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Additional new and noteworthy moss (Bryophyta) records from Vietnam and Laos

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Abstract

This study of recent collections of mosses in Vietnam and Laos yield 10 new records for Indochina, 15 new records for Vietnam, 2 new records for Laos, and 5 other noteworthy records, including significant range extension and validation of doubtful records. *Acroporium rufum* is an erroneous record and should be removed from the Vietnamese flora. A new combination *Distichophyllum cuspidatum* var. *subcuspidatum* is proposed, whereas *Trichosteleum montanum* is considered a new synonym of *Papillidiopsis ramulina*. The occurrence of *Thuidium pristocalyx* var. *orientale*, a name overlooked in previous moss checklists of Vietnam, is here supported with an authentic specimen. *Trismegistia lancifolia* and *T. rigida* (= *T. calderensis* var. *convoluta*), which have been recently resurrected from synonymy accepted in previous checklists, are both confirmed to occur in Vietnam from our collections.

Key words: mosses, new combination, new records, new synonym, Vietnam, Laos, Bidoup-Nui Ba National Park, Lam Dong Province

Vietnamese Moss Flora

Indochina, as most widely currently accepted comprises five nations, namely Cambodia, Laos, Myanmar, Thailand, and Vietnam. Vietnam is located on the easternmost portion of continental SE Asia. The non-vascular flora of Vietnam, especially bryophytes, is poorly known. The moss flora of Vietnam has seen a resurgence of research activities and floristic publications in the past decade (Tan & Ninh 2003, Tan *et al.* 2003, Ho *et al.* 2010, He & Nguyen 2012). Knowledge of the moss flora has been summarized by Tan & Iwatsuki (1993) based mainly on literature records. A very recently compiled checklist of Vietnamese mosses (He & Nguyen 2012) documented 59 families, 213 genera, and 719 species (including 44 infraspecific taxa) of which 103 species are reported to be endemic, which translate to about 14% endemism for mosses in the Vietnamese flora, although taxonomic assessments of many reported species need further verification with herbarium vouchers. As of today, the moss flora of the southern half of the country is less surveyed and studied than its counterpart in northern Vietnam. For a review of the history of bryological explorations and research on moss floristic affinities in Vietnam, see Tan & Iwatsuki (1993) and He & Nguyen (2012).

Our study of recent collections of mosses made in 2010–2011 by us and in 2012 by Mr. J. Regalado has yielded 22 new and noteworthy moss records for Vietnam. Many of these are widespread species in the Northern Hemisphere and Indochina, but not yet known from Vietnam.

1. ***Acroporium convolutum*** (Sande Lac. in Dozy & Molkenboer 1869: 215) M. Fleischer (1923: 1276) **var. *convolutum*** [Family Sematophyllaceae]

Comments:—Among its congeners, the species is best identified by the oblong-lanceolate leaves, long-acuminate and convolute apices, coupled with unipapillose leaf cells. Most species of *Acroporium* Mitten (1868: 182) in the

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region have only smooth leaf cells. Previously known from western Malesia, this species has extended its known range in recent years to Peninsular Thailand and southern China (Tan 1994). This is a new record for the moss flora of Vietnam.

Specimens examined:—VIETNAM. Lâm Đồng Province, Bidoup-Núi Bà National Park, along trail to Hon Giao peak, tree trunk, mixed tropical mountain forest, 1630–1700 m, 12°11'15.10"N, 108°42'51.70"E, 11 Dec 2010, *T.T. Luong BD1210-018b, BD1210-019* (both PHH, SING).

2. ***Acroporium convolutum* var. *elatum*** (Dixon 1935: 120) B.C. Tan (1994: 263) [Family Sematophyllaceae]

Comments:—*Acroporium convolutum* var. *elatum* differs significantly from the var. *convolutum* in the length of its tubulose leaf apices (see Tan 1994). Known from Peninsular Malaysia, Borneo and Philippines (Tan 1994), the taxon is new to Indochina and Vietnam.

Specimen examined:—VIETNAM. Lâm Đồng Province, Bidoup-Núi Bà National Park, along 2nd order stream behind Hon Giao station, tree trunk along stream, mixed tropical mountain forest, humid, dense, 1600–1650 m, 12°11'08.3"N, 108°42'49.6"E, 11 Dec 2010*, T.T. Luong BD1210-036* (PHH, SING).

3. ***Acroporium downii*** (Dixon 1916: 322) Brotherus (1925: 436) [Family Sematophyllaceae]

Comments:—*Acroporium downii* is often misidentified as *A. convolutum* from herbarium specimens. See Tan (1994) for the diagnostic differences between the two species. Known previously from Peninsular Malaysia, Borneo, Sumatra and Peninsular Thailand (cf. Tan 1994), this is a new species record for Vietnam.

Specimen examined:—VIETNAM. Lâm Đồng Province, Bidoup-Núi Bà National Park, along trail to Hon Giao peak, subzone 88, tree trunk, mixed bamboo forest, dense, dry, 1750–1800 m, 12°11'21.95"N, 108°42'48.54"E, 27 Apr 2010*, T.T. Luong BD410-078* (PHH, SING).

4. ***Acroporium johannis-winkleri*** Brotherus (1928: 133) [Family Sematophyllaceae]

Comments:—This is a distinctive species of *Acroporium* Mitten (1868: 182) in the region with erect, setaceous and involute leaves. The small plant size with leaves less than 5 mm long is diagnostic for the species. Known today from many parts of Malesia (Tan 1994), Taiwan (Shevock *et al.* 2014) and Thailand (Pollawatn *et al*. 2008), this represents the first record for Vietnam.

Specimen examined:—VIETNAM. Lâm Đồng Province, Bidoup-Núi Bà National Park, along trail to 1st peak of Hon Giao, on decayed log, semi-shade, mixed tropical mountain forest, 1650 m, 12°11'13.70"N, 108°42'51.30"E, 21 Jan 2011*, T.T. Luong BD0111-016* (PHH, SING).

5. ***Aerobryidium crispifolium*** (Broth. & Geh. in Geheeb 1898: 19) M. Fleisch. in Brotherus (1906: 821) [Family Meteoriaceae]

As this is an uncommon species in continental Asia, we provide below a detailed description of the specimen collected from Vietnam.

Plant regularly pinnately branched, with branches complanate, to ca. 10 mm long and 3–3.5 mm wide, including leaves. Branch leaves oblong-ovate, rugose with a gradually attenuated apex, apex short to long, ending in an acute to obtuse tip. Leaf margins minutely serrulate, crispate-undulate in the upper half. Median laminal cells linear, minutely unipapillose; alar cells shorter not otherwise differentiated. Flagelliform branches near tip of primary branches with smaller narrow leaves.

Comments—*Aerobryidium crispifolium* is known from southern China, Philippines (Luzon), Borneo, Sulawesi, Seram and New Guinea. This is a new record for continental SE Asia and Vietnam.

Specimen examined:—VIETNAM. Lâm Đồng Province, Bidoup-Núi Bà National Park, Trail behind Giang Ly Station towards Cycads hill, mixed tropical montane forest, epiphyll, shaded, humid, 1481–1486 m, 12°11'26.61"N, 108°41'14.32"E, 18 May 2011*, T.T. Luong & B.C. Ho BD511-214* (PHH).

6. ***Diphyscium chiapense*** D.H. Norris (1981: 375) **subsp. *unipapillosum*** (Deguchi 1984: 97) T.-Y. Chiang & S.-H. Lin (2001: 217) [Family Diphysiaceae]

Comments—This is a taxon that has a widely disjunctive worldwide distribution. Known previously from Taiwan, Japan and the Philippines (Magombo, 2003), the first Vietnamese report of this taxon was made by He & Nguyen (2012) from Thừa Thiên-Huế Province at the northern central coast of Vietnam. Our collections from Lâm Đồng Province represent the second known locality of this taxon in Vietnam.

Although smaller than *D. chiapense* subsp. *chiapense* from the Neotropics, the robust plants of subsp. *unipapillosum* of to about 1.5 cm in height still stands out among species of *Diphyscium* D. Mohr (1803: 34) in the country. Among its congeners in Asia, the bistratose lamina and the sharply mammillose-unipapillose leaf cells of subsp. *unipapillosum* are diagnostic.

Specimen examined:—VIETNAM. Lâm Đồng Province, Bidoup-Núi Bà National Park, along trail to Hon Giao peak, subzone 88, 12°11'21.95"N, 108°42'48.54"E, 1750–1800 m, 12°11'21.95"N, 108°42'48.54"E, 27 Apr 2010*, T.T. Luong BD410-080* (PHH, SING); along 2nd order stream behind Hon Giao station, 1600–1650 m, 12°11'08.3"N, 108°42'49.6"E, 11 Dec 2010*, T.T. Luong BD1210-057, BD1210-058* (all PHH, SING).

7. ***Distichophyllum cuspidatum*** (Dozy & Molkenboer 1844: 8) Dozy & Molkenboer (1846: 101) **var. *subcuspidatum*** (Noguchi & Z. Iwatsuki 1972: 476) B.C. Ho, T.T. Luong & B.C. Tan, ***comb. nov.*** [Family Daltoniaceae] Basionym: *Distichophyllum subcuspidatum* Nog. & Z. Iwats., J. Hattori Bot. Lab. 36: 476. f. 5: a–e, 1972 [1973].—Holoype: Malaysia [Borneo]. Sabah: Mt. Kinabalu, below Paka Cave, on partly shaded rotten log in ultrabasic area, 2500–2800 m, 18 May 1963, *Iwatsuki 838* (NICH!).

Comments—We consider the differences between *D. cuspidatum* and *D. subcuspidatum* not significant at the species level after comparing many specimens and the types of these two taxa. The var. *subcuspidatum* differs from the var. *cuspidatum* in having more carinate and conduplicate leaves with shorter leaf acumina. In Lâm Đồng Province, *Distichophyllum cuspidatum* var. *cuspidatum* with much longer and cuspidate leaf apices grows in the same area. New for Vietnam and Indochina.

Specimen examined:—VIETNAM. Lâm Đồng Province, Bidoup-Núi Bà National Park, Trail from Hon Giao Station towards peak of Mt. Hon Giao, mixed tropical montane forest, on tree base, 1633–1717 m, 12°11'13.70"N, 108°42'51.30"E, 18 Aug 2010*, T.T. Luong & B.C. Ho BD810-005* (*D. cuspidatum* var. *subcuspidatum*), *BD810-010* (*D. cuspidatum* var. *cuspidatum*) (all PHH).

8. ***Distichophyllum spathulatum*** (Dozy & Molkenboer 1844: 9) Dozy & Molkenboer (1846: 103) [Family Daltoniaceae]

Comments—*Distichophyllum mittenii* Bosch & Sande Lac. in Dozy & Molkenboer (1862: 25) has been reported from several provinces in Vietnam (He & Nguyen 2012). As pointed out by Ho *et al.* (2010), *D. spathulatum* and *D. mittenii* are closely related species that are indistinguishable based on vegetative characters. Reliable characters include sexuality and gametoecial morphology (Ho *et al.* 2010). Our specimen consists only of female plants (thus dioicous) with a broken spiny seta. Typical of *D. spathulatum*, the perichaetial leaves of our Vietnamese collection are more elongate in outline and about three to four times longer than the vegetative leaves. Hence, this is the first record of *D. spathulatum* in Vietnam.

Specimen examined:—VIETNAM. Lâm Đồng Province, Bidoup-Núi Bà National Park, along stream near dam behind Gly station, 28 Jul 2010*, T.T. Luong BD710-029* (PHH).

9. ***Fissidens guangdongensis*** Z. Iwats. & Z.-H. Li in Z.-H. Li (1985: 35) [Family Fissidentaceae]

Comments—This species looks like the widespread *F. pellucidus* Hornschuch (1841: 146), but the leaf costa of *F. guangdongensis* ends well below the apex. First described almost 30 years ago from Southern China (Li 1985), its range has extended significantly in Japan, Philippines, Malaysia, Singapore and recently Thailand (Tan & Choy 2002, Tan *et al.* 2006). Its expected occurrence in Vietnam is here confirmed.

Specimen examined:—VIETNAM. Lâm Đồng Province, Bidoup-Núi Bà National Park, 1400–1500 m, 25 Apr 2010*, T.T. Luong BD410-042* (PHH, SING).

10. ***Fissidens hollianus*** Dozy & Molkenboer (1854: 4) [Family Fissidentaceae]

Comments—In Vietnam, this species has been reported from northern Vietnam in Ninh Bình, Sơn La and Vĩnh Phúc Provinces. It is a new record for Lâm Đồng Province in southern Vietnam.

Fissidens hollianus is easily confused with the common *F. ceylonensis* Dozy & Molkenboer (1844: 7) in the region. Our specimen from South Vietnam has distinctly scabrous seta, which is the main diagnostic feature of *F. hollianus*.

Specimen examined:—VIETNAM. Lâm Đồng Province, Bidoup-Núi Bà National Park, 12 Dec 2010*, T.T. Luong BD 1210-076* (PHH, SING).

11. ***Macrohymenium mitratum*** (Dozy & Molkenboer 1844: 15) Brotherus (1908:1103) [Family Sematophyllaceae]

Comments—The genus *Macrohymenium* Müller (1847: 825) is easily recognized by its distinctively long endostome and diminutively short exostome seen in the mature capsule, observable in the field with a 10× hand lens.

Ramsay *et al*. (2004) have clarified the nomenclatural confusion involving the alleged synonymy between *Macrohymenium rufum* Müller (1847: 825) and *Acroporium rufum* (Reinwardt & Hornschuch 1829: 716) M. Fleischer (1923: 1672).(≡ *Leskea rufa* Reinw. & Hornsch.). The two names are described based on different type specimens, both collected from Java by Reinwardt (see also Eakin, 1976). However, He & Nguyen (2012) continued to accept this error by treating these two names as homotypic synonyms.

Macrohymenium mitratum (≡ *Leskea mitrata* Dozy & Molk.), which today includes *M. rufum* as a heterotypic synonym, should be put back into the moss flora of Vietnam as a different species from *Acroporium rufum*. In fact, we have identified *M. mitratum* in our new collections from Vietnam, confirming its previous records from Lâm Đồng Province (Jovet-Ast & Tixier 1960: 180; Tixier 1970c: 758).

On the other hand, the record of *Acroporium rufum*, which is based on the erroneous synonymy with *Macrohymenium rufum*, should be removed from the Vietnamese moss checklist, pending the verification of an authentic collection. It is already widely distributed in Malesia and recently also reported from Taiwan and Hainan (Tan 1994, Tan & Jia 1999), its occurrence in Vietnam is highly possible.

Specimen examined:—VIETNAM. Lâm Đồng Province: Bidoup-Núi Bà National Park, behind Giang Ly station, along trail to Cycads hill, 1481 m, 12°11’26.61”N, 108°41’14.32”E, 22 Jan 2011, *T.T. Luong BD0111-070* (PHH).

12. ***Macromitrium tosae*** Bescherelle (1898: 299) [Family Orthotrichaceae]

Comments—There are 24 species of *Macromitrium* that have been recorded for Vietnam. Although two similar species *M. cavaleriei* Cardot & Thér. in Thériot (1906: 40) and *M. nepalense* (Hooker & Greville 1824:.117) Schwägrichen (1827a: 134, pl. 192), have been recorded in Vietnam, especially in the Northern provinces near the Vietnamese-Chinese border (Hà Giang, Lào Cai, Cao Bằng, etc.), *M. tosae* can be distinguished from them by its lower and basal laminal cells which often have a single large papilla and the apexes not incurved when moist. See Yu *et al*. (2012) for diagnostic features and variations of the species. A common species in China, it was first described from Japan, and here reported as a new record for Indochina and Vietnam.

Specimen examined:—VIETNAM. Khánh Hòa Province: Sơn Thái area, 850 m, 12°6’41.112”N, 108° 56’ 38.40”E, 30 Dec 2011, *Dinh Nhat Lam KH_Br042* (SGN).

13. ***Papillidiopsis aquatica*** (Dixon 1935: 127) B.C. Ho & B.C. Tan (2002: 74) [Family Sematophyllaceae]

Comments—Tan (1991) was the first to interpret *P. aquatica* (as *Rhaphidostichum aquaticum* Dixon 1935: 127) as an aquatic form of the otherwise epiphytic *P. ramulina* (Thwaites & Mitt. in Mitten 1873: 319) W.R. Buck & B.C. Tan (1989: 13). The synonymy was accepted in the revision of Chinese Sematophyllaceae published by Tan & Jia (1999). However, after studying more specimens, Ho & Tan (2002) were convinced that the two names correspond to different taxa, and hence, the revival of *P. aquatica* from synonymy was proposed by them. This is a new record both to Indochina and Vietnam.

Specimen examined:—VIETNAM. Lâm Đồng Province, Bidoup-Núi Bà National Park, behind Giang Ly station, along stream to tuna damp, on decayed log & tree trunk, semi-shade, very humid, 1455 m, 12°10’57.28”N, 108°40’47.96”E, 20 Jan 2011*, T.T. Luong BD0111-009*, *BD0111-015* (both PHH, SING).

14. ***Papillidiopsis ramulina*** (Thwaites & Mitt. in Mitten 1873: 319) W.R. Buck & B.C. Tan (1989: 13) [Family Sematophyllaceae] = *Trichosteleum montanum* Tixier, Rev. Bryol. Lichénol. 37: 756. f. 15. 1970c[1971], ***syn. nov.*** Type:—VIETNAM Tuyên Đức, Benom da Treu, forêt de montagne, 1800 m, 27. III. 1958, *Tixier s.n.* (holotype P n.v.).

Comments—A segregated genus from *Trichosteleum* Mitten (1868: 181), *Papillidiopsis* (Brotherus 1908: 1119) W.R. Buck & B.C. Tan (1989: 11) has several widespread species in Malesia. The genus is characterized by having strongly concave leaves with a somewhat constricted leaf apex (Buck & Tan 1989). However, the genus seems not well represented in Indochina. It has two species [*P. complanata* (Dixon 1924: 256) W.R. Buck & B.C. Tan (1989: 12) and *P. luxurians* (Dozy & Molkenboer 1844: 12) W.R. Buck & B.C. Tan (1989: 12)] reported from Thailand, and two species [*P. macrosticta* (Broth. & Paris in Paris 1902: 933) W.R. Buck & B.C. Tan (1989: 12) and *P. ramulina*] from Vietnam (see Tan & Ninh 2003; Tan & Iwatsuki 1993; He & Nguyen 2012).

In addition to previous report of *P. ramulina* from Hà Tĩnh Province (Tan & Ninh 2003), we report here additional localities of *P. ramulina* among our recent collections made from south central Vietnam. Populations of *P. ramulina* are variable in plant size and leaf shape, depending on the moisture conditions of the habitat.

After reviewing the species description and checking the illustration in the protologue by Tixier (1970c), we are confident that the alleged endemic taxon, *Trichosteleum montanum* Tixier, is nothing but a new synonym of this species. *Trichosteleum montanum* has been reported in Lâm Đồng (type, Tixier 1970c) and Thừa Thiên Huế (He & Nguyen 2012).

Specimen examined:—VIETNAM. Lâm Đồng Province, Bidoup-Núi Bà National Park, near Giang Ly station, tree trunk, shaded, 1450 m, 12°10’57.28”N, 108°40’47.96”E, 24 Apr 2010, *T.T. Luong BD410-012* (PHH); along trail to 1st peak of Hon Giao, falling branch, mixed bamboo mountain forest, dry, semi-shade, 12°11’21.95”N, 108°42’48.54”E, 1800–1900 m, 17 May 2011, *T.T. Luong & B.C. Ho BD511-036* (PHH).

15. ***Pohlia crudoides*** (Sullivant & Lesquereux 1859: 278) Brotherus (1903: 548) [Family Mniaceae]

Comments—Although *Pohlia* Hedwig (1801: 171) is a large genus in many continental Asiatic countries, the genus is under-collected in Indochina with three species reported from Vietnam (see He & Nguyen 2012). We add here a new species record, *P. crudoides*. The somewhat appressed and stiff oblong lanceolate leaves when dry, are a good diagnostic character for the species (Zhang *et al.* 2007). In capsule morphology, *P. crudoides* somewhat resembles *P. elongata* Hedwig (1801: 171) but the well-developed neck of the horizontal capsule in *P. crudoides* is not as long as the theca as seen in the pyriform capsule of *P. elongata* (Zhang *et al.* 2007). The exostome of *P. crudoides* in the Vietnamese specimen is finely to moderately papillose, with many strong trabecular markings across the width of each tooth; median line is not clear. Its endostome is finely papillose with low basal membrane, and no cilia were observed. *Pohlia crudoides* has a near cosmopolitan distribution. Its discovery in Vietnam and Indochina is a welcome addition.

Specimen examined:—VIETNAM. Lào Cai Province, Sa Pa District, Ta Van Commune, near the Seo My Ty ranger station, on boulder along a road, 1675 m, *J. Regalado 2014* (MO, UC).

16. ***Ptychomitrium dentatum*** (Mitten 1865: 149) A. Jaeger (1874: 102) [Family Ptychomitriaceae]

Comments—The vegetative leaf characters of *P. dentatum*, such as the broadly acute apex, strong costa, 2–5 rows of bistratose leaf margins, sharp marginal teeth, etc., superficially resemble some species of *Pogonatum* sect. *Racelopus* (Dozy & Molkenboer 1855: 37) A. Touw (1986: 11), such as *Pogonatum marginatum* Mitten (1859: 153). However, the leaves of *P. dentatum* are neither complanate nor anisophyllous. More important is the arthrodontous and haplolepidous peristome of *P. dentatum* seen in the specimen. In addition, its leaves are broadly-lanceolate to oblong-ovate (distinctly broadest below middle), unlike the leaves of *Pogonatum marginatum*, which are more lingulate-lanceolate (margins almost parallel or only slightly narrowing towards tip).

According to Cao *et al.* (2001) the species is known from China, Korea and Japan. Although Tixier (1966) first reported the species from northern Vietnam in Lào Cai Province, our collection represents a significant range extension of the species to southern Vietnam.

Specimen examined:—VIETNAM. Lâm Đồng Province, Bidoup-Núi Bà National Park, along stream near dam behind Gly station, on rock, opened, sunny, 28 Jul 2010, *T.T. Luong BD710-019* (PHH, SING).

17. ***Tayloria squarrosa*** (Hooker 1808: 308) T.J. Koponen (1974: 43) [Family Splachnaceae]

Comments—The genus *Tayloria* Hooker (1816: 144) has three species reported from Vietnam (He & Nguyen 2012), namely *T. indica* Mitten (1859: 57), *T. rudolphiana* (Garovaglio 1840: 22) Bruch & Schimp. in Bruch *et al.* (1844: 208) and *T. subglabra* (Griffith 1842: 483) Mitten (1859: 57), all are widespread species in Asia with *T. rudolphiana* reaching Europe.

The genus belongs to a unique moss family that prefers to grow on nitrogen rich habitat and decaying organic substrates. As a genus, *Tayloria* is characterized by having erect capsule with a marked development of the apophysis and 16 erect peristome teeth jointed into pairs. Among the congeners, *T. squarrosa*, with its squarrose leaves, either wet or dry, is distinctive and cannot be mistaken for other species that have either appressed or somewhat twisted leaves when dry.

Tayloria squarrosa has a known distribution from China, India, Nepal, Sikkim and Burma (Gao & He 2003, Koponen & Koponen 1974). The species is new to Vietnam and Indochina.

Specimen examined:—VIETNAM. Lào Cai Province, Sa Pa District, O-Quy-Ho Commune, trail to Mt. Fan-Xi-Pan from ranger station to first camp site, on decayed log, 1900–2200 m, 11 Apr 2012, *J. Regalado 1994* (MO, UC).

18. ***Thuidium assimile*** (Mitten 1859: 133) A. Jaeger in Jaeger & Sauerbeck (1878: 260) [Family Thuidiaceae]

Comments—*Thuidium assimile* and *T. cymbifolium* (Dozy & Molkenboer 1844: 10) Dozy & Molkenboer (1865: 115) belong to a complex of species and are sometimes difficult to separate from each other. The two species can be best separated by the stem leaves, that in *T. cymbifolium*, they are abruptly narrowed into a long hair tip, whereas those of *T. assimile* are more gradually narrowed towards the shorter leaf tip. See Touw (2001) for details and other less obvious differentiating features.

Thuidium assimile is known from America, Africa, Europe, and in Asia from India, Bhutan, Nepal, China, Siberia, Japan, and disjunctively distributed in New Guinea (Touw 2001). It is here reported new to Indochina and Vietnam.

Incidentally, the records of *Thuidium pristocalyx* var. *orientale* (Mitt. *ex* Dixon 1913: 329) A. Touw (2001: 47) listed for Vietnam in Touw (2001) was missed by He & Nguyen (2012) but further confirmed here from our collection.

Specimen examined:—VIETNAM. Lâm Đồng Province, Bidoup-Núi Bà National Park, shade, wet, 28 Jul 2010, *T.T. Luong BD710-033b* (*T. assimile*); along stream near dam behind Gly station, on rock, opened, wet, 28 Jul 2010, *BD710-006* (*T. cymbifolium*); 12 Dec 2010, *BD1210-093* (*T. pristocalyx* var. *orientale*) (all PHH).

19. ***Trematodon longicollis*** Michaux (1803: 289) [Family Bruchiaceae]

Comments—The somewhat elongate and curved capsular neck (apophysis) that is longer than the urn is distinctive for the genus. Our specimen has the apophysis about twice as long as the urn and a bistratose leaf margin that are both diagnostic for *T. longicollis*. The species has been reported by He & Nguyen (2012) from Đà Nẵng, Ninh Bình, Vĩnh Phúc Provinces, along with three other species in the same genus. Our collection represents a new provincial record in the southern half of the country.

Specimen examined:—VIETNAM. Lâm Đồng Province, Bidoup-Núi Bà National Park, subzone 90, between Giang Ly and K'long K'lanh, 1400–1500 m, 25 Apr 2010, *T.T. Luong BD410-043*(PHH).

20. ***Trichostomum tenuirostre*** (Hooker & Taylor 1827: 83) Lindberg (1864: 225) [Family Pottiaceae]

Comments—A total of seven species of *Trichostomum* are listed by He & Nguyen (2012) from Vietnam. Our present collection of the cosmopolitan *T. tenuirostre* represents the eighth known species from Vietnam, and the first report of this species from Indochina. The plants in our collection have strongly curled leaves when dry. The leaves are linear-lanceolate with margins somewhat narrowly incurved. This combination of characters would identify it to either *T. hattorianum* Tan & Iwatsuki (1993: 74) or *T. tenuirostre*. Although our plants are small (ca. 1 cm tall), the broader and more undulate leaves distinguishes itself from the more narrow-leaved *T. hattorianum*. The percurrent or shortly excurrent costa does not seem to be a consistent character to identity this species.

Specimen examined:—VIETNAM. Lâm Đồng Province, Bidoup-Núi Bà National Park, along stream near dam behind Gly station, on rock, opened, wet, 28 Jul 2010, *T.T. Luong BD710-011* (PHH, SING).

21. ***Trismegistia calderensis*** (Sullivant 1855: 184) Brotherus (1908: 1078) **var. *subintegrifolia*** (Brotherus 1928: 131) Akiyama (2010: 15) [syn. *Trismegistia rigida* (Mitten 1868: 182) Brotherus (1908: 1078)]

Comments—*Trismegistia calderensis* var. *subintegrifolia* has been identified, and this represents a new record for the moss flora of Vietnam and Indochina. *Trismegistia calderensis* var. *subintegrifolia* can be distinguished from *T. calderensis* var. *convoluta* (Bosch & Sande Lac. in Dozy & Molkenboer 1865: 140) K.T. Yong, B.C. Tan & B.C. Ho (2013: 118), also found in our collection (see below), by its leaf shape, cell areolation, and the margin not strongly toothed (see Akiyama 2010).

Specimen examined:—VIETNAM. Lâm Đồng Province, Bidoup-Núi Bà National Park, behind Giang Ly station, along trail to Cycads hill, decayed log, mixed tropical mountain forest, 12°11’26.61”N, 108°41’14.32”E, 1481 m, 22 Jan 2011, *T.T. Luong BD0111-056* (PHH, HYO, SING).

22. ***Trismegistia lancifolia*** (Harv. in Hooker 1836: t.21, f.5) Brotherus (1908: 1078) [Family Sematophyllaceae]

Comments—*Trismegistia rigida* (Mitten 1868: 182) Brotherus (1908: 1078) has been the only species in the genus reported from Vietnam (see Pócs 1965 for a review). Later moss checklists (Tan & Iwatsuki 1993; He & Nguyen 2012) considered *T. rigida* a synonym of *T. lancifolia*. However, the new revision of *Trismegistia* (Akiyama 2010) has distinguished the two names as distinct taxa. The identity of some earlier reported specimens of *T. rigida* from Vietnam have been verified by Akiyama (2010) and treated under *T. calderensis* var. *rigida* (Reinwardt & Hornschuch 1829: 731) H. Akiyama (2010: 11), a name not validly published, and should be corrected to *T. calderensis* var. *convoluta* (Bosch & Sande Lac. in Dozy & Molkenboer 1865: 140) K.T. Yong, B.C. Tan & B.C. Ho (2013: 118) (see Yong *et al.* 2013 for details).

With the kind assistance of Dr. Akiyama (pers. comm. June 2012), authentic specimens of *T. lancifolia* and *T. calderensis* var. *convoluta* have been confirmed from our Vietnamese collections.

Specimen examined:—VIETNAM. Lâm Đồng Province, Bidoup-Núi Bà National Park, behind Giang Ly station, along trail to Hon Giao peak, tree trunk along stream, mixed tropical mountain forest, 1630–1700 m, 12°11’15.10”N, 108°42’51.70”E, 11 Dec 2010, *BD1210-020* (*T. lancifolia*); along 2nd order stream behind Hon Giao station, decayed log near small stream, mixed tropical mountain forest, humid, dense, 12°11’09.6”N, 108°42’49.8”E, 1630–1650 m, *BD1210-025* (*T. calderensis* var. *convoluta*); along trail behind Giang Ly station to Cycads hill, decayed log, mixed tropical mountain forest, humid, dense, 12°11’26.61”N, 108°41’14.32”E, 1481–1486 m, 18 May 2011, *T.T. Luong & B.C. Ho BD511-048* (*T. calderensis* var. *convoluta*) (all PHH, HYO, SING).

23. ***Warburgiella breviseta*** (Brotherus 1913: 93) Brotherus (1925: 429) [Family Sematophyllaceae]

The falcate-secund leaves, with an expanded, concave, oblong base, and a rapidly constricted, long and toothed acumen are the diagnostic features of the genus *Warburgiella* Müll. Hal. *ex* Broth. *in* Warburg (1900: 176) (see Buck & Tan 1989).

Our specimens have branches 1.5–2 mm wide, including leaves. The leaf margins are entire or nearly so below, sharply serrate above. The narrow leaf acumen is about as long as the leaf base, and laminal cells has single central papilla. The fertile specimen (*BD511-057*) has smooth setae, 7–10 mm long, and horizontal capsules, with quadrate to short rectangular exothecial cells that have unequal wall thickness (non-collenchymatous). The operculum is long rostrate, and the calyptra, cucullate. This small genus of about five accepted species today in Malesia needs a critical reassessment. *Warburgiella breviseta* is known from Philippines and Borneo (Sarawak) and with this new record, also from Indochina and Vietnam.

Specimens examined:—VIETNAM. Lâm Đồng Province, Bidoup-Núi Bà National Park, along trail to Hon Giao peak, subzone 88, tree branch, mixed bamboo forest, semi shade, 12°11’21.95”N, 108°42’48.54”E, 1750–1800 m, 27 Apr 2010*, T.T. Luong BD410-099*; along trail behind Giang Ly station to Cycads hill, on decayed log, semi-shade, mixed tropical mountain forest, 12°11’26.61”N, 108°41’14.32”E, 1481–1486 m, 18 May 2011, *T.T.Luong & B.C. Ho BD511-057*; epiphyll, 12°11’26.61”N, 108°41’14.32”E, 1481–1486 m, 18 May 2011, *T.T.Luong & B.C. Ho BD511-216* (all PHH, SING).

Laotian Moss Flora

In spite of the increasing threat to the shrinking primary forests, the country's flora, both the vascular and non-vascular plants, is still not well known. Publications reporting on the indigenous mosses, even in the 20th century, have been few (see Dixon 1936, Tixier 1970a, 1970b). By 1993, Tan and Iwatsuki accounted only 83 genera and 145 species for the Laotian moss flora. In fact, the moss flora of Laos is one of the least known among the five nations of the Indochina Peninsula.

Consequently, any new survey of the Laotian moss flora today will likely produce new species records for the country. In a new study of the specimens of *Fissidens* collected from Laos, Suzuki & Iwatsuki (2014) have added 24 new species records to the genus, with description of two species new to science, increasing greatly the *Fissidens* flora of the country from 4 to 30 species.

Below we report two moss species as new records to Laos, even though they are widespread species in Indochina and across the entire Southeast Asia.

1. ***Aerobryidium aureonitens*** (Hook. ex Schwägrichen 1827b: pl. 221) Brotherus (1906: 820) [Family Meteoriaceae]

Comments—*Aerobryidium aureonitens* is a polymorphic species with several varieties described in literature. The Laotian specimen bears short lateral branches that are somewhat tumid and somewhat complanate. The elongate and drooping plant habit foretells its family affinity. Its long, undulate, slender leaf apices, and the single costa, however, are characteristic for the genus, while the moderately concave leaf resembles a species of *Meteorium* (Bridel 1827: 264) Dozy & Molkenboer (1848: 157). The cliff habitat is also unusual for this moss that prefers to grow on tree trunk base.

Within Indochina, *A. aureonitens* has been reported from Thailand, Myanmar (see Tan & Iwatsuki 1993), and recently, from Vietnam (He & Nguyen 2012). It is a new species record for Laos.

Specimen examined:—LAOS**.** On shaded roadside cliff, outside of Phonsavanh on way to Vang Vieng, 6 Oct 2010, *B.C. Tan 2010-00103* (UC).

2. ***Anomobryum julaceum*** **(**Schrad. ex Gärtner et al. 1802: 97) Schimper 1860: 382 [syn. *A. filiforme* var. *concinnatum* (Spruce 1847: 121) Loeske (1933: 200)] [Family Bryaceae]

Comments—It is a pleasant addition of this nearly cosmopolitan genus and species to the moss flora of Laos, known previously from Myanmar among the Indochinese countries (Tan & Iwatsuki 1993). The julaceous plant habit and the imbricate leaves are very characteristic of the genus. The leaf costae are percurrent to slightly excurrent. The Laotian collection has numerous reddish to dark greenish and top-shaped gemmae in the leaf axils. Each gemma has a few differentiated primordial leaves. We are accepting this taxon in *Anomobryum* following the treatment in the Flora of China (see Zhang *et al*. 2007).

Specimen examined:—LAOS. On shaded and wet roadside cliff, outside of Phonsavanh on way to Vang Vieng, 6 Oct 2010, *B.C. Tan 2010-00103* (UC).

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