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Mosses of Xishuangbanna, Yunnan, China

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Abstract. The moss flora of Xishuangbanna, Yunnan Province, China was investigated. The mosses recognized comprise 26 families, 58 genera and 84 species. *Haplocladium strictulum*, *Phyllodon lingulatus*, *Pogonatum camusii* and *Taxithelium parvulum* are new additions to the moss flora of Yunnan Province. For each species recognized here, locality, substrate, specimen number and taxonomic note are provided.
Key words : bryophytes, mosses, Xishuangbanna, Yunnan, China.

This study deals with the moss flora of Xishuangbanna, Yunnan Province, China based on the collections made under a research program, "Biodiversity inventory in the Western Pacific region," by the National Museum of Nature and Science, Tokyo. The first author has studied the moss flora of the alpine regions in East Asia with special interest of the endemic taxa (Higuchi & Arikawa 2005, 2006; Higuchi & Lin 2005, 2007). In 2007 we made a field research and collected bryophytes mainly from Mengla County of Xishuangbanna, Yunnan Province.

Xishuangbanna, situated in the south end of Yunnan Province, shares a border with Myanmar at its southwest and Laos at its southeast. The region is located in the south extension of the Hengduan Mountains, and the land is almost occupied by mountainous and hilly areas below the altitude of 1,500 meters. The main river in Xishuangbanna is Lancangjiang River which is known as Mekong River when it passes through Laos, Thailand, Cambodia and Vietnam. Xishuangbanna lies just below the Tropic of Cancer, and has a tropical climate. Generally, there are two seasons: May to October is the rainy season and November to April is the dry season. Xishuangbanna is biogeographically located at a transitional zone from tropical Southeast Asia to subtropical East Asia. The vegetation of Xishuangbanna mainly consists of tropical rain forest, tropical seasonal moist forest, tropical montane evergreen broad-leaved forest and tropical monsoon forest (cf. Liu & Qin, 1994).

Wu (1992) firstly reported the moss flora of Xishuangbanna and recorded a total of 149 species, 81 genera and 33 families. Subsequently the bryophyte flora of Yunnan Province was compiled in a series of "Flora Yunnanica", vol. 17 of Hepaticae and Anthocerotae (Gao & Cao, 2000), vols. 18 (Li, 2002) and 19 (Li, 2005) of Musci. The purpose of this study is to investigate the moss flora of Xishuangbanna and to compile it based on the specimens collected.

Materials and Methods

Field studies were carried out in October, 2007, and a total of ca. 300 specimens were collected. The main sites investigated are divided as follows (Fig. 1).

Fig. 1. Photographs showing the area investigated. 1. Xishuangbanna Tropical Botanical Garden. 2. Forest southeast of Xishuangbannna Tropical botanical Garden. 3, 4. Limestone gorge near Mengjuan. 5. Tropical rain forest at Xiaolongha. 6. *Pogonatum camusii* growing on soil at trail south of Wanthienshu. 7. Tropical monsoon forest northwest of Mengla.

I: Menglun, Mengla County, Xishuangbannna Tropical Botanical Garden (21°55′N, 101°16′E, 550 m alt.), along trail, October 19, 2007 (Fig. 1: 1).

II: Menglun, Mengla County, southeast of Xishuangbannna Tropical botanical Garden (21°53–55′N, 101°17–19′E, 570–820 m alt.), small gorge and slope of limestone hills, October

20, 2007 (Fig. 1: 2).

III: a pass between Menglun and Mengla (21°48′N, 101°22′E, 950–1000 m alt.), Mengla County, along road, October 21, 2007.

IV: Mengjuan, Mengla County, between Menglun and Mengla (21°40′N, 101°23′E, 770 m alt.), small limestone gorge, October 21, 2007 (Fig. 1: 3, 4).

V: Xiaolongha, Mengla County, south of Mengla (21°24′N, 101°37′E, 690–770 m alt.), small valley, October 22, 2007 (Fig. 1: 5).

VI: Nahong, Mengla County, south of Mengla (21°21′N, 101°40′E, 920 m alt.), small valley, October 22, 2007.

VII: Wanthienshu, Mengla County, north of Mengla (21°36–37′N, 101°35′E, 680–700 m alt.), small valley, October 23, 2007.

VIII: northwest of Mengla (21°31–36′N, 101°29′E, 1000–1300 m alt.), Mengla County, mountain slope, October 23, 2007 (Fig. 1: 7).

IX: east of Jinghong (21°52′N, 101°29′E, 900–1050 m alt.), Jinghong City, along road and small valley, October 24, 2007.

Results and Discussion

The mosses recognized comprise 26 families, 58 genera and 84 species. Among of them, *Haplocladium strictulum*, *Phyllodon lingulatus*, *Pogonatum camusii* and *Taxithelium parvulum* are new additions to the moss flora of Yunnan Province. *Haplocladium strictulum* is a pantropical element, *Pogonatum camusii* and *Taxithelium parvulum* are East Asian element and *Phyllodon lingulatus* is East Asian and pacific element. Wu (1992) noted that the moss flora of Xishuangbanna showed a similarity to that of Southeast Asia and the Himalayas. The mosses recognized in this study mainly consist of East Asian and palaeotropic elements, although our field studies were carried out in short time and limited area.

Enumeration of species

The families, genera and species are arranged alphabetically. The generic position follows Goffinet *et al*. (2008). The distribution of the species in China was referred to Redfearn *et al*. (1996) and a series of English versions of the moss flora of China, vols. 1 (Gao & Crosby, 1999), 2 (Li & Crosby, 2001), 3 (Gao & Crosby, 2003), 4 (Li & Crosby, 2007), 6 (Wu & Crosby, 2002.), 7 (Hu *et al.*, 2008) and 8 (Wu & Crosby, 2005). Each species is referred by collecting sites (I–IX), substrate, specimen numbers and taxonomic notes. The specimens cited here are preserved in the herbaria of the Department of Botany, National Museum of Nature and Science (TNS), Okayama University of Science (HIRU) and Cryptogamic herbarium, Kunming Institute of Botany, Academia Sinica (HKAS).

Anomodontaceae

Anomodon rugelii (Müll.Hal.) Keissl., Ann. Naturh. Hofmus. Wien 15: 214 (1900).

II: on rock-cliff, Higuchi 48576, Nishimura 12280; on tree-trunk, Higuchi 48578. IV: on boulder, Higuchi 48631.

Bartramiaceae

Philonotis hastata (Duby) Wijk. & Margad., Taxon 8: 74 (1959).

I: on tree-trunk of palm tree, Higuchi 48520.

Philonotis turneriana (Schwägr.) Mitt., J. Linn. Soc. Bot. suppl. 1: 62 (1859).

II: on soil, Higuchi 48552. IV: on soil bank, Higuchi 48618 (+*Fissidens ceylonensis*). V: on soil, Higuchi 48650; on soil bank, Higuchi 48658. IX: on soil, Higuchi 48785 (+*Pseudotaxiphyllum pohliaecarpum*).

Brachytheciaceae

Brachythecium plumosum (Hedw.) Schimp., Bryol. Eur. 6: 8 (1853).

VIII: on tree-trunk, Higuchi 48748, 48756, Nishimura 12317.

Eurhynchium hians (Hedw.) Sande Lac., Ann.

Mus. Bot. Lugd. Bat. 2: 299 (1866).

VIII: on soil bank, Higuchi 48767. IX: on soil bank, Higuchi 48787.

Rhynchostegium contractum Cardot, Bull. Soc. Bot. Gen. sér. 2, 4: 381 (1912).

I: on soil, Higuchi 48541.

Rhynchostegium inclinatum (Mitt.) A.Jaeger, Ber. S. Gall. Naturw. Ges. 1876–77: 366 (1878).

I: on boulder, Higuchi 48521; on tree-trunk, Higuchi 48526, Nishimura 12268; on soil, Higuchi 48542.

Rhynchostegium pallidifolium (Mitt.) A.Jaeger, Ber. S. Gall. Naturw. Ges. 1876–77: 369 (1878).

V: on tree-trunk, Higuchi 48648. VIII: on boulder, Higuchi 48776.

Bryaceae

Bryum capillare Hedw., Spec. Musc. 182 (1801).

VIII: on tree-trunk, Higuchi 48757 (+*Orthomnion dilatatum*).

Bryum cellulare Hook., in Schwägr., Spec. Musc. Suppl. 3: 214a (1827).

V: on soil, Higuchi 48649.

Bryum coronatum Schwägr., Spec. Musc. suppl. 1: l03, f. 71 (1816).

III: on tree-trunk, Higuchi 48597. IV: on rock (limestone), Higuchi 48642. VIII: on tree-trunk, Higuchi 48752, Nishimura 12320.

Calymperaceae

Calymperes erosum Müll.Hal., Linnaea 21: 182 (1848).

VI: on fallen log, Higuchi 48682 (+*Macromitrium ferriei*).

Leucophanes octoblepharioides Brid., Bryol. Univ. 1: 763 (1827).

V: on tree-trunk, Higuchi 12297.

Octoblepharum albidum Hedw., Spec. Musc. Frond. 50 (1801).

VI: on decaying log, Higuchi 48681 (+*Isopterygium tenerum*). VIII: on tree-trunk, Higuchi 48734 (+*Sematophyllum subhumile*).

Cryphaeaceae

Schoenobryum concavifolium (Griff.) Gang., Mosses E. India 5: 1209 (1976).

III: on tree-trunk, Higuchi 48598. V: on branch, Higuchi 48651, 48676. VIII: on tree-trunk, Higuchi 48759.

Dicranaceae

Campylopus japonicus Broth., Hedwigia 38: 207 (1899).

III: on soil bank, Higuchi 48604. VIII: on soil bank, Higuchi 48770.

Microdus brasiliensis (Duby) Thér., Bull. Herb. Boissier, sér. 2, 7: 278 (1907).

VII: on soil bank, Higuchi 48694, 48697 (+*Garckea flexuosa*).

Ditrichaceae

Garckea flexuosa (Griff.) Margad. & Nork., J. Bryol. 7: 440 (1973).

I: on soil, Higuchi 48544, Nishimura 12270. II: on soil bank, Higuchi 48553, Nishimura 12275. V: on rock-cliff, Higuchi 48656. VII: on soil bank, Higuchi 48696, 48697 (+*Microdus brasiliensis*), 48698.

Notes. The plants with sporophytes (Higuchi 48544) show a variation of stem length (Fig. 2: 1). In the plants (Higuchi 48656) perigonia were formed on not only on the terminal position of the stem but also on the lateral one of the stem (Fig. 2: 2, 3).

Fig. 2. *Garckea flexuosa.* 1. Plants with sporophytes. 2. Plants with sporophytes (A) and plants with perigonia (B). 3. A part of male plants. Arrows showing perigonia. Scales for 1–3 in 1 mm. (1 from *Higuchi 48544*; 2, 3 from *Higuchi 48656*.)

Entodontaceae

Erythrodontium julaceum (Schwägr.) Paris, Index Bryol. 436 (1896).

I: on tree-trunk, Higuchi 48537; on branch, Nishimura 12268 (+*Rhynchostegium inclinatum*). III: on tree-trunk, Higuchi 48585. VIII: on tree-trunk, Higuchi 48733 (+*Aerobrydium filamentosum*), 48735 (+*Mesonodon flavescens*), 48749, Nishimura 12321, 12328. IX: on tree-trunk, Higuchi 48778, Nishimura 12336.

Mesonodon flavescens (Hook.) W.R.Buck, J. Hattori Bot. Lab. 48: 117 (1980).

III: on tree-trunk, Higuchi 48595. VIII: on tree-trunk, Higuchi 8735 (+*Erythrodontium julaceum*). VIII: on tree-trunk, Higuchi 48750.

Fissidentaceae

Fissidens bryoides Hedw. var. ***bryoides***, Spec. Musc. 153 (1801)

III: on soil bank, Higuchi 48581 (+*Fissidens taxifolius*). VIII: on boulder, Higuchi 48743 (+*Fissidens taxifolius*), 48746 (+*Fissidens gardneri*); on tree-trunk, Higuchi 48740 (+*Taxiphyllum taxirameum*), 48774 (+*Oxystegus tenuirostris*). IX: on tree-trunk, Higuchi 48779 (+*Taxiphyllum taxirameum*).

Fissidens ceylonensis Dozy & Molk., Ann. Sc. Nat. Bot. ser. 3, 2: 304 (1844).

IV: on rock-crevice, Higuchi 48616, 48618 (+*Philonotis turneriana*). IX: on soil bank, Higuchi 48788.

Fissidens crenulatus Mitt., J. Proc. Linn. Soc., Bot., Suppl. 1: 140 (1859).

II: on soil, Higuchi 48555.

Fissidens curvatus Hornsch., Linnaea 15: 148 (1841).

V: on soil bank, Higuchi 48661. IX: on soil, Higuchi 48789.

Fissidens gardneri Mitt., J. Linn. Soc. Bot. 12: 593 (1869).

VII: on boulder, Higuchi 48746 (+*Fissidens bryoides* var. *bryoides*).

Fissidens javanicus Dozy & Molk., Bryol. Jav. 1: 11 (1855).

VI: on rock-cliff, Higuchi 48688.

Fissidens osmundioides Hedw., Spec. Musc. 153, f. 40 (1801).

VI: on boulder, Higuchi 48687. VIII: on soil bank, Higuchi 48769.

Fissidens taxifolius Hedw., Spec. Musc. 155, pl. 39 (1801).

III: on soil bank, Higuchi 48581 (+*Fissidens bryoides* var. *bryoides*); on rock-cliff, Higuchi 48609, 48611. VIII: on boulder, Higuchi 48743 (+*Fissidens bryoides* var. *bryoides*).

Hypnaceae

Ectropothecium dealbatum (Reinw. & Hornsh.) A.Jaeger, Ber. Thätigk. St. Gallischen Naturwiss. Ges. 1877–78: 264 (1880).

I: on boulder, Higuchi 48522, Nishimura 12272; on tree-trunk, Higuchi 48534; on decaying log, Higuchi 48535, Nishimura 12265, 12276; on soil, Higuchi 48545, Nishimura 12271. II: on boulder, Higuchi 48554; on decaying log, Nishimura 12279. III: on soil, Higuchi 48591, 48601; on boulder, Nishimura 12285, 12286. IV: on decaying log, Nishimura 12291. V: on boulder, Higuchi 48674, Nishimura 12304, 12305, 12306, 12307; on rotten log, Nishimura 12298. VIII: on decaying log, Higuchi 48723, Nishimura 12335; on tree-trunk, Nishimura 12329, 12332; on root, Nishimura 12330; on rotten log, Nishimura 12326; on boulder, Nishimura 12324, 12325. IX: on boulder, Higuchi 48783, Nishimura 12337.

Phyllodon lingulatus (Cardot) W.R.Buck, Mem. New York Bot. Gard. 45: 521 (1987).

VI: on rock-cliff, Higuchi 48689.

Pseudotaxiphyllum pohliaecarpum (Sull. & Lesq.) Z. Iwats., J. Hattori Bot. Lab. 63: 449 (1987).

II: on soil bank, Higuchi 48548, Nishimura 12273. VIII: on soil bank, Higuchi 48763, 48771 (+*Campylopus japonicus*), 48773. IX: on soil, Higuchi 48784, 48785 (+*Philonotis turneriana*).

Taxiphyllum cuspidifolium (Cardot) Z.Iwats., J. Hattori Bot. Lab. 28: 220 (1965).

VIII: on tree-trunk, Higuchi 48732.

Taxiphyllum taxirameum (Mitt.) M.Fleisch., Musci Fl. Buitenz. 4: 1435 (1923).

I: on soil, Higuchi 48539, Nishimura 12269. IV: on rock-crevice, Higuchi 48626; on rock-cliff, Higuchi 48636 (+*Barbula unguiculata*). VII: on root, Higuchi 48712. VIII: on tree-trunk, Higuchi 48728, 48740 (+*Fissidens bryoides* var. *bryoides*). IX: on tree-trunk, Higuchi 48779 (+*Fissidens bryoides* var. *bryoides*); on soil, Higuchi 48780, 48781 (+*Barbula unguiculata*).

Vesicularia montagnei (Schimp.) Broth. in Engler & Prantl, Nat. Pfl. 1: 1094 (1908).

I: on decaying log, Higuchi 48529. IV: on boulder, Higuchi 48613; on root, Higuchi 48645. VI: on boulder, Higuchi 48685. VII: on tree-trunk, Higuchi 48705.

Vesicularia reticulata (Dozy & Molk.) Broth. in Engler & Prantl, Nat. Pfl. 1(3): 1094 (1908).

II: on soil bank, Higuchi 48547, Nishimura 12274. IV: on rock-cliff (limestone), Higuchi 48625; on root, Higuchi 48644. VII: on decaying log, Higuchi 48710, Nishimura 12312; on rock, Nishimura 12311. IX: on boulder, Nishimura 12338; on decorticated log, Nishimura 12339.

Leskeaceae

Claopodium assurgens (Sull. & Lesq.) Cardot, Bull. Soc. Bot. Gen. sér. 2, 3: 283 (1911).

VII: on root, Nishimura 12310.

Claopodium prionophyllum (Müll.Hal.) Broth. in Engler & Prantl, Nat. Pfl. 1: 1009 (1908).

III: on tree-trunk, Higuchi 48596. V: on boulder, Nishimura 12299. VIII: on boulder, Higuchi 48744.

Haplocladium strictulum (Cardot) Reimers, Hedwigia 76: 199 (1937).

I: on tree-trunk, Higuchi 48527.

Notes. Morphological characters of both gametophytes and sporophytes of plants (Higuchi

48527) agree with those of *Haplocladium strictulum*, although paraphyllia are sparse on stems and branches. In China, this species had been known from Nei Mongol and Sichuan (Wu & Crosby, 2002).

Leucobryaceae

Leucobryum juniperoideum (Brid.) Müll.Hal., Linnaea 18: 689 (1845).

VI: on tree-trunk, Higuchi 48690.

Meteoriaceae

Aerobrydium crispifolium (Broth. & Geh.) M.Fleisch. ex Broth. in Engler & Prantl, Nat. Pfl. 1(3): 821 (1906).

V: on branch, Higuchi 48678. VII: on branch, Higuchi 48713.

Aerobrydium filamentosum (Hook.) M.Fleisch. ex Broth., in Engler & Prantl, Nat. Pfl. 1(3): 821 (1906).

III: on rock-cliff, Higuchi 48590. V: on branch, Nishimura 12300. VI: on fallen log, Higuchi 48683. VII: on tree-trunk, Higuchi 48730 (+*Calyptothecium wightii, Pterobryopsis orientalis*), Higuchi 48733 (+*Erythrodontium julaceum*). VIII: on tree-trunk, Higuchi 48741, 48754, Nishimura 12319.

Aerobryidium levieri (Renauld & Cardot) S.H.Lin, Yushania 5: 26 (1988).

I: on branch, Nishimura 12267. IV: on tree-trunk, Higuchi 48617 (+*Homaliodendron exiguum*); on rock-cliff, Higuchi 48622; on branch, Nishimura 12288. VII: on branch, Higuchi 48714, 48718.

Barbella flagellifera (Cardot) Nog., J. Jpn. Bot. 14: f. 3 (1938).

V: on branch, Higuchi 48654. VII: on branch, Nishimura 12316; on leaves, Nishimura 12314.

Duthiella flaccida (Cardot) Broth. in Engler & Prantl, Nat. Pfl. 1(3): 1010 (1908).

IV: on boulder (limestone), Higuchi 48621.

Meteoriopsis reclinata (Müll.Hal.) M.Fleisch. var. ***subreclinata*** M.Fleisch., Musi Fl. Buitenzorg 3: 643 (1907).

III: on tree-trunk, Higuchi 48583, Nishimura 12284.

Trachypus humilis Lindb., Act. Soc. Sc. Fenn. 10: 230 (1872).

II: on root, Nishimura 12283. IV: on rock-cliff, Higuchi 48624. V: on branch, Higuchi 48667. VIII: on tree-trunk, Higuchi 48722.

Mniaceae

Orthomnion dilatatum (Mitt.) P.-C.Chen, Feddes Repert. 58: 25 (1955).

VIII: on tree-trunk, Higuchi 48751, 48757 (+*Bryum capillare*).

Plagiomnium succulentum (Mitt.) T.J.Kop., Ann. Bot. Fenn. 5: 147 (1968).

IV: on soil, Higuchi 48619. V: on boulder, Higuchi 48668.

Neckeraceae

Caduciella mariei (Besch.) Enroth, J. Bryol. 16: 612 (1991).

I: on tree-trunk, Higuchi 48533. VII: on tree-trunk, Higuchi 48703, 48719 (+*Chaetomitriopsis glaucocarpa, Taxithelium parvulum*), Nishimura 12315 (+*Calyptothecium wightii*).

Notes. The generic name, *Caduciella*, derives from its caduceus leaves of stems and branches. This species is distinguished from *C. guangdongensis* Enroth, endemic to China, by having stronger and longer costa, leaves with rounded to broadly obtuse apices and entire leaf margins (Enroth 1993). *Caduciella mariei* is distributed in Tanzania, Comoro Islands, India, China (Yunnan), Vietnam, Thailand, Malaysian Peninsula, Sumatra, Boreneo, Moluccas, Philippines, Papua New Guines, Micronesia and Australia (Enroth 1991), while *C. guangdongensis* is only known

from China (Guangdong, Hainan) (Zhang 1994).

Homaliadelphus targionianus (Mitt.) Dixon & P.Varde var. ***rotundatus*** Nog., J. Hattori Bot. Lab. 4: 27 (1950).

II: on rock-cliff (limestone), Higuchi 48565; on tree-trunk, Higuchi 48579 (+*Pinnatella alopecuroides*).

Homaliodendron exiguum (Bosch & Sande Lac.) M.Fleisch., Musci Fl. Buitenz. 3: 897 (1908).

I: on root, Higuchi 48532. IV: on tree-trunk, Higuchi 48612, 48617 (+*Aerobryidium levieri*). VII: on tree-trunk, Higuchi 48704, 48707, Nishimura 12309.

Neckeropsis lepineana (Mont.) M.Fleisch., Musci Fl. Buitenz. 3: 879 (1908).

II: on tree-trunk, Higuchi 48572. IV: on boulder (limestone), Higuchi 48629, Nishimura 12295.

Pinnatella alopecuroides (Mitt.) M.Fleisch., Hedwigia 45: 84 (1906).

I: on root, Nishimura 12266. II: on branch, Higuchi 48566; on boulder (limestone), Higuchi 48574 (+*Entodontopsis pygmaea*), Nishimura 12281; on tree-trunk, Higuchi 48579 (+*Homaliadelphus targionianus*). IV: on boulder (limestone), Higuchi 48620, Nishimura 12287; on rock-cliff (limestone), Higuchi 48623.

Orthotrichaceae

Macromitrium ferriei Cardot & Thér., Bull. Ac. Int. Geogr. Bot. 18: 250 (1908).

VI: on fallen log, Higuchi 48682 (+*Calymperes erosum*).

Zygodon viridissimus (Dicks.) Brid. var. ***viridissimus***, Bryol. Univ. 1: 592 (1826).

IX: on tree-trunk, Higuchi 48777.

Notes. This variety is distinguished from var. *rupestris* by having broader leaves and gemmae with vertical septations.

Polytrichaceae

Atrichum crispulum Schimp. ex Besch., Ann. Sc. Nat. Bot. sér. 7, 17: 351 (1893).

III: on soil, Higuchi 48589. VIII: on soil, Higuchi 48758.

Pogonatum camusii (Thér.) Touw, J. Hattori Bot. Lab. 60: 26 (1986).

I: on soil, Higuchi 48536. II: on soil bank, Higuchi 48549. VII: on soil bank, Higuchi 48702.

Notes. This species is characterized by persistent protonemata and small leaves without lamellae, and resembles *P. spinulosum*. *P. camusii* differs from *P. spinulosum* by having papillose setae. It was growing on soil bank of trail (Fig. 1: 6). In China, this species had been known from Taiwan and Hainan (Wu & Crosby, 2005).

Pogonatum cirratum (Sw.) Brid. subsp. ***fuscatum*** (Mitt.) Hyvönen, Acta Bot. Fenn. 138: 32 (1989).

III: on rock-cliff, Higuchi 48582. VIII: on soil bank, Higuchi 48765, Nishimura 12333.

Pogonatum neesii (Müll.Hal.) Dozy, Ned. Kruidk. Arch. 4(1): 75 (1856).

V: on soil bank, Higuchi 48660. VII: on soil bank, Higuchi 48695, 48700. VIII: on soil bank, Higuchi 48762. IX: on soil, Higuchi 48786, Nishimura 12340.

Pogonatum nudiusculum Mitt., J. Proc. Linn. Soc., Bot., Suppl. 2: 153 (1859).

VIII: on soil bank, Higuchi 48768, Nishimura 12334.

Pottiaceae

Barbula indica (Hook.) Spreng., Nomencl. Bot. 2: 72 (1824).

I: on soil, Higuchi 48546. IV: on soil, Higuchi 48638.

Barbula unguiculata Hedw., Spec. Musc. 118

(1801).

IV: on soil, Higuchi 48636 (+*Taxiphyllum taxirameum*). IX: on soil, Higuchi 48781 (+*Taxiphyllum taxirameum*).

Bryoerythrophyllum gymnostomum (Broth.) P.C.Chen, Hedwigia 80: 255 (1941).

IV: on rock-cliff (limestone), Nishimura 12292.

Gymnostomum aurantiacum (Mitt.) Paris, Ind. Bryol. 542 (1894).

III: on rock-cliff (limestone), Higuchi 48608. IV: on rock-cliff (limestone), Nishimura 12293.

Hyophila involuta (Hook.) A.Jaeger, Ber. S. Gall. Naturw. Ges. 1871–72: 354 (1873).

I: on concrete, Higuchi 48540. III: on rock-cliff, Higuchi 48610; on root, Higuchi 48592. VI: on boulder, Higuchi 48692. IX: on rock-cliff, Higuchi 48792.

Hyophila nymaniana (M.Fleisch.) M.Menzel, Willdenowia 22: 198 (1992).

Syn. *Hyophila rosea* Williams

II: on boulder (limestone), Higuchi 48575.

Notes. This species is characterized by having interrupted leaf arrangement on stems, contorted leaves when dry, pluripapillose laminal cells and papillose cells of abaxial surface of costa. Eddy (1990) considered that *Hyophila rosea* Williams is identical with *Glyphomitrium nymanianum* M.Fleisch.

Oxystegus tenuirostris (Hook. & Taylor) A.J.E.Smith, J. Bryol. 9: 393 (1977).

VIII: on tree-trunk, Higuchi 48774.

Pterobryaceae

Calyptothecium wightii (Mitt.) M.Fleisch., Hedwigia 45: 62 (1905).

I: on tree-trunk, Higuchi 48530. II: on branch, Higuchi 48570, Nishimura 12277. V: on tree-trunk, Higuchi 48647, 48677. VII: on branch, Higuchi 48717, Nishimura 12315 (+*Caduciella mariei*). VIII: on tree-trunk, Higuchi 48730 (+*Aerobrydium filamentosum, Pterobryopsis orientalis*), 48731, Nishimura 12323.

Pterobryopsis orientalis (Müll.Hal.) M.Fleisch., Hedwigia 59: 217 (1917).

III: on tree-trunk, Higuchi 48584. VIII: on tree-trunk, Higuchi 48738, Nishimura 12318, 12327.

Pylaisiadelphaceae

Isopterygium albescens (Hook.) A.Jaeger, Ber. S. Gall. Naturw. Ges. 1876–77: 433 (1878).

IV: on decaying stump, Higuchi 48634. V: on decaying log, Higuchi 48664.

Isopterygium minutirameum (Müll.Hal.) A.Jaeger, Ber. S. Gall. Naturw. Ges. 1876–77: 434 (1878).

II: on soil, Higuchi 48560.

Isopterygium tenerum (Sw.) Mitt., J. Linn. Soc. Bot. 12: 499 (1869).

II: on decaying log, Higuchi 48573. VI: on decaying log, Higuchi 48680 (+*Papillidiopsis macrosticta*), 48681 (+*Octoblepharum albidum*).

Taxithelium parvulum (Broth. & Paris) Broth. in Engler & Prantl, Nat. Pfl. 1(3): 1092 (1908).

V: on branch, Higuchi 48653 (+*Chaetomitriopsis glaucocarpa*), 48663. VII: on branch, Higuchi 48719 (+*Caduciella mariei, Chaetomitriopsis glaucocarpa*).

Notes. This species is characterized by pluripapillose laminal cells (Fig. 3: 7, 8), lanceolate leaves with obtuse apices (Fig. 3: 3, 4) and alar region consisting of a few hyaline, subquadrate, thin-walled cells (Fig. 3: 9). *Taxithelium* resemble *Radulina* in pluripapillose leaf cells. Species of *Radulina* are distinguished from *Taxithelium* spp. by having a basal row of much inflated, hyaline alar cells of leaf and strongly collenchymatous exothecial cells. The spores from a mature capsule were dimorphous, i.e., large ones (14–18 μm in diameter) and small ones (8–12 μm in di-

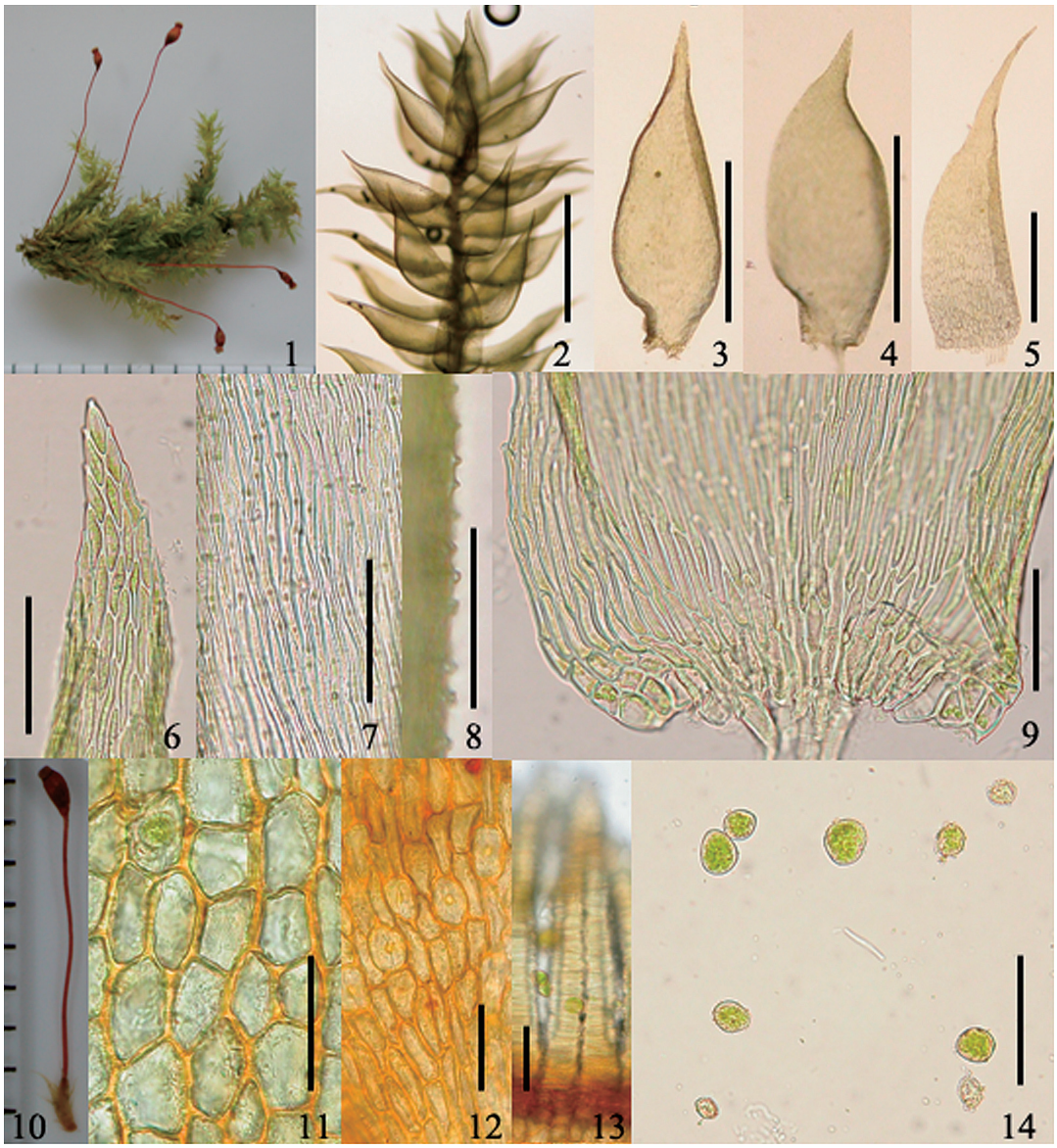

Fig. 3. *Taxithelium parvulum.* 1. Plant with sporophytes. 2. A part of branch when wet. 3, 4. Branch leaves. 5. Inner perichaetial leaf. 6. Apical part of branch leaf. 7, 8. Median laminal cells. 9. Basal part of branch leaf. 10. Sporophyte. 11. Median exothecial cells. 12. Stomata. 13. Outer peristome. 14. Spores. Scales for 1 & 10 in 1 mm. Scale bars=0.5 mm in 2–5, =50 μm in 6–9, 11–14. (All from *Higuchi 48653*.)

ameter) (Fig. 3: 14). This can be regarded as false anisospory, since smaller ones are pale-brown showing dead condition. In China, this species had been known from Taiwan and Hainan (Wu & Crosby, 2005).

Racopilaceae

Racopilum cuspidigerum (Schwägr.) Ångström, Oefv. Kon. Vet. Akad. Foerh. 29, 4: 10 (1872).

I: on root, Higuchi 48531. VIII: on tree-trunk, Higuchi 48721.

Sematophyllaceae

Papillidiopsis macrosticta (Broth. & Paris) W.R.Buck & B.C.Tan, Acta Bryol. Asiat. 1: 12 (1989) "1990".

VI: on decaying log, Higuchi 48680 (+*Isopterygium tenerum*).

Sematophyllum subhumile (Müll.Hal.) M.Fleisch., Musci Fl. Buitenz.. 4: 1264 (1923).

VIII: on tree-trunk, Higuchi 48760, 48734 (+*Octoblepharum albidum*), Nishimura 12331.

Sematophyllum subpinnatum (Brid.) E.G.Britton, Bryologist 21: 28 (1918).

I: on tree-trunk, Higuchi 48538. II: on tree-trunk, Higuchi 48557, 48562. III: on tree-trunk, Higuchi 48593. V: on fallen log, Nishimura 12302. VIII: on tree-trunk, Higuchi 48729, 48747, Nishimura 12322.

Trichosteleum boschii (Dozy & Molk.) A.Jaeger, Ber. S. Gall. Naturw. Ges. 1876–77: 421 (1878).

III: on rock-cliff, Higuchi 48603.

Stereophyllaceae

Entodontopsis pygmaea (Paris & Broth.) W.R.Buck & Ireland, Nova Hedwigia 41: 105 (1985).

I: on tree-trunk, Higuchi 48523. II: on fallen log, Higuchi 48571; on boulder, Higuchi 48754 (+*Pinnatella alopecuroides*); on rock-cliff, Higuchi 48564, 48577 (+*Trachypus humilis*); on root, Nishimura 12282.

Symphyodontaceae

Chaetomitriopsis glaucocarpa (Schwägr.) M.Fleisch., Musci Fl. Buitenz.. 4: 1372 (1923).

V: on branch, Higuchi 48653 (+*Taxithelium parvulum*), 48662, 48671; on tree-trunk, Higuchi 48673, Nishimura 12303, 12308. VII: on branch, Higuchi 48719 (+*Caduciella mariei, Taxithelium parvulum*).

Symphyodon echinatus (Mitt.) A.Jaeger, Ber. Thätigk. St. Gallischen Naturwiss. Ges. 1876–77: 296 (1878).

VII: on branch, Higuchi 48715.

Thuidiaceae

Pelekium bonianum (Besch.) Touw, J. Hattori Bot. Lab. 90: 203 (2001).

IV: on boulder (limestone), Higuchi 48632; on rock-cliff (limestone), Higuchi 48635, Nishimura 12289.

Pelekium gratum (P. Beauv.) Touw, J. Hattori Bot. Lab. 90: 203 (2001).

I: on decaying log, Higuchi 48524. II: on decaying log, Higuchi 48569. III: on tree-trunk, Higuchi 48586.

Thuidium cymbifolium (Dozy & Molk.) Dozy & Molk., Bryol. Jav. 2: 115 (1865).

IV: on boulder, Higuchi 48628. VI: on boulder, Higuchi 48686. VIII: on boulder, Higuchi 48725.

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中国雲南，シーサンパンナの蘚類

樋口正信・西村直樹・黎　興江

中国雲南，シーサンパンナの蘚類フロラを2007年に調査した．今回の調査で本地域から26科58属84種の蘚類を確認した．それらのうち，4種 (*Haplocladium strictulum*, *Phyllodon lingulatus*, *Pogonatum camusii*, *Taxithelium parvulum*) が雲南省の蘚類フロラに新たに加わるものであった．各種について，産地，基物，標本番号を示し，またいくつかの種にはノートを付した．