

Mosses of Mt. Chilai, Taiwan

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Abstract. The moss flora of Mt. Chilai, Taiwan, was investigated in 2009. The mosses recognized in this study comprise 34 families, 83 genera and 128 species. Among them two species, *Gollania turgens* and *Tayloria splachnoides*, are new additions to the moss flora of Taiwan, and most of them are circumboreal species. For each species, substrate, locality, specimen number and distribution were given.

Key words: bryophytes, mosses, Mt. Chilai, Taiwan.

This study deals with the moss flora of Mt. Chilai, Taiwan, mainly based on the collections made under a research program, “Biodiversity inventory in the Western Pacific region,” of the National Museum of Nature and Science, Tokyo. In 2009 we made a field research and collected bryophytes from the summit area of Mt. Chilai.

Taiwan is situated in the northwest region of the Pacific Ocean, consisting of the main island and many smaller islands and locates 400 km between 21°50′ and 25°20′ N latitude. Mt. Chilai is located at 24°05′09N and 121°19′24 E, and includes the Main Mountain (3,560 m alt.), the North Peak (3,605 m alt.) and the South Peak (3,357 m alt.). These peaks have been known to have steep cliffs.

As far as we know, no bryophyte flora of Mt. Chilai has been compiled.

The purpose of this study is to investigate the moss flora of Mt. Chilai and to compile it based on the specimens collected.

Materials and Methods

Field studies were carried out in 2009, and a total of ca. 270 specimens were collected. The

main sites investigated are divided into four areas as follows (Figs. 1, 2).

I: Hualien County, from Song-Syue Hotel (3100 m alt.) to Chenggong Cabin (2800 m alt.), along trail in *Abies kawakamii* forest, 29 September 2009, 2 October 2009.

II: Nantou County, from Chenggong Cabin (2800 m alt.) to Chilai Cabin (3300 m alt.), along trail in *Abies kawakamii* forest, 30 September 2003, 1 October 2009.

III: Hualien County, from Chilai Cabin (3300 m alt.) to around North Peak (3607 m alt.), above tree line, 30 September 2009.

IV: Hualien County, from Chilai Cabin (3300 m alt.) to Main Peak (3560 m alt.), above tree line, 1 October 2009.

The checklist of Taiwanese mosses by Chiang et al. (2001) was used for checking a new record. The recent monographic studies concerned were also referred for the data of the distribution.

Results and Discussion

The mosses recognized in this study com-

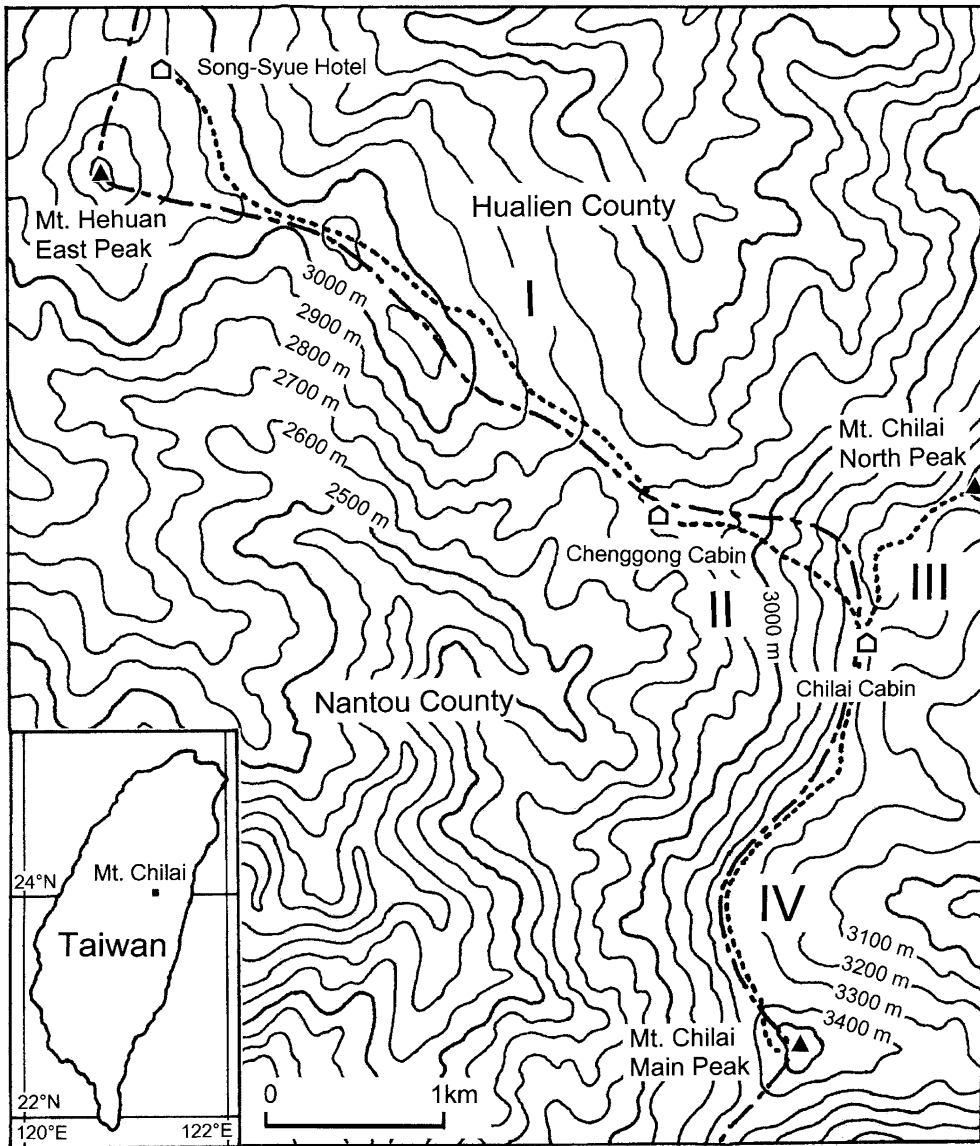


Fig. 1. Map showing the area investigated.

prise 34 families, 83 genera and 128 species. Among them two species, *Gollania turgens* and *Tayloria splachnoides*, are new additions to the moss flora of Taiwan. Higuchi & Lin (2004) discussed the relationship between the moss floras of Japan and Taiwan and noted that the moss flora of alpine region in Taiwan appears to be related to those of Japan, southwestern China and the boreal region. *Gollania turgens* and *Tayloria splachnoides* are also known from

Japan and mainland China.

Higuchi & Lin (2006) studied the moss flora of Mt. Yushan and reported 33 families, 86 genera and 137 species. The comparison between the moss floras of Mt. Yushan and Mt. Chilai was tentatively carried out based on our data, although they differ geologically, climatologically and phytogeographically. The number of species in Mt. Chilai is almost the same as that of Mt. Yushan, although the area



Fig. 2. Photographs showing the area investigated. 1. *Abies kawakamii* forest and grassland at the eastern slope between Song-Syue Hotel and Chenggong Cabin. 2. Chenggong Cabin. 3. Lower part of the western slope between Chenggong Cabin and the ridge. 4. Upper part of the western slope between Chenggong Cabin and the ridge. 5. North Peak of Mt. Chilai with Chilai Cabin just under the ridge. 6. Main Peak of Mt. Chilai.

studied in Mt. Chilai was narrower than that of Mt. Yushan in size and elevation (2800–3560 m in Mt. Chilai, 2600–3952 m in Mt. Yushan). The moss floras of both mountains are somewhat different in their species composition. The

four families are present in Mt. Yushan but absent from Mt. Chilai, such as Andreaeaceae, Hedwigiaceae, Symphyodontaceae and Takakiaceae. In Mt. Chilai, *Didymodon nigrescens* replaced *Andreaea* species as a habitant on the

exposed rock-surface at ridge. The four families, Climaciaceae, Hypopterygiaceae, Neckeraceae and Sphagnaceae, are absent from Mt. Yushan, whereas they are present in Mt. Chilai.

Enumeration of species

The families, genera and species are arranged alphabetically. Each species is referred by collecting sites (I-IV), the substrates and specimen numbers. The name of the collectors is abbreviated as follows: Masanobu Higuchi (mh) and Kuei-Yu Yao (ky). The complete set of the specimens are preserved in the herbarium of the Department of Botany, National Museum of Nature Science (TNS) and duplicates in the herbarium of the Department of Life Science, Tunghai University, Taichung (TUNG).

Amblystegiaceae

Cratoneuron filicinum (Hedw.) Spruce, Cat. Musc. Amaz. And.: 21 (1867).

IV: on rock-cliff, mh-50007.

Distribution. Europe, Asia, N. & S. America and New Zealand.

Cratoneuron formosanum Broth., Ann. Bryol. 1: 22 (1928).

III: on rock-cliff, mh-49928.

Distribution. Endemic to Taiwan.

Hygrohypnum luridum (Hedw.) Jenn., Man. Moss. West Pennsylv. 287 (1913).

II: on rock-crevice, ky-2141a.

Distribution. Widely distributed in the Northern Hemisphere.

Sanionia uncinata (Hedw.) Loeske, Hedwigia 46: 309 (1907).

III: on humus, mh-49936. IV: on boulder, mh-49973, ky-2233a.

Distribution. Europe, northern Asia, Himalayas, Japan, N. & S. America and Australia.

Bartramiaceae

Bartramia halleriana Hedw., Spec. Musc. 164 (1801).

I: on soil, ky-2302; on humus, mh-50074. II: on humus, mh-49908.

Distribution. Widely distributed in Europe, Africa, Asia and western region of N. America.

Bartramia ityphylla Brid., Musc. Rec. 2: 132 (1803).

III: on rock-crevice, mh-49942.

Distribution. Northern Europe, Himalayas, mainland China, Philippines, Taiwan, Korea, Japan, N. America and Greenland.

Breutelia arundinifolia (Duby) M.Fleisch., Musc. Fl. Buitenz. 2: 630 (1904).

II: on soil, ky-2205; on humus, mh-49895.

Distribution. Tropical Asia.

Plagiopus oederiana (Sw.) H.A.Crum & L.E. Anderson, Mosses E. N. Amer. 1: 636 (1981).

IV: on rock-cliff, mh-50005, 50008 (+ *Ditrichum crispatisimum*).

Distribution. Widely distributed in the Northern Hemisphere.

Brachytheciaceae

Brachythecium buchananii (Hook.) A.Jaeger, Ber. S. Gall. Naturw. Ges. 1876-77: 341 (1878).

II: on humus, mh-49909.

Distribution. Himalayas, Korea, Taiwan and Japan.

Brachythecium helminthocladum Broth. & Paris, Rev. Bryol. 31: 63 (1904).

II: on boulder, mh-49887.

Distribution. Mainland China, Taiwan, Korea and Japan.

Brachythecium plumosum (Hedw.) Schimp.,

Bryol. Eur. 6: 8 (1853).

II: on boulder, ky-2150; on rock-cliff, mh-49897, 50042. IV: on rock-cliff, mh-50037. III: on rock-cliff, mh-49951.

Distribution. Widely distributed in the Northern Hemisphere.

Cirriphyllum cirrosum (Schwaegr.) Grout, Bull. Torr. Bot. Cl. 25: 223 (1898).

IV: on boulder, mh-50003 (+*Gollania ruginosa*); on rock, ky-2276a.

Distribution. Europe, Caucasus, Pakistan, mainland China, Taiwan, Japan and N. America.

Eurhynchium angustirete (Broth.) T.J.Kop., J. Bot. 75: 126 (1937).

I: on humus, mh-49859; on humus, mh-49851, 49860, 50067. II: on humus, mh-49900.

Distribution. Europe, Turkey, Taiwan, Korea and Japan.

Kindbergia arbuscula (Broth.) Ochyra, Lindbergia 8: 54 (1982).

I: on tree-trunk, mh-49861. II: on boulder, mh-49889. III: on humus, mh-49919.

Distribution. Mainland China, Taiwan and Japan.

Bryaceae

Anomobryum filiforme (Griff.) A.Jaeger, Ber. S. Gall. Naturw. Ges. 1873-74: 142 (1875).

II: on soil, mh-49893. IV: on soil, mh-50036.

Distribution. Widely distributed in the Northern Hemisphere.

Bryum argenteum Hedw., Spec. Musc. 181 (1801).

II: on rock-cliff, mh-49891.

Distribution. Cosmopolitan.

Bryum billardieri Schwaegr., Spec. Musc. Suppl. 1: 115 (1816).

II: on soil, ky-2167. III: on humus, mh-49932. IV: on humus, mh-49967 (+*Bryoery-*

throphyllum recurvirostre var. *recurvirostre*).

Distribution. Widely distributed in tropical and warm temperate regions.

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

I: on boulder, ky-2209b.

Distribution. Widely distributed throughout the world.

Pohlia elongata Hedw., Spec. Musc. 171 (1801).

IV: on soil, mh-49971.

Distribution. Europe, Pakistan, central and eastern Asia, Philippines, New Guinea and N. America.

Pohlia flexuosa Harv., Icon. Pl. 1: pl. 19 (1836).

III: on soil, mh-49920.

Distribution. Widely distributed in tropical regions of Asia and America.

Pohlia longicollis (Hedw.) Lindb., Musci Scand. 17 (1879).

II: on basal part of tree-trunk, ky-2144a. IV: on rock-cliff, mh-49965.

Distribution. Widely distributed in the Northern Hemisphere.

Pohlia prolifera (Kindb.) Broth. in Engler & Prantl, Nat. Pfl. 1(3): 551 (1903).

II: on rock-cliff, mh-50041.

Distribution. Widely distributed in the Northern Hemisphere.

Pohlia wahlenbergii (F.Weber & Mohr) A.L. Andrews in Grout, Moss Fl. N. Am. 2: 203 (1935).

I: on humus, mh-49852 (+*Hookeria acutifolia*).

Distribution. Widely distributed throughout the world.

Climaciaceae

Climacium dendroides (Hedw.) F. Weber & Mohr, Naturh. Reise Schweden 96 (1804).

IV: on humus, mh-50002, 50035; on soil, ky-2282a.

Distribution. Widely distributed in the Northern Hemisphere and New Zealand.

Dicranaceae

Campylopus fragilis (Brid.) Bruch & Schimp., Bryol. Eur. 1: 164 (1847).

I: on humus, mh-49850. IV: on rock-cliff, mh-50001 (+ *Oxystegus tenuirostris*).

Distribution. Europe, Taiwan, Russia Far East, Korea, Japan and N. America.

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

II: on soil, ky-2174a; on decaying log, mh-50046 (+ *Dicranodontium denudatum*).

Distribution. Taiwan, Korea and Japan.

Dicranella heteromalla (Hedw.) Schimp., Coroll. 13 (1856).

I: on rotten stump, mh-50081.

Distribution. Widely distributed in the Northern Hemisphere.

Dicranodontium denudatum (Brid.) E.G. Britt., N. Am. Fl. 15: 151 (1913).

II: on decaying log, mh-50046 (+ *Campylopus japonicus*).

Distribution. Widely distributed in the Northern Hemisphere.

Dicranum hamulosum Mitt., Trans. Linn. Soc. London Bot. 3: 156 (1891).

IV: on humus, mh-50017 (+ *Rhytidium rugosum*).

Distribution. Mainland China, Taiwan, Japan and Russia Far East.

Dicranum japonicum Mitt., Trans. Linn. Soc.

London Bot. 3: 155 (1891).

I: on rock-cliff, mh-49849; on humus, mh-49856; on decaying log, mh-50062.

Distribution. Mainland China, Taiwan, Korea and Japan.

Dicranum majus Turner, Musc. Hib. 59 (1804).

II: on humus, mh-49898.

Distribution. Europe, Caucasus, mainland China, Taiwan, Korea, Russia Far East, Japan, N. America and Greenland.

Dicranum mayrii Broth., Hedwigia 38: 207 (1899).

I: on decaying log, mh-49855; on tree-trunk, mh-50071.

Distribution. Taiwan, Korea, Japan and Sakhalin.

Dicranum viride (Sull. & Lesq.) Lindb. var. *hakkodense* (Cardot) Takaki, J. Hattori Bot. Lab. 35: 35 (1972).

IV: on tree-trunk, mh-49979.

Distribution. Taiwan and Japan.

Oncophorus crispifolius (Mitt.) Lindb., Act. Soc. Sc. Fenn. 10: 229 (1872).

IV: on basal part of tree-trunk, mh-49957 (+ *Hypnum tristo-viride*, *Paraleucobryum enerve*).

Distribution. Mainland China, Taiwan, Korea, Russia Far East and Japan.

Oncophorus wahlenbergii Brid., Bryol. Univ. 1: 400 (1826).

IV: on humus, mh-49959.

Distribution. Widely distributed in the Northern Hemisphere.

Paraleucobryum enerve (Thed.) Loeske, Hedwigia 47: 171 (1908).

IV: on basal part of tree-trunk, mh-49957 (+ *Hypnum tristo-viride*, *Oncophorus crispifolium*); on boulder, mh-49986 (+ *Leptodontium handelii*).

Distribution. Widely distributed in the Northern Hemisphere.

Rhabdoweisia crispata (With.) Lindb., Act. Soc. Sc. Fenn. 10: 22 (1871).

IV: on soil, mh-49966.

Distribution. Europe, Caucasus, mainland China, Java, Taiwan, Japan, Russia Far East, Hawaii and N. & S. America.

Ditrichaceae

Distichium capillaceum (Hedw.) Bruch & Schimp., Bryol. Eur. 2: 156 (1846).

III: on rock-cliff, mh-49954 (+*Oxystegus tenuirostris*).

Distribution. Widely distributed throughout the world.

Ditrichum crispatisimum (Müll.Hal.) Paris, Ind. Bryol. Suppl. 131 (1900).

IV: on rock-cliff, mh-50008 (+*Pgagiopus oederi*).

Distribution. Europe, New Guinea, Taiwan, Japan and N. & C. America (cf. Matsui & Iwatsuki 1990).

Encalyptaceae

Encalypta ciliata Hedw., Spec. Musc. 61 (1801).

IV: on rock-cliff, mh-49999 (+*Gollania turgens*, *Myurella julacea*), mh-50032 (+*Leptodontium flexifolium*, *Trachycystis ussuriensis*).

Distribution. Europe, Africa, Asia, N. & S. America and Greenland.

Encalypta rhabdocarpa Schwägr., Suppl. Spec. Musc. 1(1): 56 (1811).

IV: on rock-crevice, mh-50030.

Distribution. Widely distributed in the Northern Hemisphere.

Notes. Chiang et al. (2001) listed this species in the checklist of Taiwanese mosses as *Encalypta rhabdocarpa* Schwägr., although

Chiang and Kuo (1989) reported this species from Taiwan for the first time as *E. rhabdocarpa*.

Entodontaceae

Entodon morrisonensis Nog., J. Jpn. Bot. 14: 30 (1938).

I: on root, mh-49864. II: on rock-cliff, mh-49901.

Distribution. Mainland China and Taiwan (Hu & Wang, 2008).

Fissidentaceae

Fissidens dubius P.Beauv., Prodr. 57 (1805).

II: on boulder, ky-2209a. IV: on rock-crevice, mh-50020.

Distribution. Widely distributed in the Northern Hemisphere.

Fissidens ganguleei Norkett ex Gangulee, Moss. E. India2: 527 (1971).

I: on soil, mh-50055.

Distribution. Nepal, India, mainland China, Taiwan and Japan.

Fissidens involutus Wilson ex Mitt., J. Linn. Soc. Bot. Suppl. 1: 138 (1859).

II: on boulder, mh-49874.

Distribution. Nepal, India, Philippines, mainland China, Taiwan, Korea and Japan.

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

II: on rock-crevice, mh-49913 (+*Isopterygiopsis muelleriana*). III: on rock-cliff, mh-49924.

Distribution. Widely distributed throughout the world.

Grimmiaceae

Grimmia apiculata Hornsch., Flora 2: 85 (1819).

III: on rock-cliff, mh-49939.

Distribution. Europe, Himalayas, Taiwan and Japan.

Grimmia longirostris Hook., Musci Exot. 1: 62 (1818).

II: on boulder, ky-2173. III: on rock-crevice, mh-49943. IV: on rock-cliff, mh-50027.

Distribution. Widely distributed in the Northern Hemisphere.

Ptychomitrium formosicum Broth. & Yasuda, Ann. Bryol. 1: 19 (1928).

II: on boulder, mh-49888.

Distribution. Taiwan and Japan.

Racomitrium barbuloides Cardot, Bull. Herb. Boiss. sér. 2, 8: 336 (1908).

III: on humus, mh-49938.

Distribution. Mainland China, Taiwan, Korea and Japan (cf. Deguchi 1989).

Racomitrium carinatum Cardot, Bull. Herb. Boiss. sér. 2, 8: 335 (1908).

II: on boulder, ky-2166.

Distribution. Taiwan, Korea and Japan.

Racomitrium subsecundum (Hook. & Grev.) Mitt. & Wilson, Kew J. Bot. 9: 324 (1857).

II: on rock-cliff, mh-50038. IV: on boulder, mh-49974, ky-2229; on soil, mh-49990.

Distribution. Himalayas, India, Sri Lanka, mainland China, Taiwan, Philippines, Sumatra, Java, Borneo, New Guinea, Central America and Dominica (cf. Frisvoll 1988).

Schistidium strictum (Turn.) Loeske ex Martensson, Kung. Svenska Vetenskapsakad. Avh. Naturskyddsärenden 14: 110 (1956).

IV: on rock-cliff, mh-50004.

Distribution. Widely distributed in temperate and arctic regions in the world.

Hookeriaceae

Hookeria acutifolia Hook. & Grev., Edinburgh J. Sc. 2: 225 (1825).

I: on humus, mh-49852 (+*Pohlia wahlenbergii*).

Distribution. Taiwan, Japan, Hawaii and N. & S. America.

Hylocomiaceae

Hylocomium splendens (Hedw.) Schimp., Bryol. Eur. 5: 173 (1852).

II: on humus, mh-49879. IV: on humus, mh-49988.

Distribution. Europe, Asia, Aleutians, Alaska, eastern N. America and Greenland.

Pleurozium schreberi (Brid.) Mitt., J. Linn. Soc. Bot. 12: 537 (1869).

I: on humus, mh-50073. II: on humus, mh-49916. III: on humus, mh-49917; on boulder, mh-49944. IV: on humus, mh-49989; on rock-cliff, mh-50022.

Distribution. Widely distributed in the Northern Hemisphere.

Hypnaceae

Ctenidium pinnatum (Broth. & Paris) Broth. in Engler & Prantl, Nat. Pfl. 1(3): 1073 (1918).

I: on boulder, mh-49869; on rock-cliff, mh-50061. II: on rock-cliff, mh-49896; on boulder, ky-2200a.

Distribution. Mainland China, Taiwan and Japan.

Gollania flagellata Higuchi, J. Jpn. Bot. 86: 205 (2011).

III: on tree-trunk, mh-49929. IV: on tree-trunk, mh-49963 (+*Leptodontium flexifolium*); on branch, mh-50010.

Distribution. Endemic to Taiwan.

Notes. This species is characterized by (1) distinct stepwise layered stems by annual growth, (2) stem leaves with longer costae and long-decurrent bases, (3) cylindrical capsules, (4) exostome teeth with blunt apical parts and (5) endostome with fragile segments and

rudimentary cilia (Higuchi 2011). There is no difficulty in distinguishing this species from the other species of the genus when it has flagelliform branches. *Gollania flagellata* was described based on the specimen from Mt. Nanhu and also recorded from Mt. Chingshui. This species seems to be rather common in the central high mountains.

Gollania japonica (Cardot) Ando & Higuchi, *Hikobia* suppl. 1: 192 (1981).

II: on boulder, mh-49867, 49870, ky-2211.

Distribution. Nepal, mainland China, Taiwan and Japan.

Gollania philippinensis (Broth.) Nog., *Acta Phyt. Geobot.* 20: 241 (1962).

I: on humus, mh-49844. II: on humus, mh-49894; on boulder, mh-49884, ky-2201. III: on humus, mh-49925, 49927; on rock-cliff, mh-49926. IV: on humus, mh-50013; on rock-cliff, mh-50014.

Distribution. Mainland China, Taiwan and Philippines.

Gollania robusta Broth., *Sitzungsber. Akad. Wiss. Wien Math.-Nat. Kl. Abt. 1*, 133: 582 (1924).

I: on soil, mh-49866. II: on boulder, mh-49882; on rock-cliff, mh-49911, 49914; on root, mh-50039. III: on humus, mh-49931 (+ *Trachycystis ussuriensis*).

Distribution. Mainland China, Taiwan and Japan.

Notes. This species is very rare and only five localities including Mt. Chilai had been known (Higuchi 1985). Recently Higuchi (2009) reported this species from central Honshu, Japan.

Gollania ruginosa (Mitt.) Broth. in Engler & Prantl, *Nat. Pfl.* 1(3): 1055 (1908).

IV: on boulder, mh-50003 (+ *Cirriphyllum cirrosum*).

Distribution. N. W. India, Bhutan, mainland China, Taiwan, Korea, Russia Far East and

Japan.

Gollania turgens (Müll.Hal.) Ando, *Bot. Mag. Tokyo* 79: 769 (1966).

IV: on rock-cliff, mh-49997, 49999 (+ *Encalypta ciliata*, *Myurella julacea*), 50000 (+ *Myurella sibirica*).

Distribution. Nepal, India, Mainland China, Russia Far East, Japan, Alaska and W. Canada. New to Taiwan.

Notes. This species is characterized by *Hypnum*-like appearance, strongly falcate leaves, long and parallel costae, thick-walled and porose lamina cells of stem leaves and markedly recurved leaf margins of stem leaves (Higuchi 1985).

Hypnum cupressiforme Hedw. var. *cupressiforme*, *Spec. Musc.* 291 (1801).

II: on boulder, mh-49890. III: on rock-cliff, mh-49940. IV: on humus, mh-50018.

Distribution. Widely distributed throughout the world.

Hypnum cupressiforme Hedw. var. *filiforme* Brid., *Musc. Rec.* 2: 138 (1801).

II: on tree-trunk, mh-49875 (+ *Clastobryopsis robusta*), 49876.

Distribution. Widely distributed in the Northern Hemisphere and Tasmania.

Hypnum macrogynum Besch., *Ann. Sc. Nat. Bot. sér. 7*, 15: 91 (1892).

III: on boulder, mh-49950. IV: on rock-cliff, mh-49964 (+ *Ptilium crista-castrensis*).

Distribution. East and South Africa, Madagascar, Mascarene Is., Nepal, India, Bhutan, Myanmar, Malaysia, mainland China and Taiwan.

Hypnum subimponens Lesq. subsp. *ulophyllum* (Müll.Hal.) Ando, *Bot. Mag. Tokyo* 79: 766 (1966).

II: on boulder, mh-49877, ky-2171a. III: on boulder, mh-49918; on rock-cliff, mh-49948 (+ *Lescurea incurvata*).

Distribution. Pakistan, Nepal, Bhutan, Assam, mainland China, Taiwan, Korea and Japan.

Hypnum tristo-viride (Broth.) Paris, Ind. Bryol. Suppl. 214 (1900).

I: on rock-cliff, mh-49853 (+*Brotherella fauriei*); on decaying log, mh-50059. II: on rock-cliff, mh-49903; on decaying log, mh-49905. IV: on basal part of tree-trunk, mh-49957 (+*Oncophorus crispifolius*, *Paraleucobryum enerve*), 49972.

Distribution. Mainland China, Taiwan, Korea and Japan.

Isopterygiopsis muelleriana (Schimp.) Z. Iwats., J. Hattori Bot. Lab. 33: 379 (1970).

II: on soil, mh-49892; on rock-crevice, mh-49913 (+*Fissidens taxifolius*).

Distribution. Europe, Pakistan, Kashmir, E. Himalaya, mainland China, Taiwan, Russia Far East, Japan and N. America.

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

I: on soil, mh-50054.

Distribution. Nepal, S. E. Asia, mainland China, Taiwan and Japan.

Ptilium crista-castrensis (Hedw.) De Not., Cronac. Briol. Ital. 2: 17 (1867).

IV: on rock-cliff, mh-49964 (+*Hypnum macrogynum*); on boulder, ky-2251.

Distribution. Europe, Caucasus, Siberia, Nepal, India, Bhutan, Myanmar, mainland China, Taiwan, Korea, Japan, N. America and Greenland.

Hypopterygiaceae

Cyathophorum hookerianum (Griff.) Mitt., J. Proc. Linn. Soc. Bot. Suppl. 1: 147 (1859).

II: on branch, mh-49871 (+*Isothecium subdiversiforme*, *Meteoriella soluta*).

Distribution. India, Thailand, Vietnam,

Philippines, mainland China, Taiwan and Japan.

Hypopterygium flavolimbatum Müll.Hal., Syn. Musc. Frond. 2: 10 (1850).

II: on soil, mh-49868; on humus, ky-2172.

Distribution. Pakistan, Nepal, Bhutan, India, Sri Lanka, Thailand, Vietnam, Malaysia, Indonesia, mainland China, Taiwan, Japan, Russia Far East, Philippines, Papua New Guinea, Solomon Islands, Alaska and W. Canada (cf. Kruijer 2002).

Lembophyllaceae

Isothecium subdiversiforme Broth., Hedwigia 38: 237 (1899).

I: on basal part of tree-trunk, mh-49857, 50056. II: on branch, mh-49871 (+*Cyathophorum hookerianum*, *Meteoriella soluta*); on basal part of tree-trunk, ky-2153.

Distribution. Mainland China, Taiwan and Japan.

Leskeaceae

Lescuraea incurvata (Hedw.) E. Lawton, Bull. Torr. Bot. Cl. 84: 290 (1957).

III: on boulder, mh-49946; on rock-cliff, mh-49948 (+*Hypnum subimponens* subsp. *ulophyllum*).

Distribution. Europe, Pakistan, Taiwan, Korea, Japan and N. America.

Lescuraea mutabilis (Brid.) Lindb. ex Hag., K. Norsk. Vid. Selsk. Skrift. 1908: 53 (1909).

IV: on tree-trunk, mh-50012.

Distribution. Europe, East Russia, mainland China, Taiwan, Korea and Japan.

Leucobryaceae

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

II: on fallen tree-trunk, ky-2218.

Distribution. Europe, Macaronesia, Mada-

gascar, Turkey, Caucasus, Himalayas, India, Sri Lanka, Myanmar, mainland China, Thailand, Sumatra, Java, Borneo, Sulawesi, New Guinea, Philippines, Taiwan, Korea and Japan (cf. Yamaguchi 1993).

Leucodontaceae

Leucodon coreensis Cardot, Beih. Bot. Centralbl. 17: 23 (1904).

I: on boulder, mh-49883.

Distribution. Mainland China, Taiwan, Korea and Japan (cf. Akiyama 1988).

Leucodon exaltatus Müll.Hal., Nuov. Giorn. Bot. Ital. n. ser. 3: 112 (1896).

I: on tree-trunk, mh-50080 (+*Macrocoma tenue* subsp. *sullivantii*).

Distribution. Mainland China and Taiwan (cf. Akiyama 1988).

Leucodon subulatus Broth., Symb. Sin. 4: 75 (1929).

III: on rock-cliff, mh-49935. IV: on rock-cliff, mh-49996.

Distribution. Mainland China and Taiwan (cf. Akiyama 1988).

Meteoriaceae

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

I: on tree-trunk, mh-50076; on branch, mh-50079.

Distribution. India, Sri Lanka, Thailand, Myanmar, Vietnam, Java, Sumatra, Borneo, Philippines, mainland China, Taiwan and Japan.

Chrysocladium retrorsum (Mitt.) M.Fleisch., Musci Fl. Buitenz. 3: 829 (1907).

II: on tree-trunk, mh-49885.

Distribution. India, Sri Lanka, Vietnam, Philippines, mainland China, Taiwan and Japan.

Floribundaria floribunda (Dozy & Molk.) M. Fleisch., Hedwigia 44: 302 (1905).

II: on branch, ky-2208a.

Distribution. Widely distributed in tropical regions of Asia and Africa.

Neodictyella pendula (Sull.) W.R.Buck, J. Hattori Bot. Lab. 75: 62 (1994).

I: on trunk of bamboo, mh-50078. II: on tree-trunk, mh-49878; on branch, mh-49886. IV: on branch, mh-49955, 49983; on tree-trunk, mh-49977, 50026.

Distribution. Mainland China, Taiwan, Japan, N. America and Mexico.

Pseudobarbella levieri (Renauld & Cardot) Nog., J. Hattori Bot. Lab. 3: 86 (1948).

I: on tree-trunk, mh-50064.

Distribution. Himalayas, Thailand, mainland China, Taiwan and Japan.

Sinskea flammea (Mitt.) W.R.Buck, J. Hattori Bot. Lab. 75: 64 (1994).

I: on branch, mh-49854, 50063, ky-2114, 2295; on rock-cliff, mh-50065. IV: on tree-trunk, mh-50025.

Distribution. Himalayas, India, Thailand, mainland China, Taiwan, Philippines and Japan.

Mniaceae

Mnium lycopodioides (Hook.) Schwägr., Spec. Musc. suppl. 12: 24 (1826).

IV: on soil, mh-50023.

Distribution. Himalayas, mainland China, Philippines, Taiwan, Korea and Japan.

Plagiomnium maximoviczii (Lindb.) T. J. Kop., Ann. Bot. Fenn. 5: 147 (1968).

II: on boulder, mh-50047. IV: on rock-cliff, mh-50024.

Distribution. Widely distributed in East Asia.

Trachycystis ussuriensis (Maack & Regel) T.J.

Kop., Ann. Bot. Fennici 14: 206 (1977).

I: on soil, ky-2118. II: on humus, mh-49937. IV: on rock-cliff, mh-50032 (+*Encalypta ciliata*, *Leptodontium flexifolium*).

Distribution. Mainland China, Taiwan, Korea, Russia Far East and Japan.

Neckeraceae

Homaliodendron flabellatum (Sm.) M. Fleisch., Hedwigia 45: 74 (1906).

I: on tree-trunk, mh-50050, ky-2288.

Distribution. Widely distributed in tropical Asia.

Neckera pennata Hedw., Spec. Musc. 200 (1801).

II: on decaying log, mh-49872.

Distribution. Widely distributed throughout the world.

Orthotrichaceae

Amphidium mougeotii (Bruch & Schimp.) Schimp., Coroll. 39 (1856).

III: on rock-cliff, mh-49945. IV: on rock-cliff, mh-49995.

Distribution. Europe, Caucasus, Taiwan, Japan and North America (Crum & Anderson 1981).

Macrocoma tenue (Hook. & Grev.) Vitt subsp. *sullivantii* (Müll.Hal.) Vitt, Bryologist 83: 413 (1980).

I: on tree-trunk, mh-50080 (+*Leucodon exaltatus*). II: on branch, mh-49880, 50048; on fallen tree-trunk, ky-2187a.

Distribution. Himalayas, mainland China, Taiwan, Japan, Hawaii and N., C. & S. America (cf. Vitt 1980).

Ulota crispa (Hedw.) Brid., Mant. Musc. 112 (1819).

IV: on branch, mh-49956.

Distribution. Europe, Africa, mainland China, Taiwan, Korea, Siberia, Russia Far

East, Japan, N. America and Tasmania.

Ulota morrisonensis Horik. & Nog., J. Sci. Hiroshima Univ., Ser. B, Div. 2, 3: 37 (1937).

I: on trunk of bamboo, mh-49845; on branch, ky-2103. II: on branch, mh-49906. IV: on trunk of bamboo, mh-49978, 49987.

Distribution. Endemic to Taiwan.

Plagiotheciaceae

Plagiothecium formosicum Broth. & Yasuda, Rev. Bryol. 53: 3 (1926).

IV: on boulder, mh-49962.

Distribution. Endemic to Taiwan.

Plagiothecium laetum Schimp., Bryol. Eur. 5: 185 (1851).

II: on humus, mh-49899. IV: on humus, mh-49960, 49961; on boulder, mh-49982.

Distribution. Widely distributed in the Northern Hemisphere.

Plagiothecium neckeroideum Schimp. var. *nec-keroidium*, Bryol. Eur. 5: 195 (1851).

III: on basal part of tree-trunk, mh-49922.

Distribution. Europe, Himalayas, mainland China, Thailand, Java, Sumatra, Borneo, Philippines, Taiwan, Russia Far East and Japan.

Plagiothecium neckeroideum Schimp. var. *nii-takayamae* (Toyama) Z.Iwats., J. Hattori Bot. Lab. 33: 354 (1970).

II: on root, mh-49910; on tree-trunk, ky-2146. IV: on boulder, mh-49985.

Distribution. Endemic to Taiwan.

Plagiothecium nemorale (Mitt.) A.Jaeger, Ber. S. Gall. Naturw. Ges. 1876-77: 451 (1878).

I: on rock-cliff, mh-49863, 49865, 50069. III: on root, mh-49921. IV: on basal part of tree-trunk, mh-49969.

Distribution. Europe, Africa, Siberia, Himalayas, mainland China, Taiwan, Korea and Japan.

Polytrichaceae

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

II: on soil, ky-2290.

Distribution. Thailand, mainland China, Taiwan, Korea and Taiwan.

Pogonatum alpinum (Hedw.) Röhl., Ann. Wetterau Ges. 3: 226 (1814).

IV: on soil, mh-49991, ky-2265a; on humus, mh-49992.

Distribution. Widely distributed in the Northern Hemisphere and S. America.

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

I: on rock-cliff, mh-50053.

Distribution. India, Nepal, Bhutan, Laos, Myanmar, Thailand, Vietnam, Malaysia, Indonesia, Philippines, mainland China and Taiwan (cf. Hyvönen & Lai 1991).

Pogonatum fastigiatum Mitt., J. Linn. Soc. Bot. Suppl. 1: 154 (1859).

I: on rock-cliff, mh-50052.

Distribution. India, Nepal, Sikkim, Bhutan, Thailand, Mainland China and Taiwan (cf. Hyvönen & Lai 1991).

Pogonatum inflexum (Lindb.) Sande Lac., Ann. Mus. Bot. Lugduno-Batavi 4: 308 (1870).

I: on boulder, mh-50066.

Distribution. Mainland China, Taiwan, Korea, Russia Far East and Japan.

Pottiaceae

Bryoerythrophyllum recurvirostre (Hedw.) P. C. Chen, Hedwigia 80: 5 (1941).

IV: on humus, mh-49967 (+ *Bryum billardieri*); on rock-cliff, mh-49968.

Distribution. Widely distributed throughout the world.

Didymodon nigrescens (Mitt.) K. Saito, J. Hattori Bot. Lab. 39: 510 (1975).

II: on boulder, ky-2135. III: on rock-cliff, mh-49934. IV: on rock-cliff, mh-50029 (+ *Myurella julacea*).

Distribution. Himalayas, mainland China, Taiwan and Japan.

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

II: on boulder, ky-2170.

Distribution. Europe, Asia, New Guinea, Australia, Samoa and North to South America.

Leptodontium flexifolium (Dicks. ex With.) Hampe, Oefv. K. Vet. Ak. Foerh. 21: 227 (1864).

IV: on tree-trunk, mh-49963 (+ *Gollania flagellata*); on boulder, mh-49986 (+ *Paraleucobryum enerve*); on rock-cliff, mh-50032 (+ *Encalypta ciliata*, *Trachycystis ussuriensis*).

Distribution. Europe, central Africa, Asia, New Guinea, Hawaii and N. & S. America.

Notes. *Leptodontium flexifolium* is very variable species in size and leaf shape. The plants (mh-49986) has flagellate-attenuate stems and loose foliation. This is a form which was described from Mt. Yushan as *Leptodontium gracillimum* by Noguchi (1944).

Leptodontium viticulosoides (P. Beauv.) Wijk & Marg., Taxon 9: 51 (1960).

I: on rock-cliff, mh-49848; on humus, mh-50075, -2121.

Distribution. Africa, Madagascar, Réunion, Himalayas, S. E. Asia, Taiwan and C. & S. America.

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

III: on rock-cliff, mh-49954 (+ *Distichium capillaceum*). IV: on rock-cliff, mh-50001 (+ *Campylopus fragilis*).

Distribution. Widely distributed in the Northern Hemisphere.

Syntrichia norvegica F.Weber, Arch. Syst. Naturgesch. 1(1): 130 (1804).

IV: on rock-cliff, mh-50031.

Distribution. Widely distributed in the Northern Hemisphere.

Pterobryaceae

Meteoriella soluta (Mitt.) S.Okam., J. Coll. Sc. Imp. Univ. Tokyo 36: 18 (1915).

II: on branch, mh-49871 (+ *Cyathophorum hookerianum*, *Isothechium subdiversiforme*); ky-2220a; on fallen tree-trunk, ky-2222. IV: on tree-trunk, mh-49958; on rock-cliff, mh-49998.

Distribution. Himalayas, Malay Peninsula, mainland China, Taiwan and Japan.

Pterobryum subarbuscula Broth., Oefv. Förh. Finska Vetensk.-Soc. 62 A(9): 22 (1921).

I: on tree-trunk, mh-50051.

Distribution. Endemic to Taiwan.

Rhytidiaceae

Rhytidium rugosum (Hedw.) Kindb., Beih. K. Svensk. Vet. Ak. Handl. 7: 15 (1883).

II: on humus, mh-49915. IV: on humus, mh-50017 (+ *Dicranum hamulosum*); on soil, ky-2268/

Distribution. Widely distributed in the Northern Hemisphere and S. America.

Sematophyllaceae

Brotherella fauriei (Cardot) Broth. in Engler & Prantl, Nat. Pfl. ed. 2, 11: 425 (1925).

I: on rock-cliff, mh-49853 (+ *Hypnum tristo-viride*).

Distribution. Taiwan and Japan.

Brotherella recurvans (Michx.) M.Fleisch., Nov. Guinea 12: 120 (1914).

IV: on humus, mh-49970.

Distribution. Mainland China, Taiwan, Japan and eastern North America.

Clastobryopsis robusta (Broth.) M.Fleisch., Musci Fl. Buitenz. 4: 1181 (1923).

II: on tree-trunk, mh-49875 (+ *Hypnum cupressiforme* var. *filiforme*). IV: on tree-trunk, mh-49993 (+ *Gammiella tonkinensis*).

Distribution. Java, Borneo, Philippines, New Guinea, Taiwan and Japan (Tan & Jia 1999).

Gammiella tonkinensis (Broth. & Paris) B.C. Tan, Bryologist 93: 433 (1990).

I: on trunk of bamboo, mh-49846, 49847; on tree-trunk, mh-50072. II: on branch, mh-49907. IV: on tree-trunk, mh-49993 (+ *Clastobryopsis robusta*).

Distribution. Indochina, Indonesia, Philippines, mainland China, Taiwan and Japan (Tan & Jia 1999).

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

I: on tree-trunk, mh-50068.

Distribution. S. and S. E. Asia, mainland China, Taiwan, Japan and Carolines (Tan & Jia 1999).

Wijkia deflexifolia (Renauld & Cardot) H.A. Crum, Bryologist 74f: 171 (1971).

I: on decaying log, mh-50057.

Distribution. Himalayas, India, Indochina, mainland China, Taiwan and Philippines (Tan & Jia 1999).

Sphagnanaceae

Sphagnum fimbriatum Wilson ex Wilson & Hook.f. in Hook.f., Bot. Antarctic Voy. Erebus and Terror 1: 398 (1847).

I: on humus, mh-49858.

Distribution. Europe, Siberia, Japan and North America.

Splachnaceae

Tayloria indica Mitt., J. Linn. Soc. Bot. Suppl. 1: 57 (1859).

II: on decaying log, mh-50049.

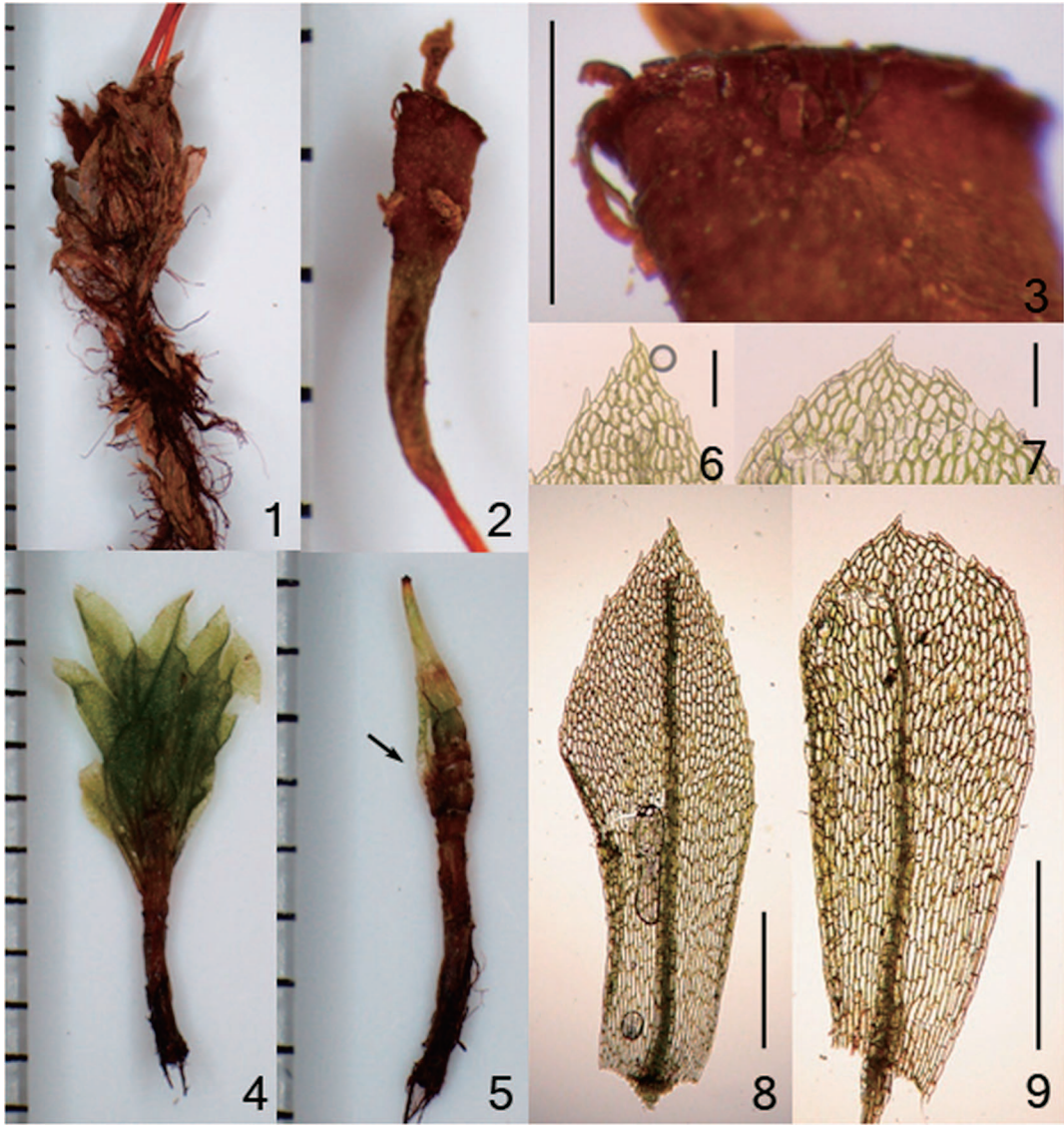


Fig. 3. *Tayloria splachnoides*. 1. A part of leafy stem with mature sporophytes. 2. Capsule when dry. 3. A part of the mouth of capsule with peristomes. 4. Leafy stem with young sporophyte. 5. Stems of 4, which leaves were removed, with young sporophyte. Arrow shows a perigonium. 6. Apical part of leaf of 8. 7. Apical part of leaf of 9. 8, 9. Leaves. Scales for 1, 2, 4, 5, 8 & 9 in 1 mm, for 3 in 0.5 mm and for 6 & 7 in 0.2 mm. (All from Higuchi 49952.)

Distribution. Nepal, Bhutan, India, Sri Lanka, Myanmar, Philippines, mainland China, Taiwan and Japan.

**Tayloria splachnoides* (Schwägr.) Hook., J. Sc. Arts 2: 144 (1816).

II: on boulder, mh-49952.

Distribution. Europe, mainland China, Japan and North America. New to Taiwan.

Notes. In Taiwan, six species of *Tayloria*, *T. alpicola*, *T. hornschurchii*, *T. indica*, *T. recurv-marginata*, *T. serrata* and *T. subglabra*, are reported (cf. Chiang et al. 2001, Higuchi & Lin 2006). Plants growing at slope between

Chenggong Cabin and ridge are identical with *Tayloria splachnoides* in having some characteristics, such as broadly acute leaves (Fig. 3: 1, 2), capsules with columella exserted (Fig. 3: 3), peristome teeth split to the base and rolled and reflexed when dry (Fig. 3: 4).

Theliaceae

Myurella julacea (Schwägr.) Bruch & Schimp., Bryol. Eur. 6: 41 (1853).

IV: on rock-crevice, mh-49984, ky-2277; on rock-cliff, mh-50029 (+*Didymodon nigrescens*), 50033.

Distribution. Widely distributed in the Northern Hemisphere.

Myurella sibirica (Müll.Hal.) Reimers, Hedwigia 76: 272 (1937).

IV: on rock-cliff, mh-50000 (+*Gollania turgens*).

Distribution. Europe, Caucasus, Siberia, Kashmir, mainland China, Japan and N. America.

Thuidiaceae

Abietinella abietina (Hedw.) M.Fleisch., Musci Fl. Buitenz. 4: 1497 (1923).

II: on boulder, ky-2162a. IV: on humus, mh-50015.

Distribution. Europe, Pakistan, mainland China, Taiwan, Korea, Japan, Sakhalin, N. America and Greenland.

Actinothuidium hookeri (Mitt.) Broth. in Engler & Prantl, Nat. Pfl. 1(3): 1019 (1908).

III: on boulder, mh-49949; ky-2179. IV: on rock-cliff, mh-50009.

Distribution. E. Himalayas, Assam, Myanmar, mainland China, Taiwan and Russia Far East.

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

I: on humus, mh-50077. III: on humus, mh-

49930. IV: on rock-cliff, mh-50019.

Distribution. Widely distributed in tropical, subtropical and temperate regions of Asia.

Trachypodaceae

Trachypus bicolor Reinw. & Hornsch., Nov. Act. Ac. Leop. Car. 14: 708 (1829).

II: on rock-cliff, mh-49912. IV: on rock-cliff, mh-50028.

Distribution. Himalayas, southern India, Sri Lanka, Java, Borneo, Philippines, mainland China, Taiwan and Japan.

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台湾奇萊山の蘚類

樋口正信・姚 奎宇・林 善雄

台湾奇萊山の蘚類フロラを 2009 年に調査した。今回の調査で本地域から 34 科 83 属 128 種の蘚類を確認した。それらのうち、2 種が台湾の蘚類フロラに新たに加わるものであった。台湾の最高峰である玉山の蘚類フロラと比較し、種数はあまり変わらないが、それぞれで特定の科が欠如することが明らかになった。各種について、基物、産地、標本番号、分布域を示した。