

Moss Flora of Lanyu, Taiwan

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Abstract The moss flora of Lanyu, Taiwan, was investigated in 2006. The mosses recognized comprise 23 families, 39 genera and 62 species. Twenty seven species are new additions to the moss flora of Lanyu. *Calymperes moluccense*, *Ectropothecium sodale* and *Radulina elegantissima* are reported as new to the moss flora of Taiwan. The moss flora of Lanyu comprising 29 families, 60 genera and 123 species is characterized by richness of tropical species as compared with that of the main island. For each species recognized here, locality, substrate, specimen number and taxonomic note are provided.

Key words : Botel Tobago, Lanyu, mosses, Taiwan.

Introduction

This study deals with the moss flora of Lanyu, Taiwan. In 2006 we made field researches and collected bryophytes mainly from the areas of Mt. Hongtoushan and Datienchi. Taiwan consists of the main island and many smaller islands in the northwest region of the Pacific Ocean and locates 400 km between 21°50' and 25°20'N latitude. Lanyu is located off the southeastern coast of the main island and is the second largest island (45 km²). This is a volcanic island and the geology of the island is mainly andesite conglomerate. Most parts of the island are mountainous and steep. The tallest mountain is Mt. Hongtoushan at 552 m above sea level. The climate is subtropical and it is characterized by strong wind and plenty of precipitation. The natural vegetation remains only around higher mountainous regions. Lanyu has been also called Orchid Island or known as Tabaco Xima, Botel Tobago, Hong-

touyu or Kôtôsho.

The mosses of Lanyu have been reported by Horikawa (1935), Noguchi (1937, 1939), Herzog and Noguchi (1955), Yang and Lee (1964), Wang (1969), Shin (1971, 1973). However, no bryophyte flora of Lanyu has been compiled. The purpose of this study is to investigate the moss flora of Lanyu and compile it based on the specimens collected and references.

Materials and Methods

Field studies were carried out in November 2006 and a total of ca. 130 specimens were collected. The specimens cited here are deposited in the herbarium of the Department of Botany, National Museum of Nature and Science (TNS) and duplicates in the herbarium of the Department of Life Science, Tunghai University, Taichung (TUNG).

The sites investigated are divided as follows.

I: Mt. Hongtoushan, 150–552 m alt., 22°03'N, 121°32'E, November 9, 2006. (Fig. 1: A, C)

II: Datienci, 180–360 m alt., 22°01'N, 121°34'E, November 10, 2006. (Fig. 1: B)

III: Central Cross Road, 170 m alt., 22°01'N, 121°33'E, November 10, 2006

IV: Hongtougou, 10 m alt., 22°01'N, 121°33'E, November 10, 2006

V: Xiaotienchi, 280 m alt., 22°04'N, 121°31'E, November 11, 2006

Results and Discussion

The mosses recognized in this study comprise 23 families, 39 genera and 62 species. Twenty seven species are new additions to the moss flora



Fig. 1. Photographs showing the area investigated and some species growing there. A. Southern slope of Mt. Hongtoushan. B. Datienci. C. Forest floor near the summit of Mt. Hongtoushan. D. *Leucobryum bowringii* growing on tree-trunk mixed with *Leucophanes angustifolium*. E. *Garovaglia elegans* growing on low tree. F. *Distichophyllum mittenii* growing on tree-trunk mixed with *Hookeria acutifolia*.

of Lanyu. Among them *Calymperes moluccense* Schwägr., *Ectropothecium sodale* (Sull.) Mitt. and *Radulina elegantissima* (M.Fleisch.) W.R. Buck & B.C. Tan are new to Taiwan. In total the moss flora of Lanyu comprise 29 families, 60 genera and 123 species.

In Taiwan, the moss flora of the lowlands is related to that of the Philippines, southern China and Southeast Asia, and has suffered much more human activities (Higuchi and Lin, 2004). The affinities of the flora and fauna of Lanyu and the Philippines have been indicated (e.g., Kano, 1931a, 1931b; Kanehira, 1935).

The 123 species known from Lanyu mainly consist of tropical species, but also include several other elements of distribution, such as East Asiatic (e.g., *Eurhynchium savatieri*, *Neckeropsis nitidula*, etc.), cosmopolitan (e.g., *Fissidens taxifolius*, *Weissia controversa*, etc.) or circumboreal species (e.g., *Eurhynchium hians*, *Ditrichum pallidum*, etc.). They are classified roughly into the following floristic groups: palaeotropic species (74 spp., 60%), East Asiatic species (21 spp., 17%), pantropical species (12 spp., 9%), cosmopolitan (6 spp., 5%), circumboreal species (5 spp., 4%) and others (5 spp., 4%). While, the mosses of Taiwan consists of East Asiatic species (44%), palaeotropic species (27%), circumboreal species (12%), cosmopolitan (7%), pantropical species (2%) and others (8%) (Higuchi and Lin, 2004). The result shows that the moss flora of Lanyu is characterized by richness of tropical species as compared with that of Taiwan.

Enumeration of the moss species known from Lanyu

The families, genera and species are arranged alphabetically. The generic position follows Goffinet *et al.* (2009). In the following enumeration an asterisk (*) preceding a species indicates "new to Lanyu." The species that were recognized in this study are in italics, and the species that are cited from the references are in Roman type. *Fissidens splachnobryoides* Broth. f. *subbrachyneuron* (Thér. & P.de la Varde) Herzog,

which was reported from the island by Herzog and Noguchi (1955), is not available here because of the lack of information. Each species is referred by collecting site (I–V), substrate and specimen number, and some species by taxonomic note.

Anomodontaceae

Herpetineuron toccoe (Sull. & Lesq.) Cardot, Beih. Bot. Centralbl., Abt. 2, 19(2): 127 (1905).

Note. This species has been reported from the island by Shin (1971, 1973).

Bartramiaceae

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

Specimen examined. IV, on stone wall (*Higuchi 48398+Brachymenium exile*, *Hyophila involuta*).

Note. This species is new to Lanyu.

Philonotis lancifolia Mitt., J. Proc. Linn. Soc., Bot., 8: 151 (1864).

Note. This species has been reported from the island by Shin (1973).

Philonotis mollis (Dozy & Molck.) Mitt., J. Proc. Linn. Soc., Bot., Suppl. 1: 60 (1859).

Note. This species has been reported from the island by Wang (1969).

Philonotis thwaitesii Mitt., J. Proc. Linn. Soc., Bot., Suppl. 1: 60 (1859).

Note. This species has been reported from the island by Shin (1973).

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

Specimen examined. V, on soil (*Higuchi 48409*).

Note. This species has been reported from the island by Shin (1973).

Brachytheciaceae

Eurhynchium celebicum (Sande Lac.) E.B.Bartram, Bernice P. Bishop Mus. Bull., 101: 217 (1933).

Note. This species has been reported from the island by Wang (1969).

Eurhynchium hians (Hedw.) Sande Lac., Ann. Mus. Bot. Lugduno-Batavi, 2: 299 (1866).

Note. This species has been reported from the island by Herzog and Noguchi (1955 as *Oxyrrhynchium hians*).

***Eurhynchium savatieri** Schimp. ex Besch., Ann. Sci. Nat. Bot., sér. 7, 17: 378 (1893).

Specimen examined. V, on soil (*Higuchi 48407*).

Note. This species is new to Lanyu.

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

Note. This species has been reported from the island by Wang (1969 as *Rhynchostegium vagans*).

***Rhynchostegium contractum** Cardot, Bull. Soc. Bot. Genève, 4: 381 (1912).

Specimen examined. I, on basal part of tree (*Higuchi 48300*).

Note. This species is new to Lanyu.

Rhynchostegium riparioides (Hedw.) Cardot, Bull. Soc. Bot. France, 60: 231 (1913).

Note. This species has been reported from the island by Noguchi (1939 as *Platyhypnidium schottmulleri*).

Bryaceae

Brachymerium exile (Dozy & Molk.) Bosch & Sande Lac., Bryol. Jav., 1: 139 (1860).

Specimens examined. IV, on stone-wall (*Higuchi 48398+Hyophila involuta, Philonotis hastata, 48399*).

Note. This species has been reported from the

island by Shin (1973).

Bryum apiculatum Schwägr., Sp. Musc. Frond., Suppl. 1, 2: 102 (1816).

Note. This species has been reported from the island by Shin (1973 as *B. nitense*).

Bryum atrovirens Brid., Muscol. Recent., 2(3): 48 (1803).

Note. This species has been reported from the island by Shin (1973 as *B. erythrocarpum*).

Bryum cellulare Hook., Sp. Musc. Frond., Suppl. 3, 1(1): 214 (1827).

Note. This species has been reported from the island by Herzog and Noguchi (1955 as *B. japonense*) and Shin (1973).

Pohlia flexuosa Harv., Icon. Pl. 1: pl. 19: f. 5 (1836).

Note. This species has been reported from the island by Shin (1973).

Calymperaceae

***Calymperes afzelii** Sw., Jahrb. Gewächsk., 1: 3 (1818).

Specimens examined. I, on tree-trunk (*Higuchi 48317+Fissidens taxifolius, 48399*). II, on rock-cliff (*Higuchi 48363+Barbula subcomosa*).

Note. This species is new to Lanyu.

***Calymperes graeffeanum** Müll.Hal., J. Mus. Godeffroy, 3(6): 64 (1874).

Specimens examined. I, on tree-trunk (*Higuchi 48296*). II, on tree-trunk (*Higuchi 48365+Haplohymenium pseudo-triste*).

Note. This species is new to Lanyu.

***Calymperes moluccense** Schwägr., Sp. Musc. Frond., Suppl. 2, 1: 99 (1824). (Fig. 2)

Specimen examined. II, on basal part of tree-trunk (*Higuchi 48368*).

Note. This species is new to Taiwan. *Calymperes moluccense* is characterized by thick-walled laminal cells around shoulders of hyaline

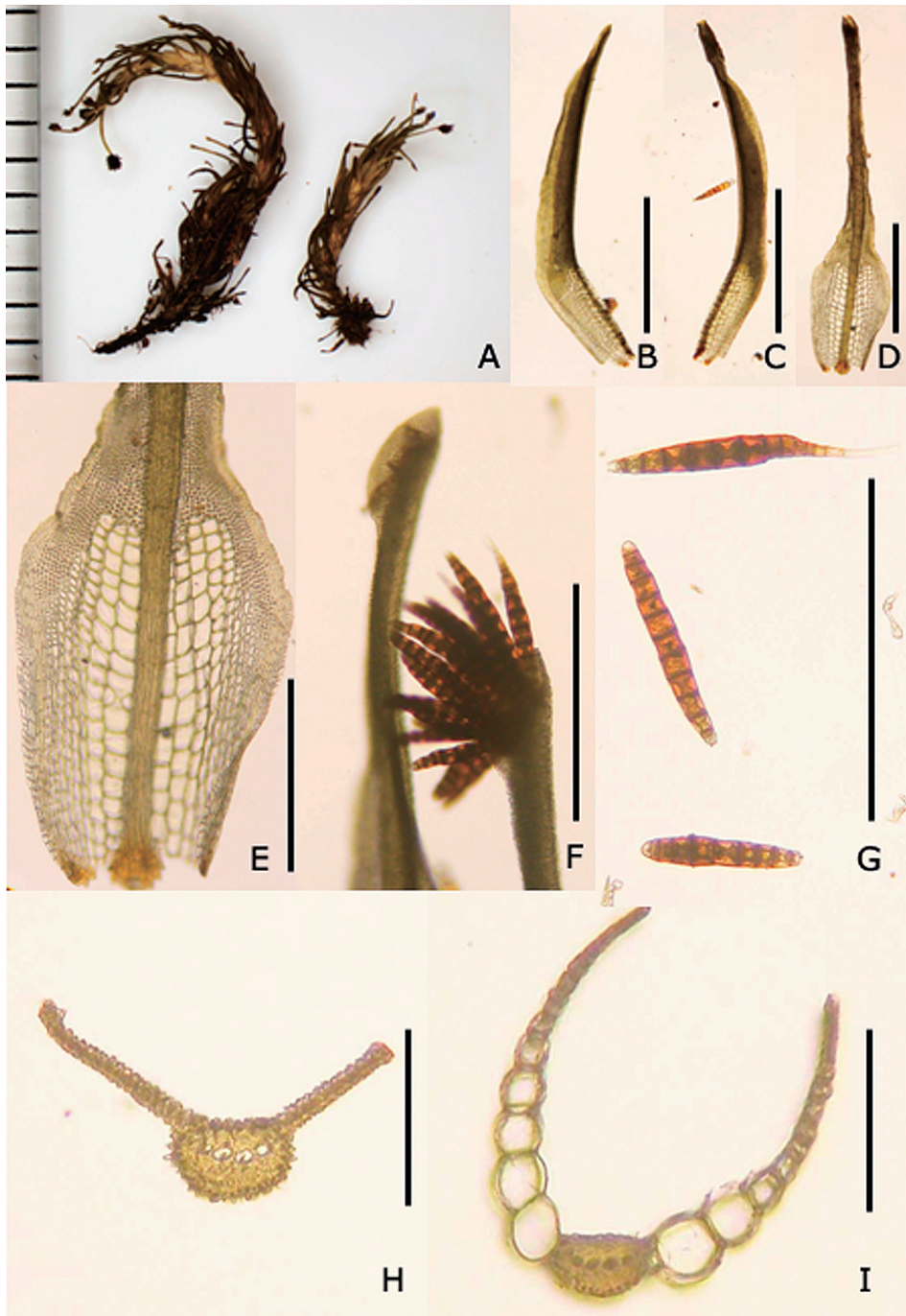


Fig. 2. *Calymperes moluccense* Schwägr. (Higuchi 48368). A. Plants. B. Nongemmiferous leaf. C, D. Gemmiferous leaves. E. Lower part of gemmiferous leaf showing cancellinae and laminal cells. F. Leaf apex of gemmiferous leaf with gemmae. G. Gemmae. H, I. Cross-sections of nongemmiferous leaf (H: middle part, I: lower part). Scale in A=1 mm. Scale bars in B–D=1 mm; E–G=0.5 mm; H & I= 0.2 mm.

base (Fig. 2: E) and broad “collar” of the chlorophyllose lamina at apices of gemmiferous leaves (Fig. 2: F) (Ellis and Tan, 1999). This species is distributed widespread in the Indo-Pacific regions, and Lanyu is the northern limit of the distribution.

Calymperes serratum A.Braun ex Müll.Hal., Syn. Musc. Frond., 1: 527 (1849).

Specimen examined. I, on tree-trunk (*Higuchi 48326*).

Note. This species has been reported from the island by Noguchi (1939 as *C. cristatum*).

Calymperes strictifolium (Mitt.) G.Roth, Hedwigia 51: 127 (1911).

Note. This species has been reported from the island by Herzog and Noguchi (1955 as *C. tuberosum*) and Wang (1969).

Calymperes tahitense (Sull.) Mitt., J. Linn. Soc., Bot., 10: 172 (1868).

Note. This species has been reported from the island by Herzog and Noguchi (1955).

Calymperes tenerum Müll.Hal., Linnaea 37: 174 (1872).

Note. This species has been reported from the island by Herzog and Noguchi (1955) and Wang (1969).

Exostratum blumii (Nees ex Hampe) L.T.Ellis, Lindbergia, 11: 25 (1985).

Specimens examined. I, on decaying log (*Higuchi 48342, 48358+Leucophanes angustifolium*).

Note. This species has been reported from the island by Horikawa (1935 as *Exodictyon blumii*), Herzog and Noguchi (1955 as *Exodictyon blumii*) and Shin (1973 as *Exodictyon blumii*).

Leucophanes angustifolium Renaud & Cardot, Rev. Bot. Bull. Mens., 9: 395 (1891).

Specimens examined. I, on root (*Higuchi 48298*); on tree-trunk (*Higuchi 48308, 48316+Leucobryum bowringii, 48323+Leucolo-*

ma molle, 48358+Exostratum blumii). II, on basal part of tree (*Higuchi 48387*).

Note. This species has been reported from the island by Herzog and Noguchi (1955 as *L. octoblepharioides*), Wang (1969 as *L. octoblepharioides*) and Shin (1973 as *L. octoblepharioides*).

Leucophanes candidum (Schwägr.) Lindb., Öfvers. Förh. Kongl. Svenska Vetensk.-Akad., 21: 602 (1865).

Note. This species has been reported from the island by Shin (1973).

Leucophanes glaucum (Schwägr.) Mitt., J. Proc. Linn. Soc., Bot., Suppl. 1: 25 (1859).

Specimen examined. II, on root (*Higuchi 48375*).

Note. This species has been reported from the island by Shin (1973 as *L. albescens*).

Mitthyridium flavum (Müll.Hal.) H.Rob., Phytologia, 32: 434 (1975).

Specimens examined. II, on root (*Higuchi 48366*); on basal part of tree (*Nishimura 12079*).

Note. This species is new to Lanyu.

Daltoniaceae

Calypstrochaeta japonica (Cardot & Thér.) Z. Iwats. & Nog., J. Hattori Bot. Lab., 46: 236 (1979).

Note. This species has been reported from the island by Yang and Lee (1964 as *Eriopus mollis*).

Distichophyllum cuspidatum (Dozy & Molk.) Dozy & Molk., Musci Frond. Ined. Archip. Ind., 4: 101 (1846).

Specimen examined. I, on tree-trunk (*Higuchi 48340*).

Note. This species has been reported from the island by Noguchi (1937).

Distichophyllum jungermannioides (Müll.Hal.) Bosch & Sande Lac., Bryol. Jav. 2: 22 (1861). PAL (As 2, 4)

Note. This species has been reported from the

island by Horikawa (1935), Herzog and Noguchi (1955) and Yang and Lee (1964).

**Distichophyllum maibarae* Besch., J. Bot. (Morot), 13: 40 (1899).

Specimens examined. I, on boulder (*Higuchi 48319, 48354*); on decaying log (*Higuchi 48325 + Trichosteleum boschii*); on tree-trunk (*Higuchi 48344, 48353*). II, on soil (*Higuchi 48378, 48379*).

Note. This species is new to Lanyu.

Distichophyllum mittenii Bosch & Sande Lac., Bryol. Jav., 2: 25 (1861).

Specimens examined. I, on root (*Higuchi 48322 + Hookeria acutifolia*); on decaying log (*Higuchi 48351 + Hookeria acutifolia*).

Note. This species has been reported from the island by Noguchi (1939).

Distichophyllum osterwaldii M.Fleisch., Musci Fl. Buitenzorg, 3: 994 (1908).

Note. This species has been reported from the island by Yang and Lee (1964).

Dicranaceae

Leucoloma molle (Müll.Hal.) Mitt., J. Proc. Linn. Soc., Bot., Suppl. 1: 13 (1859).

Specimens examined. I, on tree-trunk (*Higuchi 48323 + Leucophanes angustifolium, 48327, 48335, 48356*); on branch (*Higuchi 48341 + Hypnodendron reinwardtii*).

Note. This species has been reported from the island by Noguchi (1939).

Trematodon longicollis Michx., Fl. Bor.-Amer. 2: 289 (1803).

Note. This species has been reported from the island by Herzog and Noguchi (1955 as *T. drepanellus*, *T. flaccidisetus* and *T. paucifolius*).

Ditrichaceae

**Ditrichum difficile* (Duby) M.Fleisch., Musci Fl. Buitenzorg, 1: 300 (1904).

Specimen examined. II, on soil at roadside bank (*Higuchi 48393*).

Note. This species is new to Lanyu.

Ditrichum pallidum (Hedw.) Hampe, Flora, 50: 182 (1867).

Note. This species has been reported from the island by Wang (1969).

Fissidentaceae

Fissidens bryoides Hedw., Sp. Mus. Frond., 153 (1801).

Note. This species has been reported from the island by Shin (1971, 1973).

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

Note. This species has been reported from the island by Shin (1971, 1973).

Fissidens crispulus Brid., Muscol. Recent. Suppl., 4: 187 (1819 [1818]).

Specimens examined. II, on soil (*Higuchi 48391*). III, on soil (*Higuchi 48396*).

Note. This species has been reported from the island by Herzog and Noguchi (1955 as *F. sakourae*) and Shin (1973 as *F. incrassatus*).

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

Note. This species has been reported from the island by Shin (1971, 1973 as *F. garberi*).

**Fissidens hollianus* Dozy & Molk., Bryol. Jav., 1: 4 (1855).

Specimen examined. II, on boulder (*Higuchi 48372 + Taxithelium parvulum*).

Note. This species is new to Lanyu.

Fissidens nobilis Griff., Calcutta J. Nat. Hist., 2: 505 (1842).

Specimen examined. II, on soil (*Higuchi 48369*).

Note. This species has been reported from the island by Noguchi (1939 as *F. japonicus*), Herzog

and Noguchi (1955) and Wang (1969 as *F. filicinus*, *F. nobilis*).

**Fissidens oblongifolius* Hook.f. & Wilson, London J. Bot., 3: 547 (1844).

Specimen examined. II, on soil (Higuchi 48382).

Note. This species is new to Lanyu.

Fissidens taxifolius Hedw., Sp. Musc. Frond., 155 (1801).

Specimen examined. I, on tree-trunk (Higuchi 48317+*Calymperes afzelii*).

Note. This species has been reported from the island by Shin (1971, 1973).

**Fissidens teysmannianus* Dozy & Molk., Pl. Jungh., 317 (1854).

Specimens examined. II, on soil (Higuchi 48361, 48370).

Note. This species is new to Lanyu.

Fissidens zollingeri Mont., Ann. Sci. Nat. Bot., sér. 3, 4: 114 (1845).

Note. This species has been reported from the island by Shin (1971, 1973 as *F. xiphioides*).

Hookeriaceae

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

Specimen examined. I, on boulder (Higuchi 48310); on root (Higuchi 48321+*Homaliodendron microdendron*, *Vesicularia flaccida*, Higuchi 48322+*Distichophyllum mittenii*); on decaying log (Higuchi 48351+*Distichophyllum mittenii*); on soil (Higuchi 48381); on basal part of tree (Nishimura 12073).

Note. This species has been reported from the island by Noguchi (1937), Herzog and Noguchi (1955), Yang and Lee (1964) as *H. nipponensis* and Wang (1969).

Hypnaceae

Ectropothecium buitenzorgii (Bél.) Mitt., J.

Linn. Soc., Bot., 10: 180 (1868).

Note. This species has been reported from the island by Herzog and Noguchi (1955) and Wang (1969).

Ectropothecium dealbatum (Reinw. & Hornsch.) A.Jaeger, Ber. S. Gall. Naturw. Ges., 1877–78: 264 (1880).

Specimen examined. I, on boulder (Nishimura 12061). II, on soil (Nishimura 12085).

Note. This species has been reported from the island by Wang (1969).

**Ectropothecium moritzii* (Müll.Hal.) A.Jaeger, Ber. S. Gall. Naturw. Ges., 1877–78: 262 (1880).

Specimens examined. I, on tree-trunk (Higuchi 48336); on root (Nishimura 12065+*Vesicularia montagnei*, 12066, 12067, 12068, 12069, 12071, 12075, 12076, 12077). II, on humus (Higuchi 48374); on soil (Nishimura 12080); on rock (Nishimura 12084).

Note. This species is new to Lanyu.

Ectropothecium perminutum Broth. ex E.B. Bartram, Philipp. J. Sci., 68: 356 (1939).

Note. This species has been reported from the island by Herzog and Noguchi (1955).

**Ectropothecium sodale* (Sull.) Mitt., J. Linn. Soc., Bot., 10: 180 (1868).

Specimen examined. II, on rock (Nishimura 12078).

Note. This species is new to Taiwan. *Ectropothecium sodale* is characterized by small plants, strongly falcate and acuminate leaves and laminal cells distinctly prorate at upper ends.

Ectropothecium zollingeri (Müll.Hal.) A.Jaeger, Ber. S. Gall. Naturw. Ges., 1877–78: 272 (1880).

Note. This species has been reported from the island by Herzog and Noguchi (1955 as *Taxiphyllum formosanum* Herzog & Nog. sp. nov.).

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

Specimens examined. III, on soil (Higuchi

48397, *Nishimura 12086*).

Note. This species has been reported from the island by Wang (1969).

**Vesicularia flaccida* (Sull. & Lesq.) Z.Iwats., J. Hattori Bot. Lab., 26: 70 (1963).

Specimens examined. I, on root (*Higuchi 48321+Homaliodendron microdendron, Hooke-ria acutifolia*). II, on decaying log (*Higuchi 48384+Isopterygium minutirameum, Trichostel-eum boschii*).

Note. This species is new to Lanyu.

**Vesicularia montagnei* (Bel.) Broth. in Engler & Prantl, Nat. Pfl., I(3): 1094 (1908).

Specimens examined. I, on decaying log (*Higuchi 48297, 48309, 48350, 48360+Calli-costella papillata, Nishimura 12064, 12065+Etropothecium moritzii*); on boulder (*Nishimura 12062*). II, on soil (*Higuchi 48389, Nishimura 12083*). V, on soil (*Higuchi 48406*).

Note. This species is new to Lanyu.

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

Note. This species has been reported from the island by Herzog and Noguchi (1955 as *Vesicu-laria shimadae*).

Hypnodendraceae

**Hypnodendron reinwardtii* (Schwägr.) A. Jaeger, Ber. S. Gall. Natur. Ges., 1877–78: 358 (1880).

Specimens examined. I, on branch (*Higuchi 48341+Leucoloma molle*); on decaying log (*Higuchi 48343*).

Note. This species is new to Lanyu.

Hypopterygiaceae

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

Specimen examined. I, on tree-trunk (*Higuchi 48349*).

Note. This species is new to Lanyu.

Leucobryaceae

Leucobryum bowringii Mitt., J. Proc. Linn. Soc., Bot., Suppl. 1: 26 (1859).

Specimens examined. I, on humus (*Higuchi 48312*); on root (*Higuchi 48315*); on tree-trunk (*Higuchi 48316+Leucophanes angustifolium*); on decaying log (*Higuchi 48324*). II, on decaying log (*Higuchi 48385*); on humus (*Higuchi 48367*).

Note. This species has been reported from the island by Herzog and Noguchi (1955), Wang (1969) and Shin (1973).

**Leucobryum javense* (Brid.) Mitt., J. Proc. Linn. Soc., Bot., Suppl. 1: 25 (1859).

Specimen examined. I, on basal part of tree (*Higuchi 48347*).

Note. This species is new to Lanyu.

Leucomiaceae

Leucomium strumosum (Hornsch.) Mitt., J. Linn. Soc., Bot., 12: 502 (1869).

Note. This species has been reported from the island by Wang (1969 as *Leucomium aneurodic-tyon*).

Meteoriaceae

Aerobryopsis parisii (Cardot) Broth. in Engler & Prantl, Nat. Pfl., I (3): 820 (1906).

Specimen examined. I, on tree-trunk (*Higuchi 48328*).

Note. This species has been reported from the island by Shin (1971, 1973).

Aerobryopsis wallichii (Brid.) M.Fleisch., Musci Fl. Buitenzorg, 3: 789 (1908).

Note. This species has been reported from the island by Wang (1969 as *Aerobryopsis longissi-ma*).

Meteorium miquelianum (Müll.Hal.) M. Fleisch. in Engler & Prantl, Nat. Pfl., I (3): 818 (1906).

Note. This species has been reported from the

island by Wang (1969).

Trachypodopsis serrulata (P.Beauv.) M.Fleisch.
var. **crispatula** (Hook.) Zanten, *Blumea* 9: 521
(1959).

Note. This species has been reported from the island by Wang (1969).

Mniaceae

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

Specimen examined. I, on boulder (*Higuchi 48303*).

Note. This species has been reported from the island by Horikawa (1935 as *Mnium formosicum*), Herzog and Noguchi (1955 as *Mnium succulentum* var. *integrum*), Wang (1969 as *Mnium succulentum* var. *integrum*) and Shin (1973 as *Mnium succulentum* var. *integrum*).

Neckeraceae

Himantocladium cyclophyllum (Müll.Hal.) M.
Fleisch., *Musci Fl. Buitenzorg*, 3: 887 (1908).

Note. This species has been reported from the island by Noguchi (1937 as *H. loriforme*) and Shin (1973 as *H. loriforme*).

Himantocladium formosicum Broth. & Yasuda,
Rev. Bryol., 53: 2 (1926).

Note. This species has been reported from the island by Shin (1973).

Himantocladium plumula (Nees) M.Fleisch.,
Musci Fl. Buitenzorg, 3: 889 (1908).

Specimens examined. I, on tree-trunk (*Higuchi 48313, 48330, Nishimura 12072*).

Note. This species has been reported from the island by Wang (1969).

Homaliadelphus targionianus (Mitt.) Dixon &
P.de la Varde, *Rev. Bryol. Lichénol.*, 4: 142
(1932).

Note. This species has been reported from the island by Herzog and Noguchi (1955).

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

Specimen examined. I, on basal part of tree (*Higuchi 48301*).

Note. This species has been reported from the island by Noguchi (1937), Herzog and Noguchi (1955), Wang (1969) and Shin (1973).

Homaliodendron microdendron (Mont.) M.
Fleisch., *Hedwigia*, 45: 78 (1906).

Specimens examined. I, on root (*Higuchi 48321+Hookeria acutifolia, Vesicularia flaccida*). II, on basal part of tree (*Higuchi 483767*).

Note. This species has been reported from the island by Noguchi (1937), Wang (1969) and Shin (1973).

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

Note. This species has been reported from the island by Noguchi (1937), Herzog and Noguchi (1955), Wang (1969) and Shin (1973).

Neckeropsis nitidula (Mitt.) M.Fleisch., *Musci
Fl. Buitenzorg*, 3: 882 (1908).

Specimens examined. I, on boulder (*Higuchi 48295*). V, on boulder (*Higuchi 48403*).

Note. This species has been reported from the island by Herzog and Noguchi (1955), Wang (1969) and Shin (1973).

Neckeropsis obtusata (Mont.) M.Fleisch. in
Engler & Prantl, *Nat. Pfl. ed. 2*, 11: 187 (1925).

Specimens examined. II, on tree-trunk (*Higuchi 48364*); on basal part of tree (*Higuchi 48373+Taxithelium oblongifolium*).

Note. This species has been reported from the island by Shin (1971) and Shin (1973 as *Neckera obtusata*). Plants from Lanyu (*Higuchi 48364, 48373*) are smaller than those of other areas.

Thamnobryum incurvum (Nog.) Nog. & Z.
Iwats., *Misc. Bryol. Lichenol.*, 6: 33 (1972).

Note. This species has been reported from the island by Noguchi (1937 as *Thamnium incurvum*)

and Shin (1973 as *Thamnum incurvum*).

Orthotrichaceae

Macromitrium angustifolium Dozy & Molk., Ann. Sci. Nat. Bot., sér. 3, 2: 311 (1844).

Note. This species has been reported from the island by Herzog and Noguchi (1955) and Shin (1973).

Macromitrium foxworthyi Broth., Philipp. J. Sci., 3: 16 (1908).

Specimen examined. I, on tree-trunk (*Higuchi 48305+Calymperes afzelii*).

Note. This species has been reported from the island by Shin (1971, 1973).

Macromitrium holomitrioides Nog., J. Sci. Hiroshima Univ., Ser. B, Div. 2, Bot., 3: 135 (1938).

Note. This species has been reported from the island by Shin (1971, 1973).

Macromitrium japonicum Dozy & Molk., Ann. Sci. Nat. Bot., sér. 3, 2: 311 (1844).

Note. This species has been reported from the island by Wang (1969) and Shin (1971, 1973).

Pilotrichaceae

Callicostella papillata (Mont.) Mitt., J. Proc. Linn. Soc., Bot., Suppl. 1: 136 (1859).

Specimens examined. I, on boulder (*Higuchi 48304, 48359*); on decaying log (*Higuchi 48360+Vesicularia montagnei, Nishimura 12063*).

Note. This species has been reported from the island by Noguchi (1937 as *C. paillata* f. *longifolia*) and Herzog and Noguchi (1955 as *C. paillata* f. *longifolia*).

Pottiaceae

Barbula consanguinea (Thwaites & Mitt.) A. Jaeger, Ber. S. Gall. Naturw. Ges., 1877–78: 409 (1880).

Note. This species has been reported from the island by Herzog and Noguchi (1955) and Wang

(1969), but is not listed in the checklist of Taiwan mosses by Chiang *et al.* (2001).

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

Specimen examined. II, on concrete (*Higuchi 48394+Hyophila involuta*).

Note. This species has been reported from the island by Herzog and Noguchi (1955 as *Hymenostomum malayense*) and Wang (1969).

Barbula subcomosa Broth., Hedwigia, 38: 211 (1899).

Specimen examined. II, on rock-cliff (*Higuchi 48363+Calymperes afzelii*).

Note. This species has been reported from the island by Herzog and Noguchi (1955 as *Hydrogonium subcomosum*).

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

Note. This species has been reported from the island by Herzog and Noguchi (1955 as *Didymodon recurvirostre*).

Gymnostomum recurvirostrum Hedw., Sp. Musc. Frond., 33 (1801).

Note. This species has been reported from the island by Shin (1973).

Hydrogonium arcuatum (Griff.) Wijk & Margad., Taxon, 7: 289 (1958).

Note. This species has been reported from the island by Wang (1969 as *Barbula subulata*), but is not listed in the checklist of Taiwan mosses by Chiang *et al.* (2001).

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

Specimens examined. II, on concrete (*Higuchi 48394+Barbula indica, Higuchi 48395*). IV, on stone wall (*Higuchi 48398+Brachymenium exile, Pilonotis hastata*).

Note. This species is new to Lanyu.

***Weissia controversa** Hedw., Sp. Musc. Frond.,

67 (1801).

Specimen examined. V, on soil (*Higuchi 48400*). II, on decaying log (*Higuchi 48384+ Isopterygium minutirameum*).

Note. This species is new to Lanyu.

Weissia exserta (Broth.) P.C.Chen, Hedwigia, 80: 158 (1941).

Note. This species has been reported from the island by Herzog and Noguchi (1955 as *Hy-menostomum edentulum*).

Ptychomniaceae

Garovaglia elegans (Dozy & Molk.) Hampe ex Bosch & Sande Lac., Bryol. Jav., 2: 81 (1863).

Specimens examined. I, on tree-trunk (*Higuchi 48320, 48357*).

Note. This species has been reported from the island by Noguchi (1939 as *Endotrichella elegans* var. *brevicuspis*).

Pylaisiadelphaceae

***Isocradiella surcularis** (Dixon) B.C.Tan & Mohamed, Cryptog. Bryol. Lichénol., 11: 357 (1990).

Specimen examined. I, on fallen log (*Higuchi 48318*).

Note. This species is new to Lanyu.

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

Note. This species has been reported from the island by Shin (1973).

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

Specimens examined. I, on decaying log (*Higuchi 48348, 48352, Nishimura 12074*). II, on decaying log (*Higuchi 48384+ Trichosteleum boschii, Vesicularia flaccida*).

Note. This species has been reported from the island by Wang (1969).

Racopilaceae

Racopilum aristatum Mitt., J. Proc. Linn. Soc., Bot., 8: 155 (1864).

Note. This species has been reported from the island by Noguchi (1937), Herzog and Noguchi (1955) and Shin (1973).

Racopilum cuspidigerum (Schwägr.) Ångström, Öfvers. Förh. Kongl. Svenska Vetensk.-Akad., 29(4): 10 (1872).

Note. This species has been reported from the island by Shin (1971, 1973 as *Racopilum ferriei*).

Racopilum spectabile Reinw. & Hornsch., Nova Acta Phys.-Med. Acad. Caes. Leop.-Carol. Nat. Cur. 14(2): 721 (1829).

Note. This species has been reported from the island by Wang (1969).

Rhabdoweisiaceae

Amphidium papillosum E.B.Bartram, Philipp. J. Sci., 68: 48 (1939).

Note. This species has been reported from the island by Wang (1969).

Symblepharis reinwardtii (Dozy & Molk.) Mitt., Trans. Roy. Soc. Edinburgh, 31: 331 (1888).

Note. This species has been reported from the island by Wang (1969).

Rhizogoniaceae

***Pyrrhobryum spiniforme** (Hedw.) Mitt. var. **ryukyuense** (Z.Iwats.) Manuel, Cryptog. Bryol. Lichénol. 1: 70 (1980).

Specimens examined. I, on root (*Higuchi 48314*); on decaying log (*Higuchi 48337*).

Note. This species is new to Lanyu.

Sematophyllaceae

***Radulina elegantissima** (M.Fleisch.) W.R. Buck & B.C.Tan, Acta Bryol. Asiat., 1: 10 (1989)

[1990]).

Specimen examined. I, on root (*Higuchi 48339*).

Note. This species is new to Taiwan. The genus *Radulina* is characterized by pluripapillose leaf cells, a basal row of much inflated, hyaline alar cells and strongly collenchymatous exothelial cells (Tan and Jia, 1999). *R. elegantissima* is distinguished from *R. hamata* by its small plants, leaves less than 1 mm long and 0.2 mm wide and short setae less than 5 mm long.

Radulina hamata (Dozy & Molk.) W.R. Buck & B.C. Tan, *Acta Bryol. Asiat.*, 1: 10 (1989 [1990]).

Specimens examined. I, on decaying log (*Higuchi 48302*); on tree-trunk (*Higuchi 48307*).

Note. This species has been reported from the island by Herzog and Noguchi (1955 as *Trichosteleum hamatum*).

Rhaphidostichum piliferum (Broth.) Broth. in Engler & Prantl, *Nat. Pfl.*, ed. 2, 11: 434 (1925).

Specimens examined. I, on tree-trunk (*Higuchi 48345*); on decaying log (*Higuchi 48334*).

Note. This species has been reported from the island by Herzog and Noguchi (1955). *R. piliferum* is often confused with *Wijkia tanytricha*. Tan and Jia (1999) pointed out, "It is possible that all Chinese reports of *R. piliferum* are based on misidentification." *R. piliferum* is characterized by stout plants, leaves broadly ovate, more than 2.5 mm long and 1 mm wide and abruptly constricted into a filiform acumen of leaves.

Taxithelium batanense E.B. Bartram, *Philipp. J. Sci.*, 68: 345 (1939).

Note. This species has been reported from the island by Herzog and Noguchi (1955) and Shin (1973).

Taxithelium instratum (Brid.) Broth., *Rev. Bryol.* 28: 110 (1901).

Note. This species has been reported from the island by Herzog and Noguchi (1955) and Wang (1969).

****Taxithelium oblongifolium*** (Sull. & Lesq.) Z. Iwats., *J. Hattori Bot. Lab.*, 29: 60 (1966).

Specimens examined. I, on root (*Higuchi 48294*); on tree-trunk (*Higuchi 48306+Taxithelium parvulum*). II, on basal part of tree (*Higuchi 48373+Neckeropsis obtusata, Nishimura 12082*).

Note. This species is new to Lanyu.

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

Specimens examined. I, on tree-trunk (*Higuchi 48306+Taxithelium oblongifolium*). II, on boulder (*Higuchi 48372+Fissidens hollianus*).

Note. This species is new to Lanyu.

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

Specimens examined. I, on decaying log (*Higuchi 48325+Distichophyllum maibarae*). II, on decaying log (*Higuchi 48383, 48384+Isopterygium minutirameum, Vesicularia flaccida, Nishimura 12081*).

Note. This species has been reported from the island by Wang (1969) and Shin (1973).

Symphodontaceae

Chaetomitriopsis glaucocarpa (Reinw. ex Schwägr.) M. Fleisch., *Musci Fl. Buitenzorg*, 4: 1372 (1923).

Note. This species has been reported from the island by Shin (1971, 1973).

Trachythecium micropyxis (Broth.) E.B. Bartram, *Philipp. J. Sci.*, 68: 363 (1939).

Note. This species has been reported from the island by Herzog and Noguchi (1955).

Trachythecium verrucosum (A. Jaeger) M. Fleisch. var. ***binervulum*** Herzog, *J. Hattori Bot. Lab.*, 14: 70 (1955).

Note. This varietas was described based on the specimens from Lanyu and Lutao (Herzog and Noguchi, 1955).

Thuidiaceae

Claopodium aciculium (Broth.) Broth. in Engler & Prantl, Nat. Pfl., I (3): 1009 (1908).

Note. This species has been reported from the island by Herzog and Noguchi (1955 as *C. aciculium* var. *brevifolium*).

Claopodium gracillimum (Cardot & Thér.) Nog., J. Hattori Bot. Lab., 27: 33 (1964).

Note. This species has been reported from the island by Shin (1973).

Haplohymenium pseudo-triste (Müll.Hal.) Broth. in Engler & Prantl, Nat. Pfl., I (3): 986 (1907).

Specimen examined. II, on tree-trunk (*Higuchi* 48365+*Calymperes graeffeanum*).

Note. This species has been reported from the island by Herzog and Noguchi (1955 as *H. filiforme* and *H. submicrophyllum*) and Shin (1973).

Pelekium bifarium (Bosch & Sande Lac.) M. Fleisch., Musci Fl. Buitenzorg 4: 1513 (1923).

Note. This species has been reported from the island by Herzog and Noguchi (1955) and Wang (1969).

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

Note. This species has been reported from the island by Herzog and Noguchi (1955 as *Thuidium lejeuneoides*) and Shin (1973 as *Thuidium lejeuneoides*).

Pelekium velatum Mitt., J. Linn. Soc., Bot., 10: 176 (1868).

Note. This species has been reported from the island by Herzog and Noguchi (1955) and Shin (1973).

Pelekium versicolor (Müll.Hal.) Touw, J. Hattori Bot. Lab., 90: 205 (2001).

Note. This species has been reported from the island by Wang (1969 as *Thuidium minutulum*).

**Thuidium pristocalyx* (Müll.Hal.) A.Jaeger,

Ber. S. Gall. Naturw. Ges., 1876–77: 257 (1878).
Specimen examined. II, on soil (*Higuchi* 48380).

Note. This species is new to Lanyu.

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