwandashan National Nature Reserve: Zhang Boyuan et al. 2014426A, 2014429B. Shiwandashan: Guo Shuiliang & Yu Jing a418 (SHNU). Rongshui County, Jiuwandashan: Wang Meizhi 45989 (PE). Longsheng County: Wu Pengcheng, Lin Youxing et al. 831 (PE); Wei Yumei 10-176; Guo Shuiliang & Yu Jing 110619380 (SHNU). Mao' ershan National Nature Reserve: Wang Youfang & Zuo Qin 606 (HSNU), 1957 (HSNU) as *R. pallenticaule*; He Si & Wei Yumei 48680; Tang Qiming 20180907-36.

Distribution: Baise, Chongzuo, Fangchenggang, Hechi, Nanning, Liuzhou, Guilin; China (Jilin, Shaanxi, Sichuan, Guizhou, Chongqing, Hunan, Yunnan, Guangxi, Fujian, Taiwan), Japan.

10.6 *Rhynchosygium pallenticaule* Müll. Hal., Nuovo Giornale Botanico Italiano, new series 4: 271. 1897. Species description: See Liu (2010).

Specimens examined: Longlin County: Wei Yumei 8-353, 8-356. Leye County, Yachang Orchid National Nature Reserve: Tang Qiming & Zhang Shiyao 20180930-54, 20181008-610. Napo County: Xie Qiang et al. Penhe 10; Wei Yumei 10-472. Jingxi County, Guwen Water Source Forest Reserve: Wei Yumei 8-668, 8-690A. Jingxi County, Bangliang Nature Reserve: Wei Yumei 8-632, 1978. Jingxi County, Hujian: Hu Shunshi 54. Wuming County, Sanshiliulongjun Nature Reserve: Wei Yumei 5-60. Wuming County, Daming Mountain National Nature Reserve: Tang Qiming 20181107095. Longzhou County: Wei Yumei 5-474. Shangsi County, Shiwandashan: Wang Jian et al. 2014321; Zhang Boyuan et al. 2014321. Fangcheng District, Shiwandashan National Nature Reserve: Zhang Boyuan et al. 2014438C (HSNU). Longsheng County: Guo Shuiliang & Yu Jing 110621181 (SHNU). Mao' ershan National Nature Reserve: Wang Youfang & Zuo Qin 677 (HSNU).

Distribution: Baise, Chongzuo, Fangchenggang, Nanning, Guilin; Endemic to China (Heilongjiang, Jilin, Shaanxi, Zhejiang, Yunnan, Guangxi, Guangdong, Hainan).

10.7 *Rhynchostegium pallidifolium* (Mitt.) A. Jaeger, Bericht über die Thätigkeit der St. Gallischen Naturwissenschaftlichen Gesellschaft 1876-77: 369. *Hypnum pallidifolium* Mitt., Journal of the Proceedings of the Linnean Society 8: 153. 1864. Species description: See Hu & Wang (2005); Liu (2010).

Specimens examined: Mao' ershan National Nature Reserve: Wang Youfang & Zuo Qin 539 as *R. subspeciosum* (HSNU).

Distribution: Guilin; China (Xinjiang, Tibet, Inner Mongolia, Jilin, Liaoning, Shaanxi, Shanxi, Shandong, Henan, Sichuan, Chongqing, Guizhou, Hubei, Hunan, Jiangxi, Anhui, Jiangsu, Shanghai, Zhejiang, Yunnan, Guangxi, Hainan, Hong Kong, Taiwan), South Korea, Japan.

10.8 *Rhynchostegium riparioides* Hedw. Bulletin de la Société Botanique de France 60: 231. 1913. Species description: See Liu (2010).

Specimens examined: Leye County: Tang Qiming & Zhang Shiyan 20181002-256. Napo County: Wei Yumei et al. 20141204-154 (HSNU). Jingxi County: Wei Yumei 5-263, 5-266, 5-320. Jingxi County, Guwen Water Source Forest Reserve: Wei Yumei 8-680A. Longzhou County, Paotaishan: Wei Yumei 5-471A. Rongshui County, Jiuwandashan: Jia Yu 00081 (PE); Wang Meizhi 46104, 46123 (PE); He Xiaolan H-00162 (PE). Longsheng County: Wu Pengcheng, Lin Youxing et al. 988 (PE); Jin Jianming, Hu Shunshi 949 (PE); Guo Shuiliang & Yu Jing 110620023 (SHNU).

Distribution: Baise, Chongzuo, Liuzhou, Guilin; China (Heilongjiang, Jilin, Liaoning, Inner Mongolia, Gansu, Shaanxi, Hebei, Shandong, Sichuan, Chongqing, Guizhou, Hubei, Hunan, Shanghai, Jiangsu, Zhejiang, Anhui, Yunnan, Guangxi, Guangdong), India, Nepal, Bhutan, Pakistan, Tanzania, North Korea, Japan.

10.9 *Rhynchostegium serpentinae* (Müll. Hal.) Broth., Nuovo Giornale Botanico Italiano, new series 13: 580. 1906. *Eurhynchium serpentinae* Müll. Hal., Nuovo Giornale Botanico Italiano, new series 4: 271. 1897. Species description: See Liu (2010).

Specimens examined: Xilin County, Nazuo Nature Reserve: Jia Peng et al. NZ100506099, NZ100506112, NZ100506221, NZ100506235, NZ100507015, NZ100507038, NZ100507082 (GACP). Xilin County: Jia Peng et al. XLMB091021218, XLMB091021222 (GACP). Xilin County, Maojie Nature Reserve: Jia Peng et al. XLMB091021139 (GACP). Leye County, Yachang Orchid National Nature Reserve: Tang Qiming & Zhang Shiyan 20180930-89, 20180930-95. Napo County: Wei Yumei 10-434; Jia Peng et al. NP091024142 (GACP). Wuming County, Daming Mountain National Nature Reserve: Tang Qiming 20181106-101. Shangsi County, Shiwandashan: Guo Shuiliang & Yu Jing (no collection number) (SHNU). Guilin City, Lingui District: Tang

Qiming 20180910-272. Jinxiu County, Dayaoshan National Nature Reserve: Tang Qiming 20180515-625.

Distribution: Baise, Fangchenggang, Nanning, Laibin, Guilin; Endemic to China (Shanxi, Shaanxi, Sichuan, Chongqing, Guizhou, Hunan, Fujian, Jiangsu, Zhejiang, Yunnan, Guangxi).

11. *Sciuro-hypnum* (Hampe) Hampe, *Linnaea* 38: 220. 1874. *Hypnum* subg. *Sciurohypnum* Hampe, *Flora* 50: 76. 1867.

11.1 *Sciuro-hypnum plumosum* (Hedw.) Ignatov & Huttunen, *Arctoa* 11: 270. 2002 [2003]. *Hypnum plumosum* Hedw., *Sp. Musc. Frond.* 257-258. 1801. *Brachythecium plumosum* (Hedw.) Schimp., *Bryol. Eur.* 6: 8 (fasc. 52-54 Monogr. 4). 1853. *Brachythecium glauculum* Müll.Hal., *Nuovo Giorn. Bot. Ital.*, n. s. 5: 199. 1898. *Brachythecium glauculum* C. Muell., *Nuov. Giorn. Bot. Ital.* n. s. 5: 199. 1897. **Species description:** See Zhai (2008).

Specimens examined: Longlin County, Dahongbao Nature Reserve: Wei Yumei 1512. Leye County: Tang Qiming 20180409-51, 20180409-59, 20180413-423; Guo Shuiliang & Yu Jing 110622012 (SHNU); Tang Qiming & Zhang Shiyan 20181002-276, 20181002-289. Jingxi County, Bangliang National Nature Reserve: Wang Jian et al. 20130815-89 (HSNU). Huanjiang County, Jiuwandashan: Wang Meizhi 47057, 47123 (PE); Jia Yu 00427a (PE). Luocheng County, Jiuwandashan: Long Guangri, Zhang Canming L-89044 (PE). Jiuwandashan: Long Guangri, Zhang Canming et al. GSY058-b as *Brachythecium plumosum*, H-046 (PE). Rongshui County, Jiuwandashan: Jia Yu 00039 (PE); Wang Meizhi 46022 (PE); He Xiaolan H-00100-a (PE). Rongshui County: He Xiaolan H00449 (PE). Longsheng County: Jin Jianming, Hu Shunshi 376-2, 376-3, 387, 394A-1, 394A-2, 416 (PE); Wu Pengcheng, Lin Youxing et al. 213, 213-2, 231, 1304-b, 1363, 1401 (PE); Guo Shuiliang & Yu Jing 110619354, 110620194, 110620227 (SHNU). Longsheng County, Huaping: Guo Shuiliang & Yu Jing 110619265, 110619317, 11062018, 110620131, 110620147, 110620156, 110620185, 110620307 (SHNU). Mao' ershan National Nature Reserve: Wang Youfang & Zuo Qin 96, 143, 145, 147, 172, 176, 186, 188, 203, 254, 281, 323, 329, 333, 336, 338, 339, 340, 343, 344, 349, 351, 354, 359, 360, 362, 363, 364, 365, 369, 370, 371, 372, 373, 374, 376, 377, 379, 380, 383, 384, 386, 387, 465, 510, 514, 517, 521, 538, 546, 558, 559, 600, 603, 605, 607-1, 608, 610, 611, 612, 614, 616, 620 as *B. glaciale*, 622, 673, 674, 675, 678, 683, 727, 734-1, 741-1, 742-1, 743-1, 744-1, 745-1, 746-1, 748-1, 749-1, 750-1, 751-1, 753-1, 754-1, 755-1, 756-1, 758-1, 759-2, 760-1, 761-1, 762-1, 763-1, 764-1, 765-1, 766-1, 768-1, 770-1, 772-1, 773-1, 774-1, 776-1, 777-1, 779, 780-1, 815, 837, 850, 871, 872, 887, 910, 921, 926, 933, 958, 960, 962, 963, 964, 967, 968, 969, 975, 976, 977, 978, 979, 982, 983, 984, 985, 986, 987, 990, 991, 993, 994, 995, 997, 998, 999, 1000, 1001, 1037, 1048, 1142, 1164b, 1187, 1249, 1259, 1316-1, 1319, 1329, 1357, 1362, 1364, 1366, 1372, 1373, 1376, 1378, 1381, 1382, 1385, 1386, 1387, 1388, 1390, 1392, 1394, 1395, 1396, 1400, 1401, 1402, 1403, 1405, 1407, 1410, 1412, 1413, 1414, 1419, 1421, 1425, 1427, 1428, 1430,

1431, 1432, 1435, 1439, 1560, 1561, 1562, 1563, 1566, 1567, 1570, 1571, 1572, 1573, 1575, 1670, 1682 (HSNU); He Si & Wei Yumei 48603, 48706; Tang Qiming 20180907-16, 20180907-33; Zhao Fangfang 788, 801, 821, 846, 851, 898 (PE).

Distribution: Baise, Hechi, Liuzhou, Guilin; China (Xinjiang, Tibet, Qinghai, Inner Mongolia, Heilongjiang, Jilin, Liaoning, Gansu, Ningxia, Shaanxi, Shanxi, Hebei, Beijing, Shandong, Henan, Sichuan, Chongqing, Guizhou, Hubei, Hunan, Anhui, Jiangsu, Zhejiang, Shanghai, Jiangxi, Fujian, Yunnan, Guangdong, Guangxi, Hong Kong, Hainan, Taiwan) and widely distributed in the Northern Hemisphere.

11.2 *Sciuro-hypnum populeum* (Hedw.) Ignatov & Huttunen, Arctoa 11: 270. 2002 [2003]. *Hypnum populeum* Hedw., Sp. Musc. Frond. 270-271, pl. 70, f. 1-6. 1801. *Brachythecium populeum* (Hedw.) Schimp., Bryol. Eur. 6: 7. 535 (fasc. 52-56 Mon. 3. 1). 1853. Species description: See Zhai (2008).

Specimens examined: Napo County: Wang Jian et al. 20130818-36A (HSNU); Jia Peng et al. NP091024144 (GACP). Tian' e County: Lai Mingzhou KS89-218 (PE).

Distribution: Baise, Hechi; China (Xinjiang, Tibet, Inner Mongolia, Heilongjiang, Jilin, Liaoning, Gansu, Shaanxi, Hebei, Beijing, Shandong, Henan, Sichuan, Hubei, Hunan, Jiangxi, Anhui, Jiangsu, Shanghai, Zhejiang, Yunnan, Guizhou, Chongqing, Guangxi, Taiwan), Europe, Russia, South Korea, Japan, Bhutan, India, Pakistan, Nepal, Indonesia (Java).

11.3 *Sciuro-hypnum reflexum* (Starke) Ignatov & Huttunen, Arctoa 11: 270. 2002[2003]. *Hypnum reflexum* Starke, Bot. Taschenbuch 306-307, 476. 1807. *Brachythecium reflexum* (Starke) B. S. G., Bryol. Eur. 6: 12 (fasc. 52-56. Monogr. 8). Species description: See Hu & Wang (2005); Zhai (2008).

Specimens examined: Xing'an County, Mao' ershan National Nature Reserve: Tang Qiming 20180907-20.

Distribution: Guilin; China (Xinjiang, Tibet, Inner Mongolia, Heilongjiang, Jilin, Liaoning, Ningxia, Shaanxi, Shanxi, Hebei, Shandong, Henan, Anhui, Jiangsu, Shanghai, Zhejiang, Sichuan, Chongqing, Guizhou, Hunan, Jiangxi, Fujian, Yunnan, Guangxi, Guangdong), Russia, Pakistan, Tajikistan, Europe, Japan, North America, India.

Note: The majority of specimens cited in this paper are deposited in the Guangxi Institute of Botany Herbarium (IBK). Hebei Normal University Herbarium (HBNU) holds duplicate specimens, and the herbaria where other cited specimens are deposited are indicated in the text.

Note: Figure translations are in progress. See original paper for figures.

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