

New moss records for Vietnam

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Abstract – Sixty-one species are newly added to the moss flora of Vietnam. Of which, ten genera (*Eurhynchiadelphus* Ignatov, Huttunen & T.J. Kop., *Fleischerobryum* Loeske, *Forsstroemia* Lindb, *Geheebia* Schimp., *Hageniella* Broth., *Leskeella* (Limpr.) Loeske, *Pterogoniadelphus* M. Fleisch., *Rhizomnium* (Mitt. ex Broth.) T.J. Kop., *Scabridens* E.B. Bartram and *Torrentaria* Ochyra) are newly reported for the country. *Scabridens* is recorded outside China for the first time. The tropical American *Macromitrium longifolium* (Hook.) Brid. is newly reported for Asia. The occurrence of *Ctenidium pinnatum* (Broth. & Paris) Broth. in Vietnam is confirmed. These results make up the moss flora of Vietnam comprising of 816 species (including 50 infraspecific taxa) belonging to 227 genera in 61 families. One hundred and three taxa of mosses are hitherto known only from Vietnam. All new generic records are illustrated based on the local specimens.

Bryoflora / bryophyte / Indochina / *Macromitrium longifolium* / Musci / *Scabridens*

INTRODUCTION

Vietnam, covering an area of ca. 330000 km², is located in the south-east Asia. The country is bordered by China on the north, Laos and Cambodia on the west and the South China Sea on the east. The territory of Vietnam is quite long and narrow (8°10'-23°24' N, 102°09'-109°30' E), most of the country is covered by mountains and highlands, and its eastern coastal areas are plains (Yu, 2010). Compared with adjacent Thailand and China (Jia & He, 2013; Sukkharak & Chantanaorrapint, 2014), the moss flora of the country has not been well investigated even a few reports for the moss flora of the country is available (He & Nguyen, 2012; Pócs *et al.*, 2013). Under the support of a grant from the Ministry of Science

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and Technology of China, a bryophyte expedition organized by Rui-Liang Zhu (HSNU) to northern Vietnam, was carried out by a joint group from China and Vietnam from October 2013 to November 2013. The main field collectors include Rui-Liang Zhu, Jian Wang, Lei Shu and Chao-Xian Zhao from East China Normal University, Yu-Mei Wei from Guangxi Institute of Botany, and Truong Van Do, Ngan Thi Lu from the Vietnam National Museum of Nature. A total of over 600 moss specimens were collected. The present paper mainly aims at presenting a total of 61 species (including one subspecies) and ten genera which are new to the moss flora of Vietnam.

MOSSES NEW TO THE MOSS FLORA OF VIETNAM

The new records with collection data and ranges are listed below. All the examined specimens are kept in HSNU.

Aerobryopsis subdivergens (Broth.) Broth. subsp. *scariosa* (E.B. Bartram) Nog.

Specimens examined. Cao Bằng: Nguyễn Bình District, Phia Oắc-Phia Đén Nature Reserve, Thành Công Commune, from the forest station to the peak, 22°36'24.81" N, 105°52'16.60" E, 1546 m, on tree trunk, 26 Oct. 2013, *R.-L. Zhu et al. 20131026-13*; *ibid.*, 22°36'28.61" N, 105°52'14.68" E, 1584 m, on tree trunk, 26 Oct. 2013, *R.-L. Zhu et al. 20131026-90*; Hà Giang: Quản Bạ District, Tùng Vài Commune, Thằng village, 23°03'02.20" N, 104°52'01.18" E, 1079 m, on tree trunk, 3 Nov. 2013, *R.-L. Zhu et al. 20131103-134*.

Distribution. China (Wu & Jia, 2011), Hawaii (Wu & Jia, 2011), Japan (Noguchi & Iwatsuki, 1989), Philippines (Tan & Iwatsuki, 1991), new to Vietnam.

Aerobryopsis subdivergens subsp. *scariosa* is easily separated from *A. subdivergens* subsp. *subdivergens* by the longer linear-lanceolate leaf apex.

Anomodon minor (Hedw.) Lindb.

Specimens examined. Cao Bằng: Trùng Khánh District, Cao Vít Gibbon Conservation Area, Phong Nậm Commune, from NàThông village (Phin valley) to Kha Muộn village (Kha valley), 22°53'16.41" N, 106°31'56.94" E, 548 m, on rock, 23 Oct. 2013, *R.-L. Zhu et al. 20131023-2*; *ibid.*, 22°53'44.80" N, 106°32'06.20" E, 622 m, on tree trunk, 23 Oct. 2013, *R.-L. Zhu et al. 20131023-136*.

Distribution. America (Vitt & Lee., 1985), Bhutan (Wu, 2002), Burma (Tan & Iwatsuki, 1993), China (Wu, 2002), India (Noguchi *et al.*, 1991), Japan (Noguchi *et al.*, 1991), Korea (Noguchi *et al.*, 1991), Nepal (Wu, 2002), Pakistan (Higuchi & Nishimura, 2003), Siberia (Noguchi *et al.*, 1991), new to Vietnam.

Atrichum yakushimense (Horik.) Mizush.

Specimens examined. Cao Bằng: Nguyễn Bình District, Phia Oắc-Phia Đén Nature Reserve, Thành Công Commune, through Phia Oắc peak, 22°36'49.04" N, 105°51'49.04" E, 1849 m, on rock, 25 Oct. 2013, *R.-L. Zhu et al. 20131025-131A*; *ibid.*, 22°36'50.41" N, 105°52'08.15" E, 1789 m, on rock, 25 Oct. 2013, *R.-L. Zhu et al. 20131025-400*.

Distribution. China (Wu & Jia, 2004), Japan (Noguchi & Iwatsuki, 1987), new to Vietnam.

This species differs from other species of *Atrichum* in its indistinct (one or two cells high, or lacking) lamellae.

Bryum dichotomum Hedw.

Specimens examined. Cao Bằng: Trà Lĩnh District, Quốc Toàn Commune, Thang Heng lake, 22°45'32.14" N, 106°17'47.50" E, 619 m, on rock, 24 Oct. 2013, *R.-L. Zhu et al.*

20131024-4; 22°45'32.17" N, 106°17'47.38" E, 612 m, on rock with a thin layer of soil, 24 Oct. 2013, R.-L. Zhu *et al.* 20131024-6; Hà Giang: Quản Bạ District, Tam Sơn town, Quản Bạ Heaven Gate, 23°02'50.38" N, 104°59'35.25" E, 1114 m, on rock, 31 Oct. 2013, R.-L. Zhu *et al.* 20131031-21B; Hà Giang: Quản Bạ District, Bát Đại Sơn Commune, Sán Chò village, 23°09'19.12" N, 105°00'01.07" E, 750 m, on rock, 4 Nov. 2013, R.-L. Zhu *et al.* 20131104-7.

Distribution. Cosmopolitan (Li, 2006; Jia & He, 2013), new to Vietnam.

***Bryum paradoxum* Schwägr.**

Specimens examined. Cao Bằng: Nguyên Bình District, Phia Oắc-Phia Đén Nature Reserve, Thành Công Commune, through Phia Oắc peak, 22°36'47.52" N, 105°51'56.01" E, 1864 m, on rock, 25 Oct. 2013, R.-L. Zhu *et al.* 20131025-56; *ibid.*, 22°36'47.52" N, 105°51'56.01" E, 1804 m, on rock, 25 Oct. 2013, R.-L. Zhu *et al.* 20131025-59B; *ibid.*, 22°36'54.86" N, 105°51'46.12" E, 1909 m, 25 Oct. 2013, R.-L. Zhu *et al.* 20131025-100.

Distribution. Chile (He, 1998b), China (Li, 2006), India (Li, 2006), Japan (Noguchi & Iwatsuki, 1988), Korea (Noguchi & Iwatsuki, 1988), Nepal (Noguchi & Iwatsuki, 1988), Peru (Menzel, 1992), Philippines (Tan & Iwatsuki, 1991), Sri Lanka (O'Shea, 2002), new to Vietnam.

***Bryum recurvulum* Mitt.**

Specimens examined. Cao Bằng: Nguyên Bình District, Phia Oắc-Phia Đén Nature Reserve, Thành Công Commune, through Phia Oắc peak, 22°36'56.15" N, 105°51'17.65" E, 1900 m, on concrete, 25 Oct. 2013, R.-L. Zhu *et al.* 20131025-3; *ibid.*, 22°36'55.93" N, 105°51'47.11" E, 1887 m, on soil, 25 Oct. 2013, R.-L. Zhu *et al.* 20131025-6; *ibid.*, 22°36'49.76" N, 105°51'52.19" E, 1852 m, on rock, 25 Oct. 2013, R.-L. Zhu *et al.* 20131025-47B; 22°36'56.15" N, 105°51'47.87" E, 1907 m, on soil, 25 Oct. 2013, R.-L. Zhu *et al.* 20131025-80B; Cao Bằng: Nguyên Bình District, Quang Thành Commune, from km 7 to Vài Khau village to Khau Canh place, 27 Oct. 2013, R.-L. Zhu *et al.* 20131027-64; 22°37'14.18" N, 105°52'37.72" E, 1153 m, on rock with a thin layer of soil, 27 Oct. 2013, R.-L. Zhu *et al.* 20131027-153.

Distribution. Bhutan (Noguchi & Iwatsuki, 1988), China (Li, 2006), Indonesia (Li, 2006), Japan (Noguchi & Iwatsuki, 1988), Thailand (Li, 2006), new to Vietnam.

***Calymperes lonchophyllum* Schwägr.**

Specimens examined. Vĩnh Phúc: Tam Đảo District, Tam Đảo town, Rừng Rinh peak, 21°27'00.62" N, 105°39'02.49" E, 1035 m, on tree trunk, 9 Nov. 2013, R.-L. Zhu *et al.* 20131109-7.

Distribution. Africa (Gao, 1996), Australia (Gao, 1996), China (Gao, 1996), Colombia (Churchill, 1998), Ecuador (Churchill, 1998), Indonesia (Touw, 1992), Japan (Jia & He, 2013), Mexico (Jia & He, 2013), Peru (Churchill, 1998), Philippines (Tan & Iwatsuki, 1991), Sri Lanka (O'Shea, 2002), Venezuela (Churchill, 1998), Pantropical **Distribution** (Gao, 1996), new to Vietnam.

***Calypothecium phyllogonioides* Nog. & X.J. Li**

Specimens examined. Cao Bằng: Trà Lĩnh District, Quốc Toàn Commune, Thang Heng lake, 22°54'36.38" N, 106°33'02.33" E, 548 m, on tree branches, 24 Oct. 2013, R.-L. Zhu *et al.* 20131024-16.

Distribution. China (Wu & Jia, 2011), new to Vietnam.

Calypothecium phyllogonioides, previously endemic to China, was known only from Hainan and Yunnan (Jia & He, 2013 as *C. phyllogonioides* (sic)). The long lingulate leaf of this species is quite different from other species in *Calypothecium*.

***Clastobryopsis robusta* (Broth.) M. Fleisch.**

Specimens examined. Cao Bằng: Nguyên Bình District, Phia Oắc-Phia Đén Nature Reserve, Thành Công Commune, through Phia Oắc peak, 22°36'53.89" N, 105°51'51.65" E, 1882 m, on dead tree branches, 25 Oct. 2013, *R.-L. Zhu et al. 20131025-34*; *ibid.*, 22°36'56.11" N, 105°51'47.19" E, 1900 m, on dead tree branches, 25 Oct. 2013, *R.-L. Zhu et al. 20131025-83*; 22°36'56.01" N, 105°51'47.19" E, 1900 m, on dead tree branches, 25 Oct. 2013, *R.-L. Zhu et al. 20131025-85A*; *ibid.*, 22°36'51.52" N, 105°52'02.00" E, 1810 m, on tree trunk, 25 Oct. 2013, *R.-L. Zhu et al. 20131025-226*; Cao Bằng: Nguyên Bình District, Phia Oắc-Phia Đén Nature Reserve, Thành Công Commune, from the forest station to the peak, 22°36'19.53" N, 105°52'18.41" E, 1605 m, on rotten tree, 26 Oct. 2013, *R.-L. Zhu et al. 20131026-44A*; Hà Giang: Quản Bạ District, Tam Sơn town, Quản Bạ Heaven Gate, 23°02'56.82" N, 104°59'33.76" E, 1149 m, on tree trunk, 31 Oct. 2013, *R.-L. Zhu et al. 20131031-52*; Hà Giang: Vị Xuyên District, Phương Độ Commune, Lũng Vài village, 22°49'17.95" N, 104°53'14.69" E, 1088 m, on tree branches, 7 Nov. 2013, *R.-L. Zhu et al. 20131107-118B*.

Distribution. China (Wu & Jia, 2004), Hawaii (Noguchi *et al.*, 1994), Borneo & Java (Wu & Jia, 2004), Japan (Noguchi *et al.*, 1994), New Guinea (Wu & Jia, 2004), Philippines (Tan & Iwatsuki, 1991), new to Vietnam.

One of the synonyms of this species is *Aptychella robusta* (Broth.) M. Fleisch. (Noguchi *et al.*, 1994). *Clastobryopsis robusta* is similar to *C. brevinervis* M. Fleisch. in the gemmae and leaf shape. In the former, however, the leaf costa is short and mostly forked (single and extending to mid-leaf in the latter).

***Ctenidium andoi* N. Nishim.**

Specimens examined. Hà Giang: Vị Xuyên District, Minh Sơn Commune, Tân Sơn village, 23°00'36.84" N, 104°54'49.71" E, 528 m, on rock, 5 Nov. 2013, *R.-L. Zhu et al. 20131105-114*.

Distribution. China (Wu & Jia, 2004), Japan (Noguchi *et al.*, 1994), Java (Wu & Jia, 2004), Korea (Noguchi *et al.*, 1994), New Guinea (Wu & Jia, 2004), Philippines (Tan & Iwatsuki, 1991), new to Vietnam.

***Ctenidium ceylanicum* Cardot ex M. Fleisch.**

Specimens examined. Cao Bằng: Nguyên Bình District, Phia Oắc-Phia Đén Nature Reserve, Thành Công Commune, through Phia Oắc peak, 22°36'49.88" N, 105°51'52.00" E, 1852 m, on rock, 25 Oct. 2013, *R.-L. Zhu et al. 20131025-50*.

Distribution. China (Wu & Jia, 2004), Sri Lanka (Wu & Jia, 2004), new to Vietnam.

***Daltonia waniana* (B.C. Tan & P.J. Lin) B.C. Ho & L. Pokorny**

Specimens examined. Cao Bằng: Nguyên Bình District, Phia Oắc-Phia Đén Nature Reserve, Thành Công Commune, from the forest station to the peak, 22°36'32.12" N, 105°52'13.89" E, 1594 m, on moist rock, 26 Oct. 2013, *R.-L. Zhu et al. 20131026-209*; 22°36'53.22" N, 105°52'03.19" E, 1781 m, on rock, 26 Oct. 2013, *R.-L. Zhu et al. 20131026-250*.

Tan & Lin (1995) described a new species, *Distichophyllum wanianum* B.C. Tan & P.J. Lin based on the type from Luchun Co., Yunnan. It was considered to be endemic to China (Guangdong, Hainan and Yunnan) (Jia & He, 2013). Recently it has been moved to *Daltonia* by Ho *et al.* (2012) based on molecular evidence.

***Dicranella heteromalla* (Hedw.) Schimp.**

Specimens examined. Cao Bằng: Nguyên Bình District, Phia Oắc-Phia Đén Nature Reserve, Thành Công Commune, through Phia Oắc peak, 22°36'53.59" N, 105°51'51.45" E, 1881 m, on rock with soil, 25 Oct. 2013, *R.-L. Zhu et al. 20131025-38*; *ibid.*, 22°36'47.45"

N, 105°51'55.82" E, 1848 m, on rock, 25 Oct. 2013, *R.-L. Zhu et al. 20131025-55A*; *ibid.*, 22°36'28.74" N, 105°52'14.39" E, 1577 m, on rock with a thin layer of soil, 25 Oct. 2013, *R.-L. Zhu et al. 20131025-158*.

Distribution. Widely distributed in the Mediterranean and Northern Hemisphere (Gao, 1994; Jia & He, 2013; Ros *et al.*, 2013), new to Vietnam.

***Dicranoloma dicarpum* (Nees) Paris**

Specimens examined. Cao Bằng: Nguyễn Bình District, Phia Oắc-Phia Đén Nature Reserve, Thành Công Commune, from the forest station to the peak, 22°36'24.70" N, 105°52'16.67" E, 1560 m, on fallen tree, 26 Oct. 2013, *R.-L. Zhu et al. 20131026-22*; Hà Giang: Vị Xuyên District, Phương Độ Commune, Lũng Vài village, 22°49'17.98" N, 104°53'14.88" E, 1096 m, on tree trunk, 7 Nov. 2013, *R.-L. Zhu et al. 20131107-123*.

Distribution. Australia (Dalton *et al.*, 1991), China (Gao, 1994), Indonesia & Malaysia (Gao, 1994), New Zealand (Beever *et al.*, 1992), Peru (Jia & He, 2013), new to Vietnam.

***Distichophyllum collenchymatosum* Cardot**

Specimens examined. Cao Bằng: Nguyễn Bình District, Phia Oắc-Phia Đén Nature Reserve, Thành Công Commune, from the forest station to the peak, 22°36'55.46" N, 105°52'00.43" E, 1786 m, on rock, 26 Oct. 2013, *R.-L. Zhu et al. 20131026-302A*.

Distribution. China (Wu, 2002), Japan (Noguchi *et al.*, 1991), Korea (Jia & He, 2013), Philippines (Tan & Iwatsuki, 1991), new to Vietnam.

***Ditrichum heteromallum* (Hedw.) E. Britton**

Specimens examined. Hà Giang: Vị Xuyên District, Phương Độ Commune, Khuổi Mi village, 22°49'13.18" N, 104°57'00.03" E, 255 m, on soil, 7 Nov. 2013, *R.-L. Zhu et al. 20131107-2*.

Distribution. America (Gao, 1994), China (Gao, 1994), Colombia (Florschütz-de Waard & Florschütz, 1979), Europe (Ros *et al.*, 2013), India (Jia & He, 2013), Japan (Noguchi & Iwatsuki, 1987), Korea (Gao, 1994), new to Vietnam.

***Duthiella speciosissima* Broth. ex Cardot**

Specimens examined. Cao Bằng: Trùng Khánh District, Cao Vít Gibbon Conservation Area, Phong Nậm Commune, from NàThông village (Phin valley) to Kha Muộn village (Kha valley), 22°53'30.71" N, 106°32'11.96" E, 658 m, on rock, 23 Oct. 2013, *R.-L. Zhu et al. 20131023-84*.

Distribution. China (Wu & Jia, 2011), Japan (Noguchi *et al.*, 1991), new to Vietnam.

***Ectropothecium dealbatum* (Reinw. & Hornsch.) A. Jaeger**

Specimens examined. Cao Bằng: Nguyễn Bình District, Phia Oắc-Phia Đén Nature Reserve, Thành Công Commune, from the forest station to the peak, 22°36'26.24" N, 105°52'16.02" E, 1570 m, on moist rock, 26 Oct. 2013, *R.-L. Zhu et al. 20131026-6A*; *ibid.*, 22°36'25.49" N, 105°52'16.18" E, 1570 m, on moist rock, 26 Oct. 2013, *R.-L. Zhu et al. 20131026-7*; 22°36'18.92" N, 105°52'21.65" E, 1593 m, on rock with a thin layer of soil, 26 Oct. 2013, *R.-L. Zhu et al. 20131026-57*.

Distribution. Africa (O'Shea, 2006), Burma (Jia & He, 2013), China (Wu & Jia, 2004), India (Wu & Jia, 2004), Indonesia (Wu & Jia, 2004), Malaysia (Jia & He, 2013), Philippines (Tan & Iwatsuki, 1991), Thailand (Dixon, 1932), new to Vietnam.

***Entodon yunnanensis* Thér.**

Specimens examined. Cao Bằng: Trùng Khánh District, Cao Vít Gibbon Conservation Area, Ngọc Côn Commune, 22°54'12.61" N, 106°33'36.49" E, 510 m, on rock, 22 Oct. 2013,

R.-L. Zhu et al. 20131022-93; Cao Bằng: Trùng Khánh District, Cao Vít Gibbon Conservation Area, Phong Nậm Commune, from NàThông village (Phin valley) to Kha Muộn village (Kha valley), *ibid.*, 22°53'15.76" N, 106°32'01.15" E, 605 m, on rock with thin soil, 23 Oct. 2013, *R.-L. Zhu et al. 20131023-26A*; *ibid.*, 22°53'15.74" N, 106°32'01.81" E, 618 m, on rock, 23 Oct. 2013, *R.-L. Zhu et al. 20131023-27*; Cao Bằng: Trà Lĩnh District, Quốc Toàn Commune, Thang Heng lake, 22°45'31.45" N, 106°17'48.67" E, 632 m, on rock, 24 Oct. 2013, *R.-L. Zhu et al. 20131024-3*.

Distribution. China (Hu & Wang, 2005), new to Vietnam.

Entodon yunnanensis was previously known only from Southwestern China (Guizhou, Xizang and Yunnan) (Jia & He, 2013). This is the first record outside China.

***Eurhynchiadelphus eustegia* (Besch.) Ignatov & Huttunen**

Figs 1-3

Specimens examined. Hà Giang: Quản Bạ District, Nghĩa Thuận Commune, Xín Cái village, 23°07'48.79" N, 104°55'37.97" E, 1237 m, on rock with a thin layer of soil, 1 Nov. 2013, *R.-L. Zhu et al. 20131101-66A*.

Distribution. China (Hu & Wang, 2005), Japan (Noguchi *et al.*, 1991), new to Vietnam.

The older name of this species is *Eurhynchium eustegium* (Besch.) Dixon recently it was treated as *Eurhynchiadelphus eustegia* based on molecular evidence (Ignatov *et al.*, 2005). *Eurhynchiadelphus*, a monospecific genus in Brachytheciaceae, is closely related to *Brachythecium* and *Myuroclada* (Li *et al.*, 2015). It is reported for Vietnam for the first time.

***Eurhynchium laxirete* Broth.**

Specimens examined. Cao Bằng: Trùng Khánh District, Cao Vít Gibbon Conservation Area, Phong Nậm Commune, from NàThông village (Phin valley) to Kha Muộn village (Kha valley), 22°53'44.80" N, 106°32'06.20" E, 622 m, on tree trunk, 23 Oct. 2013, *R.-L. Zhu et al. 20131023-136A*; Cao Bằng: Nguyên Bình District, Quang Thành Commune, from km 7 to Vài Khau village to Khau Canh place, 22°37'14.48" N, 105°52'37.42" E, 1161 m, on rock with a thin layer of soil, 27 Oct. 2013, *R.-L. Zhu et al. 20131027-65A*; Hà Giang: Quản Bạ District, Nghĩa Thuận Commune, Xín Cái village, 23°07'48.52" N, 104°55'33.57" E, 1136 m, on soil, 1 Nov. 2013, *R.-L. Zhu et al. 20131101-47*; Hà Giang: Vị Xuyên District, Phương Độ Commune, Lũng Vài village, 23°07'48.79" N, 104°55'37.97" E, 1237 m, on rock with a thin layer of soil, 7 Nov. 2013, *R.-L. Zhu et al. 20131107-67C*.

Distribution. China (Hu & Wang, 2005), Japan (Noguchi *et al.*, 1991), Korea (Hu & Wang, 2005), new to Vietnam.

***Eurhynchium savatieri* Schimp. ex Besch.**

Specimens examined. Hà Giang: Bắc Mê District, Thượng Tân Commune, Tà Lường village, 22°43'41.28" N, 105°12'18.48" E, on rock, 29 Oct. 2013, *R.-L. Zhu et al. 20131029-211*.

Distribution. China (Hu & Wang, 2005), Japan (Noguchi *et al.*, 1991), Korea (Jia & He, 2013), Vanuatu (Jia & He, 2013), new to Vietnam.

***Fauriella robustiuscula* Broth.**

Specimens examined. Cao Bằng: Nguyên Bình District, Phia Oắc-Phia Đén Nature Reserve, Thành Công Commune, through Phia Oắc peak, 22°36'52.72" N, 105°52'05.17" E, 1796 m, on tree base, 25 Oct. 2013, *R.-L. Zhu et al. 20131025-207*.

Distribution. China (Wu, 2002), new to Vietnam.

Fauriella robustiuscula, previously known only from Sichuan, was considered to be endemic to China (Jia & He, 2013). Vietnam is the southernmost locality of this species.

Fauriella tenuis (Mitt.) Cardot

Specimens examined. Cao Bằng: Nguyễn Bình District, Phia Oắc-Phia Đén Nature Reserve, Thành Công Commune, through Phia Oắc peak, 22°36'53.89" N, 105°51'51.63" E, 1882 m, on tree trunk, 25 Oct. 2013, *R.-L. Zhu et al. 20131025-32*; 22°36'52.98" N, 105°52'05.25" E, 1796 m, on root, 25 Oct. 2013, *R.-L. Zhu et al. 20131025-219*; 22°36'28.70" N, 105°52'14.63" E, 1580 m, on tree base, 25 Oct. 2013, *R.-L. Zhu et al. 20131025-265A*.

Distribution. China (Wu, 2002), Japan (Noguchi *et al.*, 1991), new to Vietnam.

Fissidens ganguleei Nork. ex Gangulee

Specimens examined. Cao Bằng: Trùng Khánh District, Cao Vít Gibbon Conservation Area, 22°54'30.35" N, 106°32'27.28" E, 536 m, on soil, 21 Oct. 2013, *R.-L. Zhu et al. 20131021-38*.

Distribution. Bangladesh (O'Shea, 2003), China (Gao, 1996), India (Dandotiya *et al.*, 2007), Indonesia (Touw, 1992), Japan (Noguchi & Iwatsuki, 1987), Nepal (Gao, 1996), new to Vietnam.

Fissidens gymnogynus Besch.

Specimens examined. Cao Bằng: Nguyễn Bình District, Phia Oắc-Phia Đén Nature Reserve, Thành Công Commune, from the forest station to the peak, 22°36'19.33" N, 105°52'19.60" E, 1602 m, on fallen tree, 26 Oct. 2013, *R.-L. Zhu et al. 20131026-53*; Hà Giang: Quản Bạ District, Nghĩa Thuận Commune, Xín Cái village, 23°07'48.57" N, 104°55'31.19" E, 1244 m, on tree base, 1 Nov. 2013, *R.-L. Zhu et al. 20131101-46*.

Distribution. China (Gao, 1996), Japan (Noguchi & Iwatsuki, 1987), Korea (Gao, 1996), Pakistan (Higuchi & Nishimura, 2003), Philippines (Tan & Iwatsuki, 1991), Thailand (Jia & He, 2013), new to Vietnam.

Fissidens obscurus Mitt.

Specimens examined. Cao Bằng: Nguyễn Bình District, Phia Oắc-Phia Đén Nature Reserve, Thành Công Commune, from the forest station to the peak, 22°36'33.40" N, 105°57'14.53" E, 1598 m, on moist rock, 26 Oct. 2013, *R.-L. Zhu et al. 20131026-220*.

Distribution. China (Gao, 1996), Japan (Noguchi & Iwatsuki, 1987), India (Gao, 1996), Nepal (Gao, 1996), new to Vietnam.

Fissidens tosaensis Broth.

Specimens examined. Hà Giang: Quản Bạ District, Tùng Vài Commune, Thặng village, 23°03'11.29" N, 104°51'43.96" E, 1155 m, on rock, 3 Nov. 2013, *R.-L. Zhu et al. 20131103-73*.

Distribution. China (Gao, 1996), Japan (Noguchi & Iwatsuki, 1987), new to Vietnam.

Fleischerobryum longicolle (Hampe) Loeske

Figs 4-5

Specimens examined. Cao Bằng: Nguyễn Bình District, Quang Thành Commune, from km 7 to Vài Khau village to Khau Canh place, 22°37'14.23" N, 105°52'37.04" E, 1157 m, on moist rock, 27 Oct. 2013, *R.-L. Zhu et al. 20131027-59*.

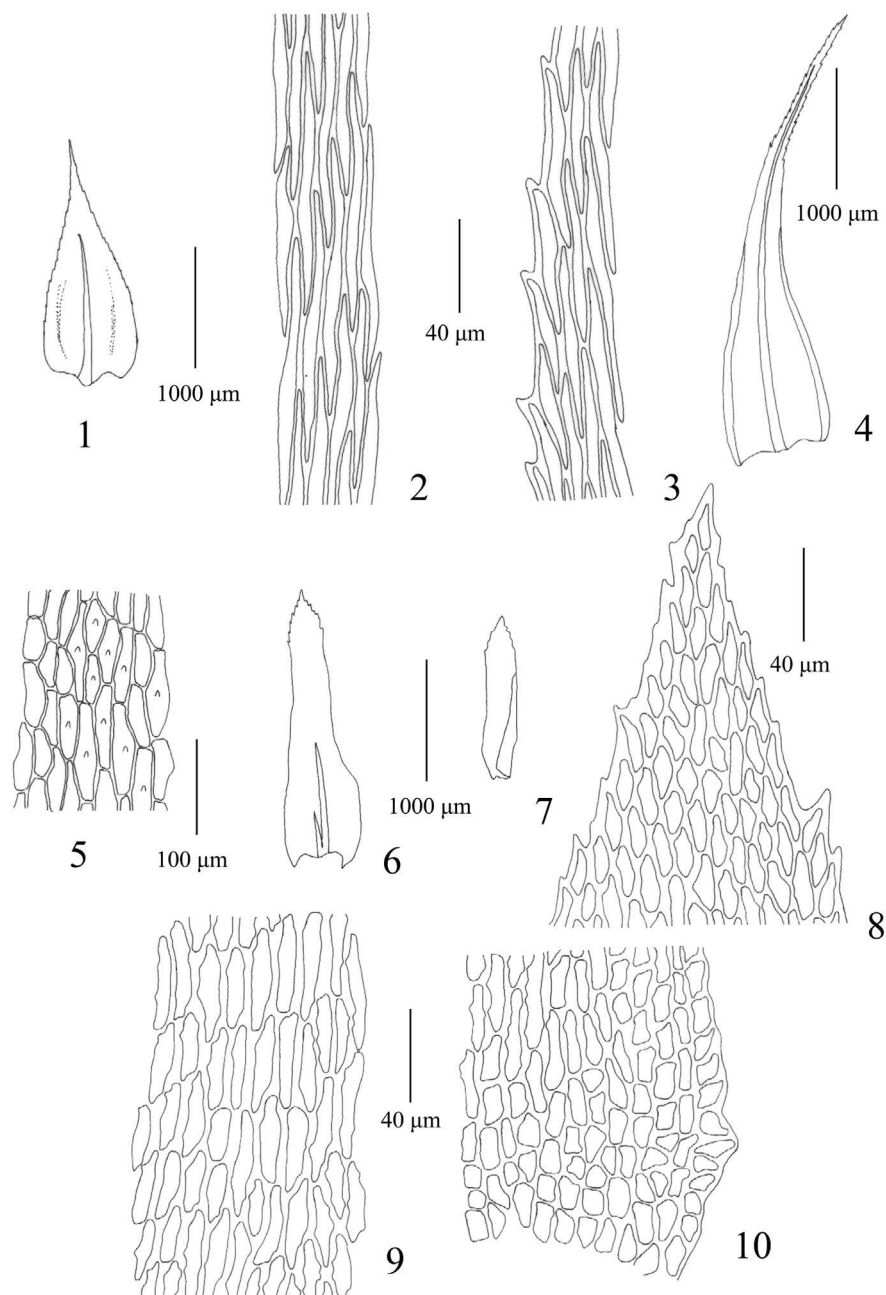
Distribution. Burma (Tan & Iwatsuki, 1993), China (Li, 2006), India (Li, 2006), Indonesia (Jia & He, 2013), Japan (Noguchi & Iwatsuki, 1989), Philippines (Li, 2006), new to Vietnam.

Fleischerobryum, a tropical Asian genus with only two species, is newly reported for Vietnam.

Forsstroemia cf. yezoana (Besch.) S. Olsson, Enroth & D. Quandt

Figs 6-10

Specimens examined. Cao Bằng: Trùng Khánh District, Cao Vít Gibbon Conservation Area, 54°31'12" N, 106°32'26.60" E, 532 m, on rock with a thin layer of soil,



Figs 1-10. **1-3.** *Eurhynchiadelphus eustegia* (Besch.) Ignatov & Huttunen (from *R. L. Zhu et al. 20131101-66A*). **1.** Stem leaf; **2.** Median laminal cells of stem leaf; **3.** Leaf border cells in the middle of stem leaf. **4-5.** *Fleischerobryum longicolle* (Hampe) Loeske (from *R. L. Zhu et al. 20131027-59*). **4.** Leaf; **5.** Median laminal cells. **6-10.** *Forstroemia yezoana* (Besch.) S. Olsson, Enroth & D. Quandt. (from *R. L. Zhu et al. 20131021-44*). **6.** Stem leaf; **7.** Branch leaf; **8.** Cells at apex of stem leaf; **9.** Median laminal cells of branch leaf; **10.** Basal cells of stem leaf.

21 Oct. 2013, *R.-L. Zhu et al. 20131021-44*; Hà Giang: Vị Xuyên District, Minh Sơn Commune, Tân Sơn village, 23°00'36.84" N, 104°54'49.71" E, 528 m, on rock, 5 Nov. 2013, *R.-L. Zhu et al. 20131105-115*.

Distribution. China (Wu & Jia, 2011), Japan (Noguchi & Iwatsuki, 1989), Korea (Wu & Jia, 2011), new to Vietnam.

This species was first described as *Neckera yezoana* Besch. but recently moved to the new genus *Forsstroemia* by molecular evidence (Olsson *et al.*, 2011). In the local samples the margin of leaf apex is serrulate to dentate (Fig. 8) and the costa is usually weakly forked (Fig. 6). *Forsstroemia* is reported for Vietnam for the first time.

***Geheebia maschalogenae* (Renauld & Cardot) R.H. Zander**

Figs 11-13

Specimens examined. Cao Bằng: Nguyên Bình District, Phia Oắc-Phia Đén Nature Reserve, Thành Công Commune, through Phia Oắc peak, 22°36'54.86" N, 105°51'46.12" E, 1909 m, on soil, 25 Oct. 2013, *R.-L. Zhu et al. 20131025-99*.

Distribution. China (Townsend, 1994), India (Townsend, 1994), Japan (Noguchi & Iwatsuki, 1988), Mexico (Noguchi & Iwatsuki, 1988), North America (Noguchi & Iwatsuki, 1988), new to Vietnam.

Geheebia maschalogenae was known previously as *Didymodon michiganensis* (Steere) K. Saito (Noguchi & Iwatsuki, 1988), which recently has been treated as *Geheebia maschalogenae* (Renauld & Cardot) R.H. Zander (Zander, 2013). *Geheebia* is reported for Vietnam for the first time.

***Hageniella micans* (Mitt.) B.C. Tan & Y. Jia**

Figs 14-17

Specimens examined. Cao Bằng: Nguyên Bình District, Phia Oắc-Phia Đén Nature Reserve, Thành Công Commune, through Phia Oắc peak, 22°36'49.04" N, 105°51'49.04" E, 1849 m, on rock, 25 Oct. 2013, *R.-L. Zhu et al. 20131025-134*; *ibid.*, 22°36'49.60" N, 105°52'06.27" E, 1779 m, on rotten tree, 25 Oct. 2013, *R.-L. Zhu et al. 20131025-258A*; Cao Bằng: Nguyên Bình District, Phia Oắc-Phia Đén Nature Reserve, Thành Công Commune, from the forest station to the peak, 22°36'22.33" N, 105°52'17.65" E, 1555 m, on rock, 26 Oct. 2013, *R.-L. Zhu et al. 20131026-24*; 22°36'21.34" N, 105°52'17.45" E, 1593 m, on rock with a thin layer of soil, 26 Oct. 2013, *R.-L. Zhu et al. 20131026-32*.

Distribution. Borneo (Wu & Jia, 2004), Canada (Wu & Jia, 2004), China (Wu & Jia, 2004), France (Ros *et al.*, 2013), Hawaii (Wu & Jia, 2004), Mexico (Sharp *et al.*, 1994), Philippines (Tan & Iwatsuki, 1991), Central America (Wu & Jia, 2004), new to Vietnam.

Hageniella is newly reported for Vietnam.

***Himantocladium formosicum* Broth. & Yasuda**

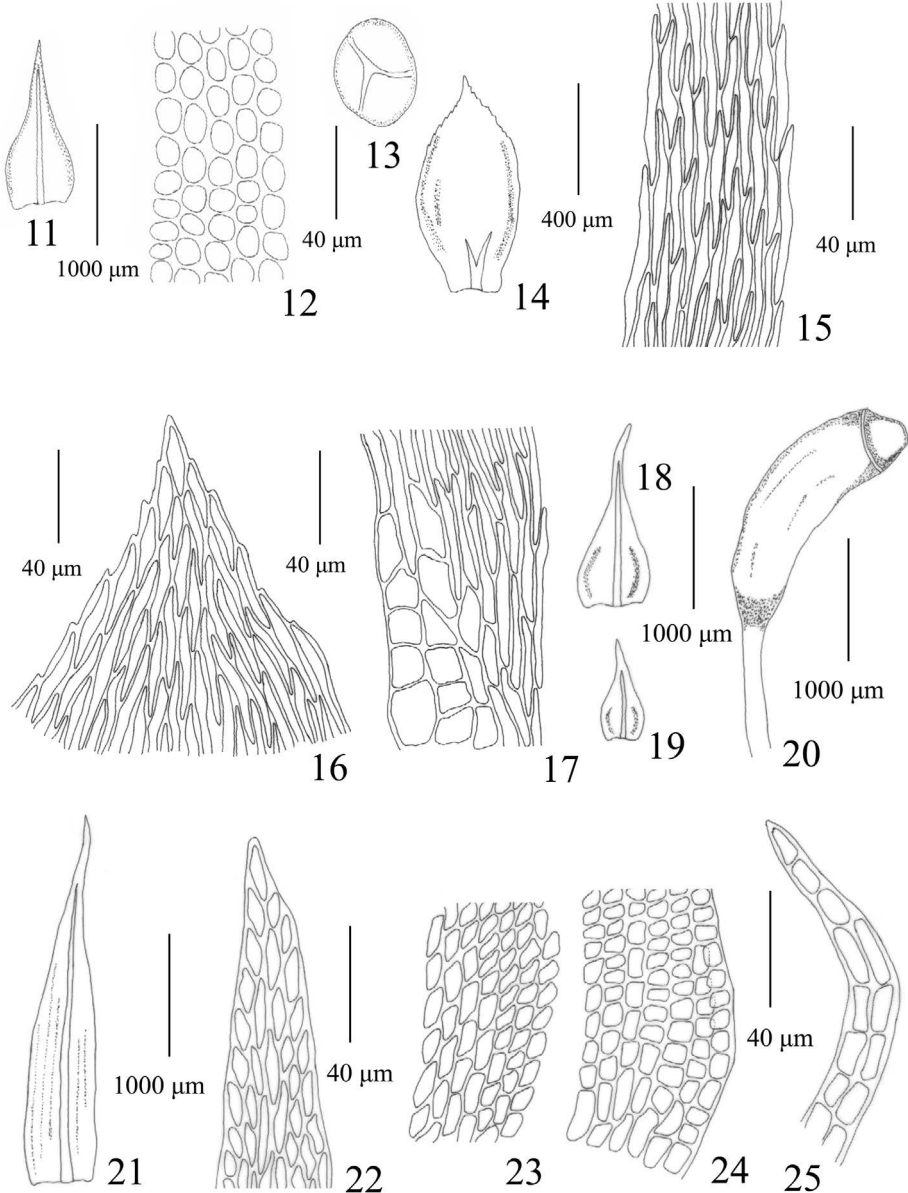
Specimens examined. Hà Giang: Bắc Mê District, Thượng Tân Commune, Tà Lương village, 22°43'41.28" N, 105°12'18.48" E, on rock, 29 Oct. 2013, *R.-L. Zhu et al. 20131029-213*; Hà Giang: Quản Bạ District, Tùng Vài Commune, Thăng village, 23°03'04.97" N, 104°52'00.86" E, 1042 m, on rock, 3 Nov. 2013, *R.-L. Zhu et al. 20131103-102*; 23°03'11.82" N, 104°52'00.78" E, 1097 m, on rock, 3 Nov. 2013, *R.-L. Zhu et al. 20131103-152A*.

Distribution. China (Wu & Jia, 2011), Laos (Jia & He, 2013), Philippines (Enroth, 1996), new to Vietnam.

***Hypnum cupressiforme* Hedw.**

Specimens examined. Cao Bằng: Nguyên Bình District, Quang Thành Commune, from km 7 to Vài Khau village to Khau Canh place, 22°37'14.48" N, 105°52'37.42" E, 1161 m, on rock with a thin layer of soil, 27 Oct. 2013, *R.-L. Zhu et al. 20131027-69*.

Distribution. Cosmopolitan (Noguchi *et al.*, 1994; Wu & Jia, 2004; Jia & He, 2013; Rams *et al.*, 2014), new to Vietnam.



Figs 11-25. **11-13.** *Geheebia maschalogena* (Renauld & Cardot) R.H. Zander (from *R. L. Zhu et al. 20131025-99*). **11.** Leaf; **12.** Median laminal cells; **13.** Gemmae; **14-17.** *Hageniella micans* (Mitt.) B.C. Tan & Y. Jia (from *R. L. Zhu et al. 20131026-24*). **14.** Leaf; **15.** Median laminal cells; **16.** Cells at apex of leaf; **17.** Basal cells; **18-25.** *Leskeella nervosa* (Brid.) Loeske. (from *R. L. Zhu et al. 20131023-209*). **18.** Stem leaf; **19.** Branch leaf; **20.** Capsule; **21.** Inner perichaetial leaf; **22.** Cells at apex of branch leaf; **23.** Median laminal cells of branch leaf; **24.** Basal cells of branch leaf; **25.** Paraphyllum on stem.

Hypnum oldhamii (Mitt.) A. Jaeger

Specimens examined. Cao Bằng: Nguyễn Bình District, Phía Oắc-Phía Đén Nature Reserve, Thành Công Commune, through Phía Oắc peak, on soil, 25 Oct. 2013, *R.-L. Zhu et al.* 20131025-51.

Distribution. China (Wu & Jia, 2004), Japan (Noguchi *et al.*, 1994), Korea (Wu & Jia, 2004), new to Vietnam.

Hypnum pallescens (Hedw.) P. Beauv.

Specimens examined. Hà Giang: Quản Bạ District, Thái An Commune, Sếu Lọng village, along Độ stream, 22°57'49.69" N, 105°05'30.32" E, 867 m, on rock with a thin layer of soil, 2 Nov. 2013, *R.-L. Zhu et al.* 20131102-81.

Distribution. China (Wu & Jia, 2004), Japan (Noguchi *et al.*, 1994), Korea (Wu & Jia, 2004), widely distributed in the Northern Hemisphere (Noguchi *et al.*, 1994; Ros *et al.*, 2013; Fojcik & Stebel, 2014), new to Vietnam.

Hypnum sakuraii (Sakurai) Ando

Specimens examined. Hà Giang: Quản Bạ District, Thanh Vân Commune, Thanh Long village, 23°05'02.24" N, 104°58'19.84" E, 845 m, on rock with soil, 1 Nov. 2013, *R.-L. Zhu et al.* 20131101-142.

Distribution. China (Wu & Jia, 2004), Japan (Noguchi *et al.*, 1994), new to Vietnam.

Leskeella nervosa (Brid.) Loeske**Figs 18-25**

Specimens examined. Cao Bằng: Trùng Khánh District, Cao Vít Gibbon Conservation Area, Phong Nậm Commune, from NàThông village (Phin valley) to Kha Muộn village (Kha valley), 22°53'39.00" N, 106°32'14.73" E, 523 m, on fallen tree, 23 Oct. 2013, *R.-L. Zhu et al.* 20131023-150; *ibid.*, 22°53'29.87" N, 106°32'21.38" E, 391 m, on tree trunk, 23 Oct. 2013, *R.-L. Zhu et al.* 20131023-209.

Distribution. China (Wu, 2002), Greenland (Wu, 2002), Japan (Noguchi *et al.*, 1991), Pakistan (Higuchi & Nichimura, 2003), Europe & North America (Wu, 2002), new to Vietnam.

Leskeella is new to the moss flora of Vietnam.

Leucoloma okamurae Broth.

Specimens examined. Vĩnh Phúc, Tam Đảo District, Tam Đảo town, Rừng Rình peak, 21°27'06.99" N, 105°38'57.01" E, 1020 m, on tree trunk, 9 Nov. 2013, *R.-L. Zhu et al.* 20131109-37.

Distribution. China (Gao, 1994), Japan (Noguchi & Iwatsuki, 1987), new to Vietnam.

This species is similar to *L. molle* (Müll. Hal.) Mitt., but it has a much wider marginal border (ca. 20 rows of linear cells at middle and ca. 25 rows at the base).

Macromitrium longifolium (Hook.) Brid.

Specimens examined. Hà Giang: Quản Bạ District, Tam Sơn town, Quản Bạ Heaven Gate, 23°02'59.90" N, 104°59'31.12" E, 1172 m, on tree trunk, 31 Oct. 2013, *R.-L. Zhu et al.* 20131031-300.

Distribution. Costa Rica (Bowers, 1970; 1974), El Salvador (Winkler, 1965), Guatemala (Bartram, 1949), Honduras (Crum, 1952), Mexico (Sharp *et al.*, 1994), Central and South America & West Indies (Sharp *et al.*, 1994), new to Vietnam.

In Asia and Oceania *Macromitrium* has been relatively well known in Australia (Vitt & Ramsay, 1985), China (Guo *et al.*, 2012), Japan (Noguchi, 1967),

New Caledonia (Thouvenot & Yong, 2015), New Zealand (Vitt, 1983), and Papua New Guinea (Vitt *et al.*, 1995). The tropical American *Macromitrium longifolium* is firstly reported for Asia. Its occurrence in other regions in tropical Asia is expected.

Meteoriopsis undulata Horik. & Nog.

Specimens examined. Hà Giang: Quận Bà District, Tam Sơn town, Quận Bà Heaven Gate, 23°02'59.90" N, 104°59'31.12" E, 1172 m, on tree trunk, 31 Oct. 2013, *R.-L. Zhu et al.* 20131031-60.

Distribution. China (Wu & Jia, 2011), Japan (Noguchi & Iwatsuki, 1989), new to Vietnam.

Meteorium atroviriegatum Cardot & Thér.

Specimens examined. Cao Bằng: Trùng Khánh District, Cao Vít Gibbon Conservation Area, Ngọc Côn Commune, 22°54'35.39" N, 106°33'02.13" E, 563 m, on rock, 22 Oct. 2013, *R.-L. Zhu et al.* 20131022-21.

Distribution. China (Wu & Jia, 2011), Japan (Noguchi & Iwatsuki, 1989), new to Vietnam.

Meteorium atroviriegatum is distinguished from *M. papillarioides* Nog. by the long lanceolate leaf apex and relatively long median laminal cells.

Neckeropsis calcicola Nog.

Specimens examined. Cao Bằng: Trùng Khánh District, Cao Vít Gibbon Conservation Area, Ngọc Côn Commune, 22°54'30.27" N, 106°32'29.13" E, 535 m, on rock, 22 Oct. 2013, *R.-L. Zhu et al.* 20131022-35A; Hà Giang: Quận Bà District, Bát Đại Sơn Commune, Sán Chồ village, 23°09'17.01" N, 104°59'59.23" E, 730 m, on rock, 4 Nov. 2013, *R.-L. Zhu et al.* 20131104-5.

Distribution. China (Wu & Jia, 2011), Japan (Noguchi & Iwatsuki, 1989), new to Vietnam.

Palamocladium euchloron (Müll. Hal.) Wijk & Margad.

Specimens examined. Cao Bằng: Nguyên Bình District, Quang Thành Commune, from km 7 to Vài Khau village to Khau Canh place, 22°35'39.94" N, 105°53'13.36" E, 1273 m, on fallen tree, 27 Oct. 2013, *R.-L. Zhu et al.* 20131027-196A.

Distribution. China (Hu & Wang, 2005), Pakistan (Higuchi & Nishimura, 2003), Ukraine (Hofmann, 1997), West Asia & Europe (Hu & Wang, 2005; Jia & He 2013), new to Vietnam.

Palamocladium euchloron is similar to *P. leskeoides* (Hook.) E. Britton, however the leaf base of the former is wide-triangular rather than ovate.

Plagiomnium cuspidatum (Hedw.) T.J. Top.

Specimens examined. Cao Bằng: Trùng Khánh District, Cao Vít Gibbon Conservation Area, Ngọc Côn Commune, 22°54'37.25" N, 106°33'03.52" E, 525 m, on rock with a thin layer of soil, 22 Oct. 2013, *R.-L. Zhu et al.* 20131022-10A; *ibid.*, 22°54'32.20" N, 106°32'57.85" E, 541 m, on soil, 22 Oct. 2013, *R.-L. Zhu et al.* 20131022-28A; *ibid.*, 22°53'57.10" N, 106°34'25.82" E, 509 m, on soil, 22 Oct. 2013, *R.-L. Zhu et al.* 20131022-80; Hà Giang: Vị Xuyên District, Phương Độ Commune, Lũng Vài village, 22°49'46.19" N, 104°53'59.89" E, 779 m, on moist rock, 7 Nov. 2013, *R.-L. Zhu et al.* 20131107-170.

Distribution. China (Li, 2006), Japan (Noguchi & Iwatsuki, 1989), Pakistan (Higuchi & Nishimura, 2003), Central and North Asia & West Asia (Li, 2006), Europe & Central and North America (Li, 2006; Ros *et al.*, 2013; Rams *et al.*, 2014), Central and North Africa (Li, 2006), new to Vietnam.

Plagiomnium integrum (Bosch & Sande Lac.) T.J. Kop.

Specimens examined. Cao Bằng: Trùng Khánh District, Cao Vít Gibbon Conservation Area, Phong Nậm Commune, from Nà Thông village (Phin valley) to Kha Muộn village (Kha valley), 22°53'41.52" N, 106°32'13.20" E, 585 m, on rock, 23 Oct., R.-L. Zhu *et al.* 20131023-154; Hà Giang: Quản Bạ District, Tùng Vài Commune, Thăng village, 23°03'06.17" N, 104°51'58.63" E, 1058 m, on rock, 3 Nov. 2013, R.-L. Zhu *et al.* 20131103-54.

Distribution. China (Li, 2006), Philippines (Tan & Iwatsuki, 1991), Malaysia & Indonesia (Li, 2006), Thailand & Laos (Tan & Iwatsuki, 1993), Himalaya (Jia & He, 2013), new to Vietnam.

Plagiomnium integrum is similar to *P. cuspidatum* (Hedw.) T.J. Top. The former, however, has the entire leaf margin.

Plagiomnium maximoviczii (Lindb.) T.J. Kop.

Specimens examined. Cao Bằng: Nguyên Bình District, Phia Oắc-Phia Đén Nature Reserve, Thành Công Commune, through Phia Oắc peak, 22°36'56.15" N, 105°51'47.87" E, 1907 m, on soil, 25 Oct. 2013, R.-L. Zhu *et al.* 20131025-80A; Hà Giang: Quản Bạ District, Nghĩa Thuận Commune, Xin Cái village, 23°07'48.79" N, 104°55'37.97" E, 1237 m, on rock with a thin layer of soil, 1 Nov. 2013, R.-L. Zhu *et al.* 20131101-66; Hà Giang: Vị Xuyên District, Phương Độ Commune, Lũng Vài village, 23°07'48.79" N, 104°55'37.97" E, 1237 m, on rock with a thin layer of soil, 7 Nov. 2013, R.-L. Zhu *et al.* 20131107-67A.

Distribution. China (Li, 2006), India (Koponen, 1981), Japan (Noguchi & Iwatsuki, 1989), Khabarovsk (Koponen, 1981), Korea (Li, 2006), Pakistan (Higuchi & Nishimura, 2003), Thailand (Jia & He, 2013), new to Vietnam.

Pohlia leucostoma (Bosch & Sande Lac.) M. Fleisch.

Specimens examined. Cao Bằng: Nguyên Bình District, Quang Thành Commune, Cầu 2 to Cá Hồi 1 place, 22°35'09.37" N, 105°52'02.95" E, 968 m, on rock, 28 Oct. 2013, R.-L. Zhu *et al.* 20131028-119.

Distribution. China (Li, 2006), Hawaii (Li, 2006), India (Li, 2006), Indonesia (Li, 2006), Japan (Noguchi & Iwatsuki, 1988), Nepal (Li, 2006), new to Vietnam.

Pohlia prolifera (Kindb.) Lindb. ex Arnell

Specimens examined. Cao Bằng: Nguyên Bình District, Quang Thành Commune, from km 7 to Vài Khau village to Khau Canh place, 22°37'25.34" N, 105°52'42.90" E, 1140 m, on rock, 27 Oct. 2013, R.-L. Zhu *et al.* 20131027-58.

Distribution. China (Li, 2006), Japan (Noguchi & Iwatsuki, 1988), widely distributed in the Northern Hemisphere (Li, 2006; Ros *et al.*, 2013), new to Vietnam.

Pseudobarbella propagulifera Nog.

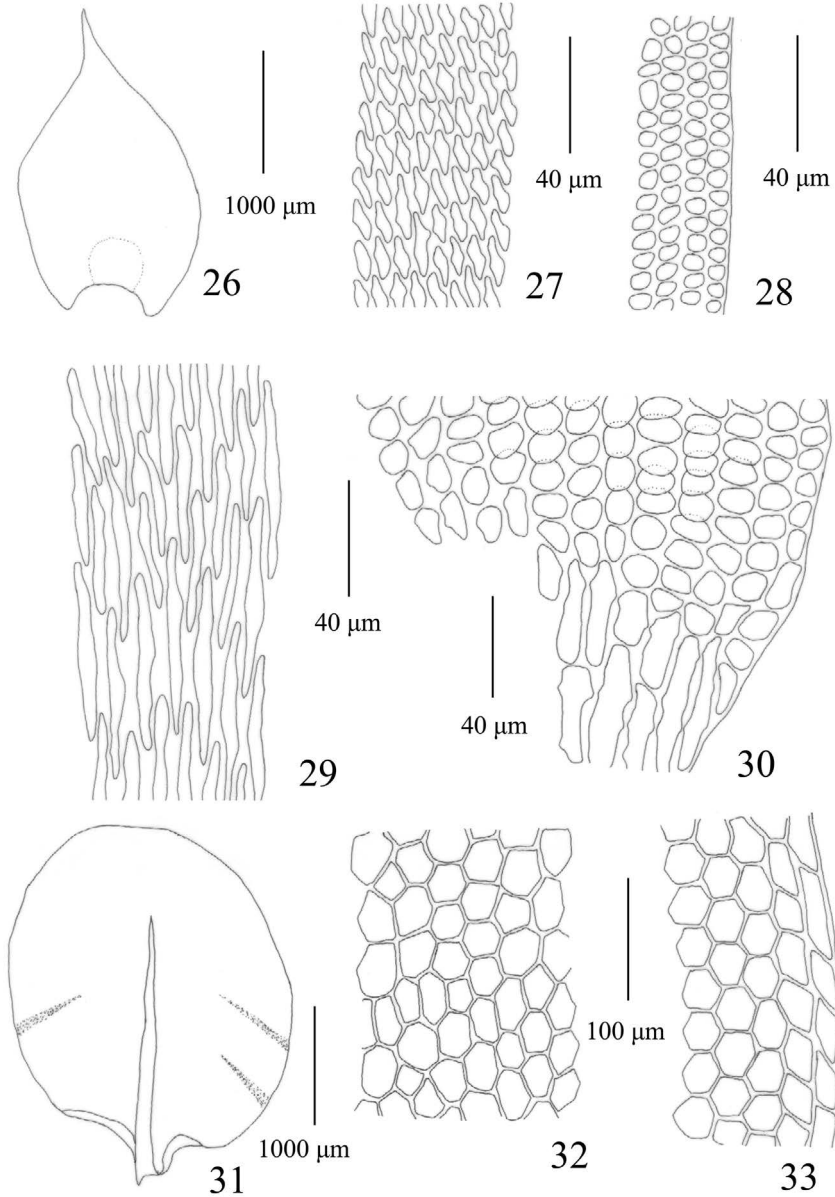
Specimens examined. Cao Bằng: Nguyên Bình District, Phia Oắc-Phia Đén Nature Reserve, Thành Công Commune, through Phia Oắc peak, 22°36'51.52" N, 105°52'02.00" E, 1810 m, on tree trunk, 25 Oct. 2013, R.-L. Zhu *et al.* 20131025-226A.

Distribution. China (Wu & Jia, 2011), new to Vietnam.

This species bears linear gemmae in the leaf axil which distinguish it from other species of *Pseudobarbella*. It is recorded outside China for the first time.

Pterogonadelphus esquirolii (Thér.) Ochyra & Zijlstra**Figs 26-30**

Specimens examined. Cao Bằng: Trùng Khánh District, Cao Vít Gibbon Conservation Area, Phong Nậm Commune, from Nà Thông village (Phin valley) to Kha Muộn village (Kha valley), 22°53'16.13" N, 106°31'57.33" E, 561 m, on rock, 23 Oct. 2013, R.-L. Zhu *et al.* 20131023-1.



Figs 26-33. **26-30.** *Pterogoniadelphus esquirolii* (Thér.) Ochyra & Zijlstra (from R. L. Zhu *et al.* 20131023-1). **26.** Leaf; **27.** Upper median laminal cells; **28.** Leaf border cells in the middle of leaf; **29.** Lower median laminal cells; **30.** Basal cells. **31-33.** *Rhizomnium magnifolium* (Horik.) T.J. Kop. (from R. L. Zhu *et al.* 20131026-79). **31.** Leaf; **32.** Median laminal cells; **33.** Leaf border cells in the middle of leaf.

Distribution. China (Wu & Jia, 2011), Japan (Wu & Jia, 2011), new to Vietnam.

Pterogoniadelphus, a small genus with four species, is newly reported for Vietnam. *Pterogoniadelphus esquirolii* is the only species known in Asia. It was listed as an endangered plant (Hallingbäck, 2009).

Rhizomnium magnifolium (Horik.) T.J. Kop.

Figs 31-33

Specimens examined. Cao Bằng: Nguyên Bình District, Phia Oắc-Phia Đén Nature Reserve, Thành Công Commune, from the forest station to the peak, 22°36'28.30" N, 105°52'14.33" E, 1587 m, on tree trunk, 26 Oct. 2013, *R.-L. Zhu et al. 20131026-79*; Cao Bằng: Nguyên Bình District, Quang Thành Commune, from km 7 to Vài Khau village to Khau Canh place, 22°35'39.84" N, 105°53'13.30" E, 1278 m, on rotten tree, 27 Oct. 2013, *R.-L. Zhu et al. 20131027-102*.

Distribution. China (Li, 2006), India (Li, 2006), Japan (Noguchi & Iwatsuki, 1989), Korea (Li, 2006), Nepal (Li, 2006), Europe & North America (Li, 2006; Ros *et al.*, 2013), new to Vietnam.

Rhizomnium is reported for Vietnam for the first time.

Rhynchostegiella japonica Dixon & Thér.

Specimens examined. Cao Bằng: Trùng Khánh District, Cao Vít Gibbon Conservation Area, Phong Nậm Commune, from NàThông village (Phin valley) to Kha Muộn village (Kha valley), 22°53'31.13" N, 106°32'10.72" E, 657 m, on tree branches, 23 Oct. 2013, *R.-L. Zhu et al. 20131023-79*; *ibid.*, 22°53'38.70" N, 106°32'14.67" E, 515 m, on tree base, 23 Oct. 2013, *R.-L. Zhu et al. 20131023-149*; Cao Bằng: Nguyên Bình District, Phia Oắc-Phia Đén Nature Reserve, Thành Công Commune, from the forest station to the peak, 22°36'28.79" N, 105°52'14.33" E, 1584 m, on tree bark, 26 Oct. 2013, *R.-L. Zhu et al. 20131026-68*; Cao Bằng: Nguyên Bình District, Quang Thành Commune, from km 7 to Vài Khau village to Khau Canh place, 22°37'14.18" N, 105°52'37.72" E, 1152 m, on dead tree branches, 27 Oct. 2013, *R.-L. Zhu et al. 20131027-151*.

Distribution. China (Hu & Wang, 2005), Japan (Hu & Wang, 2005), new to Vietnam.

Rhynchostegiella japonica Dixon & Thér. was treated as a synonym of

Brachythecium plumosum (Hedw.) Schimp. (Staples *et al.*, 2004; Ignatov *et al.*, 2005). According to our examination on the type specimen of the former species, *Rhynchostegiella japonica* does not belong to *Brachythecium* Schimp. Thus, we treat it here as a separate species.

Rhynchostegium contractum Cardot

Specimens examined. Cao Bằng: Nguyên Bình District, Phia Oắc-Phia Đén Nature Reserve, Thành Công Commune, through Phia Oắc peak, 22°36'49.76" N, 105°51'52.19" E, 1852 m, on rock, 25 Oct. 2013, *R.-L. Zhu et al. 20131025-47*; *ibid.*, 22°36'51.61" N, 105°52'01.92" E, 1810 m, on dead tree, 25 Oct. 2013, *R.-L. Zhu et al. 20131025-230*.

Distribution. China (Hu & Wang, 2005), Japan (Noguchi *et al.*, 1991), Korea (Hu & Wang, 2005), new to Vietnam.

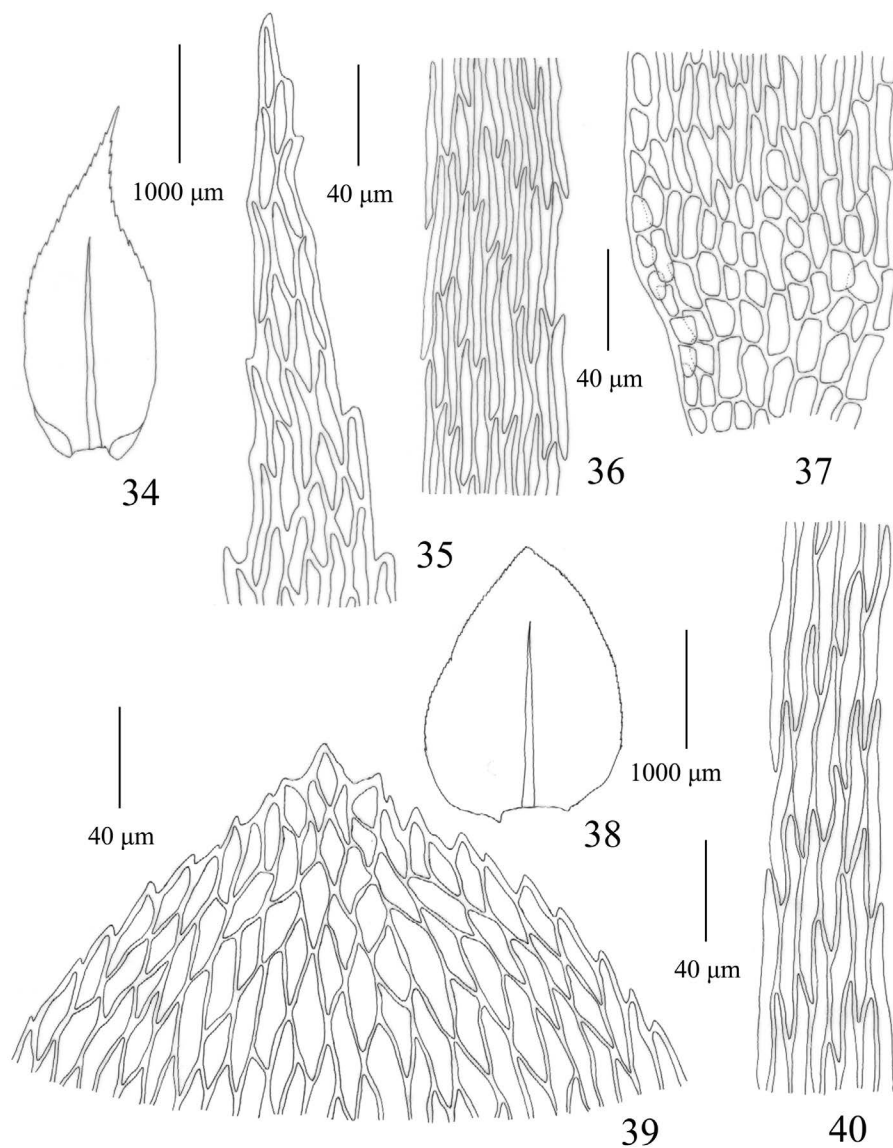
Scabridens sinensis E.B. Bartram

Figs 34-37

Specimens examined. Cao Bằng: Nguyên Bình District, Phia Oắc-Phia Đén Nature Reserve, Thành Công Commune, through Phia Oắc peak, 22°36'52.99" N, 105°52'05.24" E, 1796 m, on tree trunk, 25 Oct. 2013, *R.-L. Zhu et al. 20131025-202*; *ibid.*, 22°36'28.70" N, 105°52'14.63" E, 1580 m, on tree base, 25 Oct. 2013, *R.-L. Zhu et al. 20131025-265*.

Distribution. China (Wu & Jia, 2011), new to Vietnam.

Scabridens is a monospecific genus previously considered to be endemic to southwestern China. The present report is the first record outside China.



Figs 34-40. **34-37.** *Scabridens sinensis* E.B. Bartram (from R. L. Zhu *et al.* 20131025-202). **34.** Leaf; **35.** Cells at apex of leaf; **36.** Median laminal cells; **37.** Basal cells. **38-40.** *Torrentaria riparioides* (Hedw.) Ochyra (from R. L. Zhu *et al.* 20131103-16). **38.** Stem leaf; **39.** Cells at apex of stem leaf; **40.** Median laminal cells of stem leaf.

Sphagnum ovatum Hampe

Specimens examined. Cao Bằng: Nguyễn Bình District, Phia Oắc-Phia Đén Nature Reserve, Thành Công Commune, through Phia Oắc peak, 22°36'25.79" N, 105°52'10.07" E, 1610 m, on soil, 25 Oct. 2013, *R.-L. Zhu et al. 20131025-154*.

Distribution. China (Gao, 1994), India (Dandotiya *et al.*, 2007), Nepal (Gao, 1994), Thailand (He, 1998a), new to Vietnam.

Sphagnum ovatum was listed as an endangered plant (Hallingbäck, 2009).

Symphiodon angustus (Müll. Hal.) A. Jaeger

Specimens examined. Cao Bằng: Nguyễn Bình District, Phia Oắc-Phia Đén Nature Reserve, Thành Công Commune, from the forest station to the peak, 22°36'22.32" N, 105°52'17.07" E, 1560 m, on rock, 26 Oct. 2013, *R.-L. Zhu et al. 20131026-25*.

Distribution. Bhutan (He & Snider, 2000), India (He & Snider, 2000), new to Vietnam.

Symphiodon echinatus (Mitt.) A. Jaeger

Specimens examined. Cao Bằng: Nguyễn Bình District, Phia Oắc-Phia Đén Nature Reserve, Thành Công Commune, through Phia Oắc peak, 22°36'52.96" N, 105°52'05.24" E, 1796 m, on tree trunk, 25 Oct. 2013, *R.-L. Zhu et al. 20131025-214*; Cao Bằng: Nguyễn Bình District, Phia Oắc-Phia Đén Nature Reserve, Thành Công Commune, from the forest station to the peak, 22°36'19.95" N, 105°52'18.83" E, 1600 m, on tree trunk, 26 Oct. 2013, *R.-L. Zhu et al. 20131026-42A*.

Distribution. China (Wu, 2002), India (He & Snider, 2000), Nepal (Wu, 2002), Sri Lanka (O'Shea, 2002), Thailand (Wu, 2002), new to Vietnam.

Taxiphyllum alternans (Cardot) Z. Iwats.

Specimens examined. Hà Giang: Vị Xuyên District, Phương Độ Commune, Khuổi Mì village, 22°49'10.79" N, 104°57'02.28" E, 268 m, on rock, 7 Nov. 2013, *R.-L. Zhu et al. 20131107-26*.

Distribution. China (Wu & Jia, 2004), Japan (Noguchi *et al.*, 1994), Korea (Wu & Jia, 2004), North America (Wu & Jia, 2004), new to Vietnam.

Torrentaria riparioides (Hedw.) Ochyra

Figs 38-40

Specimens examined. Hà Giang: Quận Bạ District, Tùng Vài Commune, Thăng village, 23°03'03.26" N, 104°52'04.26" E, 1046 m, on moist rock, 3 Nov. 2013, *R.-L. Zhu et al. 20131103-16*.

Distribution. China (Hu & Wang, 2005), Japan (Noguchi *et al.*, 1991), Tanzania (Ochyra & Sharp, 1988), Yemen (Kürschner *et al.*, 2015), widely distributed in the Northern Hemisphere (Hu & Wang, 2005; Ros *et al.*, 2013), new to Vietnam.

The older name of this species is either *Rhynchostegium riparioides* (Hedw.) Cardot (Noguchi *et al.*, 1991; Hu & Wang, 2005) or *Platyhypnidium riparioides* (Hedw.) Dixon (Ochyra & Sharp (1988). Recently it has been moved to *Torrentaria* (Ochyra, 2013). *Torrentaria* is reported for Vietnam for the first time.

61. *Vesicularia hainanensis* P.C. Chen

Specimens examined. Hà Giang: Quận Bạ District, Nghĩa Thuận Commune, Xín Cái village, 23°07'49.04" N, 104°55'32.29" E, 1247 m, on tree trunk, 1 Nov. 2013, *R.-L. Zhu et al. 20131101-18A*.

Distribution. China (Wu & Jia, 2004), new to Vietnam.

Vesicularia hainanensis was previously known from Hainan and Xizang (Jia & He, 2013). It is newly reported outside China.

SPECIES CONFIRMED

Ctenidium pinnatum (Broth. & Paris) Broth.

Specimens examined. Cao Bằng: Nguyễn Bình District, Phia Oắc-Phia Đén Nature Reserve, Thành Công Commune, from the forest station to the peak, 22°36'19.33" N, 105°52'19.60" E, 1602 m, on fallen tree, 26 Oct. 2013, *R.-L. Zhu et al.* 20131026-53.

Distribution. China (Wu & Jia, 2004), Japan (Wu & Jia, 2004).

This species has been reported for Vietnam by Nishimura (1985), but no specific specimen from Vietnam was cited, our specimen confirmed the Distribution of the species in Vietnam.

DISCUSSION

The bryological research in Vietnam has hardly been advanced in the last decade possibly owing to the few collections, lack of active native bryologists and troubled political condition ((He & Nguyen, 2012). In earlier checklist (Tan & Iwatsuki, 1993), only 595 taxa were recorded from Vietnam. In the recent most comprehensive moss checklist of the country, however, a total of 719 species (including 44 infraspecific taxa) have been listed (He & Nguyen, 2012). More recently, further new species and new records, e.g. *Yakushimabryum longissimum* H. Akiyama (Akiyama, 2014), *Macromitrium densum* Mitt. (Yu *et al.*, 2014), *Neckera praetermissa* Enroth & Touw (Enroth & Touw, 2015), and other taxa (Ho *et al.*, 2015), have been found in the country. The present paper reports 61 further new records, including ten genera new to the country and seven species previously considered to be endemic to China (*Calyptothecium phyllogonioides*, *Daltonia waniana*, *Entodon yunnanensis*, *Fauriella robustiuscula*, *Pseudobarbella propagulifera*, *Scabridens sinensis*, and *Vesicularia hainanensis*). The number of moss species has been raised to 816 (including 50 infraspecific taxa) in 227 genera in 61 families (updated checklist, unpublished). Of these, 103 taxa are hitherto known only from Vietnam (Appendix) and may be considered endemic to the country. Future work should focus on intensive field collections and comprehensive taxonomic revisions.

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REFERENCES

- AKIYAMA H., 2014 — Newly found sporophytes and male plants of *Yakushimabryum longissimum* (Pylaisiadelphaceae, Musci) and a significant extension of its Distribution. *Bryological research* 11: 63-69.
- BARTRAM E.B., 1949 — Mosses of Guatemala. *Fieldiana botany* 25: 442 p.
- BEEVER J., ALLISON K.W. & CHILD J., 1992 — Mosses New Zealand (ed. 2) Dunedin, University of Otago Press. 214 p.
- BOWERS F.D., 1970 — High elevation mosses of Costa Rica. *Journal of the Hattori botanical laboratory* 33: 7-35.

- BOWERS F.D., 1974 — The mosses reported from Costa Rica. *The bryologist* 77: 150-171.
- CHURCHILL S.P., 1998 — Catalog of Amazonian mosses. *Journal of the Hattori botanical laboratory* 85: 191-238.
- CRUM H.A., 1952 — Mosses from Honduras. II. *The bryologist* 55: 279-285.
- DALTON P.J., SEPPELT R.D. & BUCHANAN A.M., 1991 — An annotated checklist of Tasmanian mosses. In: Banks M.R., Smith S.J., Orchard A.E. & Kantvilas G. (eds), *Aspects of Tasmanian botany: a tribute to Winifred Curtis*. Hobart, Royal Society of Tasmania, pp. 15-32.
- DANDOTIYA D., GOVINDAPYARI H., SUMAN S. & UNIYAL P.L., 2007 — Checklist of the bryophytes of India. *Archive for bryology* 19: 1-126.
- DIXON H.N., 1932 — On the moss flora of Siam. *Journal of the Siam society, natural history supplement* 9: 1-51.
- ENROTH J., 1996 — Contributions to tropical Asian Neckeraceae (Bryopsida). *Hikobia* 12: 1-7.
- ENROTH J. & TOUW A., 2015 — A new species of *Neckera* (Neckeraceae, Bryophyta) from northern Vietnam. *Phytotaxa* 195: 178-182.
- FLORSCHÜTZ-DE WAARD J. & FLORSCHÜTZ P.A., 1979 — Estudios sobre criptógamas Colombianas III. Lista comentada de los musgos de Colombia. *The bryologist* 82: 215-259.
- FOJCIK B. & STEBEL A., 2014. — The diversity of moss flora of Katowice Town (S Poland). *Cryptogamie, Bryologie* 35: 373-385.
- GAO C. (ed.), 1994 — *Flora bryophytorum Sinicorum, Vol. 1*. Beijing, Science Press.
- GAO C. (ed.), 1996 — *Flora bryophytorum Sinicorum, Vol. 2*. Beijing, Science Press.
- GUO S.L., MA Y.H., CAO T. & LOU Y.X., 2012 — A synopsis of Macromitrium (Orthotrichaceae) in China. *Cryptogamie, Bryologie* 33: 341-355.
- HALLINGBCK T., 2009 - Report from the Asian Bryophyte Conservation Workshop held in Singapore, Feb 28 – 2 March 2008. *The bryological times* 128: 20-25.
- HE S., 1998a — The floristic composition and phytogeographical connections of Thai mosses. *Journal of the Hattori botanical laboratory* 84: 121-134.
- HE S., 1998b — A checklist of the moss of Chile. *Journal of the Hattori botanical laboratory* 85: 103-189.
- HE S. & NGUYEN S.K., 2012 — New records and an updated checklist of the mosses of Vietnam. *Tropical bryology* 34: 32-88.
- HE S. & SNIDER J.A., 2000 — A taxonomic revision of *Symphiodon* (Musci: Symphyodontaceae). *The bryologist* 103: 52-81.
- HIGUCHI M. & NISHIMURA N., 2003 — Mosses of Pakistan. *Journal of the Hattori botanical laboratory* 93: 273-291.
- HO B.C., LUONG T.T., TAN B.C. & DINH N.L., 2015 — Additional new and noteworthy moss (Bryophyta) records from Vietnam and Laos. *Bryophyte diversity and evolution* 37: 1-11.
- HO B.C., POKORNY MONTERO C.I., TAN B.C., FRAHM J.P., SHAW A.J. & QUANDT D., 2012 — Molecular evolution and diversification of the moss family Daltoniaceae (Hookeriales, Bryophyta) with emphasis on the unravelling of the phylogeny of *Distichophyllum* and its allies. *Botanical journal of the Linnean society* 170: 157-175.
- HOFMANN H., 1997 — A monograph of the genus *Palamocladium* (Brachytheciaceae, Musci). *Lindbergia* 22: 3-20.
- HU R.L. & WANG Y.F. (eds.), 2005 — *Flora bryophytorum Sinicorum, Vol. 7*. Beijing, Science Press.
- IGNATOV M.S., HUTTUNEN S. & KOPPONEN T., 2005 — Bryophyte flora of Hunan Province, China. 5. Brachytheciaceae (Musci), with an overview of *Eurhynchiadelphus* and *Rhynchostegiella* in SE Asia. *Acta botanica Fennica* 178: 1-56.
- JIA Y. & HE S., 2013 — *Species catalogue of China, Vol. 1 Plants, Part Bryophytes*. Beijing, Science Press.
- KOPONEN T., 1981 — A synopsis of Mniaceae (Bryophyta). VI. Southeast Asian taxa. *Acta botanica Fennica* 117: 1-34.
- KÜRSCHNER H., AL-KHWLANI L. & AL-GIFRI A., 2015 — A small remarkable bryophyte collection from the Ibb Province (Yemen), with eleven new records for the bryoflora of Yemen. *Cryptogamie, Bryologie* 36: 107-116.
- LI M., MA J., IGNATOV M.S., TAN B.C., HUTTUNEN S., ZHAO J.C. & WANG Y.F., 2015 — Taxonomic re-assessment of *Kindbergia* (Brachytheciaceae, Bryophyta) in China, with a description of *Pseudokindbergia* gen. nov. *Cryptogamie, Bryologie* 36: 47-68.
- LI X.J. (ed.), 2006 — *Flora bryophytorum Sinicorum, Vol. 4*. Beijing, Science Press.
- MENZEL M., 1992 — Preliminary checklist of the mosses of Peru. *Journal of the Hattori botanical laboratory* 71: 173-254.
- NISHIMURA N., 1985 — A revision of the genus *Ctenidium* (Musci). *Journal of the Hattori botanical laboratory* 58: 1-82.

- NOGUCHI A., 1967 — Musci japonici VII. The genus *Macromitrium*. *Journal of the Hattori botanical laboratory* 30: 205-230.
- NOGUCHI A. & IWATSUKI Z. (eds), 1987 — *Illustrated moss flora of Japan. Part 1*. Nichinan-shi, the Hattori Botanical Laboratory.
- NOGUCHI A. & IWATSUKI Z. (eds), 1988 — *Illustrated moss flora of Japan. Part 2*. Nichinan-shi, the Hattori Botanical Laboratory.
- NOGUCHI A. & IWATSUKI Z. (eds), 1989 — *Illustrated moss flora of Japan. Part 3*. Nichinan-shi, the Hattori Botanical Laboratory.
- NOGUCHI A., IWATSUKI Z. & YAMAGUCHI T. (eds), 1991 — *Illustrated moss flora of Japan. Part 4*. Nichinan-shi, the Hattori Botanical Laboratory.
- NOGUCHI A., IWATSUKI Z. & YAMAGUCHI T. (eds), 1994 — *Illustrated moss flora of Japan. Part 5*. Nichinan-shi, the Hattori Botanical Laboratory.
- O'SHEA B.J., 2002 — Checklist of the moss of Srilanka. *Journal of the Hattori botanical laboratory* 92: 125-164.
- O'SHEA B.J., 2003 — An overview of the mosses of Bangladesh. *Journal of the Hattori botanical laboratory* 93: 259-272.
- O'SHEA B.J., 2006 — Checklist of the mosses of sub-Saharan Africa (version 5, 12/06). *Tropical bryology research reports* 6: 1-252.
- OCHYRA R., 2013 — The new generic name *Torrentaria*, a nomenclatural consequence of the legitimacy of *Platyhypnum* and the illegitimacy of *Platyhypnidium* (Bryophyta). *Nova Hedwigia* 96: 205-212.
- OCHYRA R. & SHARP A.J., 1988 — Results of a bryogeographical expedition to East Africa in 1968, IV. *Journal of the Hattori botanical laboratory* 65: 335-377.
- OLSSON S., ENROTH J., BUCHBENDER V., HEDENAS L., HUTTUNEN S.M. & QUANDT D., 2011 — *Neckera* and *Thamnobryum* (Neckeraceae, Bryopsida): paraphyletic assemblages. *Taxon* 60: 36-50.
- PÓCS T., LUONG T.T. & HO B.C., 2013 — New or little known epiphyllous liverworts, XVIII. Records from the Bidoup-Núi Bà National Park, Vietnam, with the description of *Drepanolejeunea bidouppensis*, sp. nov. *Cryptogamie, Bryologie* 34: 287-298.
- RAMS S., WERNER O. & ROS R.M., 2014 — Updated checklist of the bryophytes from the Sierra Nevada Mountains (S of Spain). *Cryptogamie, Bryologie* 35: 261-311.
- ROS R.M., MAZIMPAKA V., ABOU-SALAMA U., ALEFFI M., BLOCKEEL T.L., BRUGUÉS M., CROS R.M., DIA M.G., DIRKSE G.M., DRAPER I., EL-SAADAWI W., ERDAĞ A., GANEVA A., GABRIEL R., GONZÁLEZ-MANCEBO J.M., GRANGER C., HERRNSTADT I., HUGONNOT V., KHALIL K., KÜRSCHNER H., LOSADA-LIMA A., LUÍS L., MIFSUD S., PRIVITERA M., PUGLISI M., SABOVljević M., SÉRGIO C., SHABBARA H.M., SIM-SIM M., SOTIAUX A., TACCHI R., VANDERPOORTEN A. & WERNER O., 2013 — Mosses of the Mediterranean, an annotated checklist. *Cryptogamie, Bryologie* 34: 99-283.
- SHARP A.J., CRUM H. & ECKEL P.M. (eds.), 1994 — *The moss flora of Mexico. Part two*. New York, the New York Botanical Garden.
- STAPLES G.W., IMADA C.T., HOE W.J. & SMITH C.W., 2004 — A revised checklist of Hawaiian mosses. *Tropical bryology* 25: 35-70.
- SUKKHARAK P. & CHANTANAORRAPINT S., 2014 — Bryophyte studies in Thailand: past, present, and future. *Cryptogamie, Bryologie* 35: 5-17.
- TAN B.C. & IWATSUKI Z., 1991 — A new annotated Philippine moss checklist. *Harvard papers in botany* 3: 1-64.
- TAN B.C. & IWATSUKI Z., 1993 — A checklist of Indochinese mosses. *Journal of the Hattori botanical laboratory* 74: 325-405.
- TAN B.C. & LIN P.J., 1995 — Three new and remarkable species of mosses from China and the Philippines. *Tropical bryology* 10: 55-63.
- THOUVENOT L. & YONG K.T., 2015 — *Macromitrium larrainii*, a New Species of *Macromitrium* (Orthotrichaceae, Bryophyta) from New Caledonia. *Cryptogamie, Bryologie* 36: 343-348.
- TOWNSEND C.C., 1994 — A reduction in *Didymodon*, and new records for Asia. *Journal of bryology* 18: 195-196.
- TOUW A., 1992 — A survey of the moss of the Lesser Sunda Islands (Nusa Tenggara), Indonesia. *Journal of the Hattori botanical laboratory* 71: 289-366.
- VITT D.H., 1983 — The New Zealand species of the pantropical genus *Macromitrium* (Orthotrichaceae, Musci): taxonomy, phylogeny and phytogeography. *Journal of the Hattori botanical laboratory* 54: 1-94.

- VITT D.H. & LEE. P., 1985 [1984] — *Anomodon minor* (Musci: Leskeaceae) in North America. *The bryologist* 87: 338-339.
- VITT D.H. & RAMSAY H.P., 1985 — The *Macromitrium* complex in Australasia (Orthotrichaceae: Bryopsida). Part I. Taxonomy and phylogenetic relationships. *Journal of the Hattori botanical laboratory* 59: 325-451.
- VITT D.H., KOPONEN T. & NORRIS D.H., 1995 — Bryophyte flora of the Huon Peninsula, Papua New Guinea. LV. *Desmotheca*, *Groutiella*, *Macrocoma* and *Macromitrium* (Orthotrichaceae, Musci). *Acta botanica Fennica* 154: 1-94.
- WINKLER S., 1965 [1964] — Beitrage zur bryologie von El Salvador, C. A. I. Laubmoose. *Revue bryologique et lichénologique* 33: 505-540.
- WU P.C. (ed.), 2002 — *Flora bryophytorum Sinicorum*, Vol. 6. Beijing, Science Press.
- WU P.C. & JIA Y. (eds), 2004 — *Flora bryophytorum Sinicorum*, Vol. 8. Beijing, Science Press.
- WU P.C. & JIA Y. (eds), 2011 — *Flora bryophytorum Sinicorum*, Vol. 5. Beijing, Science Press.
- YU F.Z., 2010 — *Economy, society and geography of Vietnam*. Shanghai, The people's liberation army audio and video publishing house.
- YU J., YONG K.T. & GUO S.L., 2014 — Taxonomic notes on *Macromitrium densum* (Bryopsida) with a new synonym, *M. brevissimum*. *Nordic journal of botany* 32: 437-440.
- ZANDER R.H., 2013 — *A framework for post-phylogenetic systematics*. [iv], St. Louis, MO, Zetetic Publications. 209 p.

APPENDIX

The taxa hitherto known only from Vietnam

- Acroporium affine* Broth.
Acroporium dixonii Tixier
Acroporium microthecium (Broth. & Paris) Broth.
Aerobryopsis deflexa Broth. & Paris
Anomodon viticulosus (Hedw.) Hook. & Taylor var. *leptocladus* (Besch.) S. He
Barbula leiophylla Tixier
Barbula pseudonigrescens Tixier
Barbula scaberrima Broth. & Paris
Barbula scleromitra Besch.
Blindia dalatensis Tixier
Braunfelsia aenea Jovet-Ast & Tixier
Brotherella indosinensis (Broth. & Paris) Broth.
Brotherella mercieri (Paris) M. Fleisch.
Bryum billettii Besch.
Callicostella eberhardtiana Paris & Broth.
Callicostella koreaniana Tixier
Calymperes derelictum Thér. & P. de la Varde
Calymperopsis vietnamensis Ninh
Calypstrochaeta boniana (Besch.) B.C. Tan & Z. Iwats.
Campylium annamense Broth. & Paris
Chionostomum baolocense Tixier
Dicranella breviseta Paris
Dicranella eustegia Besch.
Diphyscium tamasii B.C. Tan & T.N. Ninh
Distichophyllum obtusifolium Thér. var. *vuquangiense* B.C. Tan & T.N. Ninh
Donnellia asiatica (Tixier) B.C. Tan & Z. Iwats. ex S. He
Ectropothecium annamense Thér.
Ectropothecium meti Broth. & Paris
Ectropothecium ohosimense Cardot & Thér. var. *tonkinense* Thér. & Henry
Ectropothecium rhynchostegioides Broth. & Paris
Ectropothecium saprophilum Broth. & Paris
Fauriella baolocensis Tixier
Fauriella petelotii Tixier
Fissidens aggestus (Besch.) Paris
Fissidens annamensis Paris & Broth.
Fissidens dongensis Besch.
Fissidens faniensis (Besch.) Paris
Fissidens gaultieri Paris & Broth.
Fissidens incertus Thér. & P. de la Varde
Fissidens nobilis Griff. var. *contractus* P. de la Varde
Fissidens potieri Pócs
Fissidens soldanianus Tad. Suzuki & Z. Iwats.
Fissidens tapes Paris & Broth.
Fissidens tonkinensis Paris & Broth.
Funaria eberhardtii (Broth. & Paris) Broth.
Garovaglia eberhardtii (Broth. & Paris) During
Gollania adunca S. He
Heterophyllum henryi Tixier
Heterophyllum micro-alare (Broth. & Paris) Broth.
Homaliodendron spinosum Pócs
Isopterygium annamense Broth. & Paris
Isopterygium clerophilum Besch.
Isopterygium clerophilum var. *latifolium* Tixier
Isopterygium macoense Besch.
Isopterygium minutirameum (Müll. Hal.) A. Jaeger var. *tonkinense* Besch.
Leptotrichella acutidentata (Tixier) Ochyra
Leptotrichella annamensis (Paris & Broth.) Ochyra
Leptotrichella torrentium (Thér. & P. de la Varde) Ochyra
Leucoloma annamense Thér.
Levierella densiramea Tixier
Macromitrium annamense Broth.

- Macromitrium aurantiacum* Paris & Broth.
Macromitrium lorifolium Paris & Broth.
Macromitrium orthostichum Nees ex Schwägr. subsp. *micropoma* M. Fleisch.
Macromitrium petelotii Tixier
Macromitrium vesiculosum Tixier
Macrothamnium macrocarpum var. *breviacutum* Tixier
Meiothecium prunicola Tixier
Meteorium balansaeanum Besch.
Mielichhoferia filiramea (Broth. & Paris) A.J. Shaw & H.A. Crum
Mittenothamnium evrardii (Thér.) B.C. Tan & Z. Iwats.
Neckera praetermissa Enroth & Touw
Philonotis mercieri Broth. & Paris
Polytrichum tonkinense Thér. & Henry
Pseudoleskea tonkinensis Besch.
Pseudoleskea trichodes Besch.
Pterobryopsis myurioides Tixier
Rhynchostegium contortulum Tixier
Rhynchostegium sarcoblastum Broth. & Paris
Rhynchostegium submenadense Thér. & P. de la Varde
Symphysodon langbianensis Tixier
Symphysodon squarrosus Tixier
Taxiphyllum eberhardtii (Broth. & Paris) Broth.
Taxiphyllum moutieri (Broth. & Paris) Broth.
Taxithelium isocladum (Bosch & Sande Lac.) Renauld & Cardot var. *vietnamense* Tixier
Tortula tonkinensis (Besch.) R.H. Zander
Trachypus baviensis Besch.
Trematodon microthecius Besch.
Trichosteleum annamense Broth. & Paris
Trichosteleum montanum Tixier
Trichosteleum subcucullifolium Paris & Broth.
Trichosteleum vietnamense Tixier
Trichostomum crispulum Bruch var. *pseudocrispulum* B.C. Tan & T.N. Ninh
Trichostomum perinvolutum Tixier
Vesicularia chlorotica (Besch.) Broth.
Vesicularia chlorotica var. *donghamense* (Besch.) B.C. Tan & Z. Iwats.
Vesicularia demangei Thér. & P. de la Varde
Warburgiella leptocarpa (Schwägr.) M. Fleisch. var. *bacvietensis* Tixier
Weissia longifolia Mitt. var. *poilanei* (P. de la Varde) S. He
Wijkia clastobryoides (Tixier) Ninh
Wijkia comosa (Tixier) B.C. Tan & Z. Iwats.
Wijkia flagelliformis (Tixier) B.C. Tan & Z. Iwats.
Wijkia sublepida (Broth.) H.A. Crum var. *denticulata* (Tixier) B.C. Tan & Z. Iwats.