

Mosses of Mts. Yatsugatake, Central Japan

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Abstract The moss flora of Mts. Yatsugatake, central Japan, was investigated in 2003 and 2004. The moss specimens collected by Higuchi in 1985 were also examined. The mosses recognized comprise 34 families, 97 genera and 174 species. For each species, substrate, locality, specimen number and distribution were given. In total the moss flora of Mts. Yatsugatake consists of 291 species in 135 genera and 39 families, which is characterized by the richness of rare and/or endangered species as well as species number.

Key words: bryophytes, mosses, flora, Mts. Yatsugatake, Japan.

This study deals with the moss flora of Mts. Yatsugatake, central Japan, based on the collections made under a research program, “Taxonomic research of the flora in areas with remarkable biodiversity in Japan,” of the National Science Museum, Tokyo. Although the outline of the bryophyte flora in Japan is becoming clear (cf. Iwatsuki 2004, Yamada & Iwatsuki 2006), there has never been enough knowledge on the local flora. The lack of the information on bryophytes in local areas in Japan has become a bottleneck towards the development of an effective program to protect and conserve the local flora and vegetation. In 2002 and 2003 we made a field research and collected bryophytes mainly from the summit area of Mts. Yatsugatake. During the research in 2003, we found a rare and interesting species, *Takakia lepidozoides* S. Hatt. & Inoue, in the mountains for the first time (Higuchi & Arikawa 2005).

The Yatsugatake Mountains are located in central Honshu, Japan, and stretch ca. 20 km north and south, and consist of ten mountains higher than 2,500 m above sea level (Fig. 1). The highest peak is Mt. Akadake (35°58'N, 138°22'E) at 2,889 m above sea level. The mountains are of volcanic origin and located in the so-called Fossa

magna region. Three vertical vegetation zones are distinguished on the mountains: (1) the montane deciduous forest zone ranging below 1800 m alt. where develops secondary forest and *Fagus crenata* forest, (2) the subalpine coniferous forest zone ranging 1800–2500 m alt. where develops *Tsuga diversifolia* forest lower and *Abies veitchii* and *A. mariesii* forest upper and (3) the alpine zone ranging above 2500 m alt. where develops *Pinus pumila* scrub (cf. Furuki & Inoue 1984).

For the bryophyte flora of Mts. Yatsugatake, the hepatic flora was investigated and reported by Furuki & Inoue (1984). There is no extensive study of the moss flora of the mountains except that of Kiguchi *et al.* (2006) who reported preliminary lists of the moss flora. As far as we know, the first record of mosses from Mts. Yatsugatake was made by Okamura (1917) who described *Calliargon perdecurrens* Broth. ex S. Okam. (= *Hygrohypnum ochraceum* (Wilson) Loeske). The taxa newly described from the mountains are as follows: *Dicranella ditrichoides* Broth. (1921), *Dicranum recurvicaule* Sakurai (1952a) (= *Dicranum nipponense* Besch.), *Entodon rubrissimus* Sakurai (1953) (= *Entodon flavescens* (Hook.) A. Jaeger), *Kiaeria blyttii*

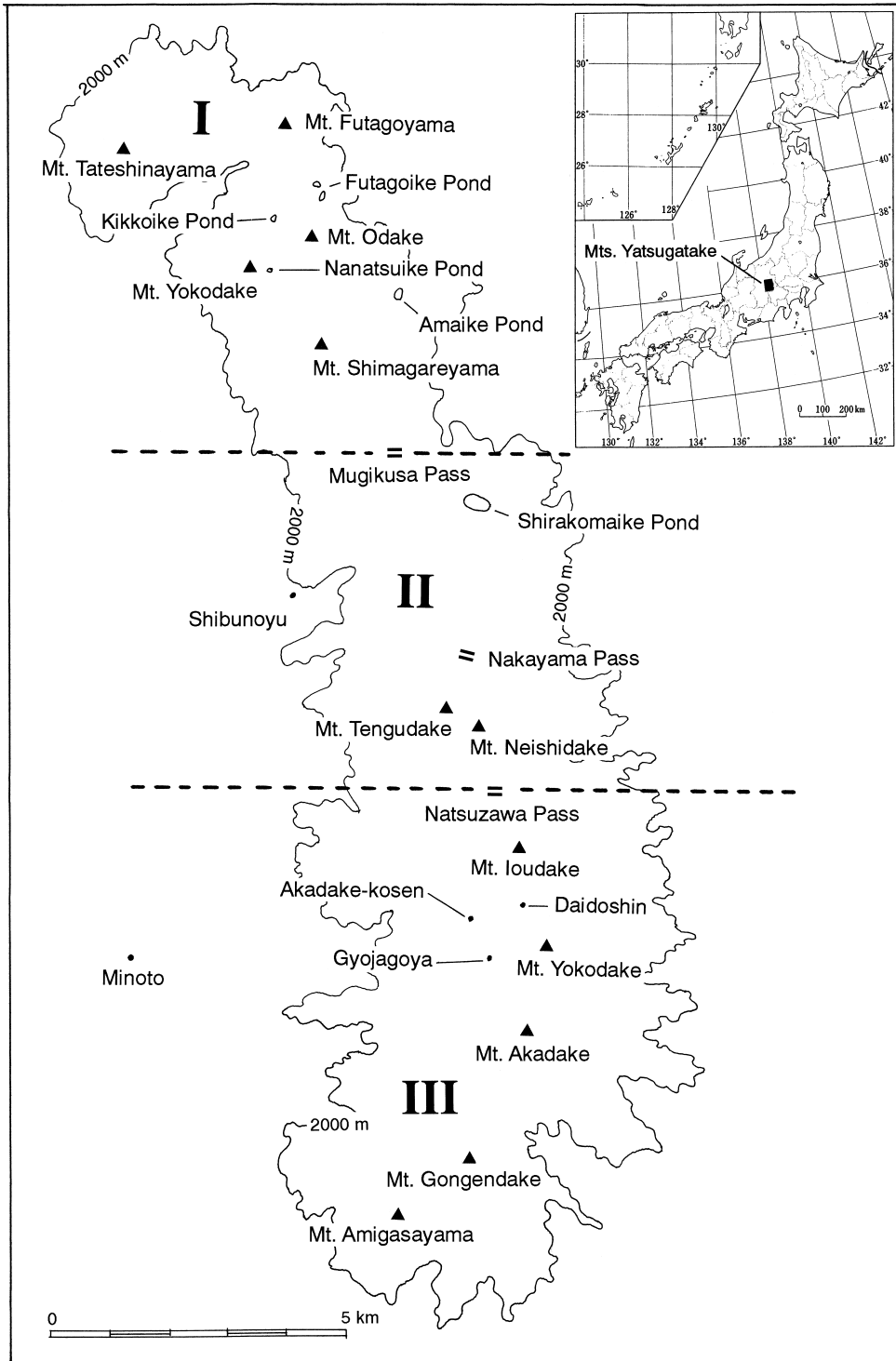


Fig. 1. Map showing the area investigated. I: Northern area (north of Mugikusa Pass). II: Central area (between Mugikusa Pass and Natsuzawa Pass). III: Southern area (south of Natsuzawa Pass). Solid line indicates 2,000 m above sea level.

(Schimp.) Broth. var. *secundifolia* Sakurai (1952b) (= *Dicranum muehlenbeckii* Bruch & Schimp.), *Kiaeria falcata* (Hedw.) I.Hagen var. *serratifolia* Sakurai (1952b), *Orthotrichum takakii* Sakurai (1952c) (= *Arctoa fulvella* (Dicks.) Bruch & Schimp. var. *longisetacea* (Cardot) Iisiba), *Plagiobryum japonicum* Nog. (1952) and *Pohlia yanoi* H.Ochi (1955) (= *Pohlia nutans* (Hedw.) Lindb.).

The purpose of this study is (1) to investigate the moss flora of Mt. Yatsugatake, (2) to compile it based on the specimens collected and the literature reported and (3) to make clear the characteristics of the moss flora of the mountains.

Materials and Methods

Field studies were carried out in 2003 and 2004 mainly above the subalpine coniferous forest zone, and a total of ca. 800 bryophyte specimens were collected. We also examined about 380 specimens collected by the first author from Mts. Yatsugatake in 1985 and two specimens collected by Dr. Furuki in 1981, which are preserved in the herbarium of Hiroshima University (HIRO). Among them about 850 specimens were mosses.

The main sites investigated are divided into three areas as follows (Fig. 1).

I: Northern area (north of Mugikusa Pass).

August 21, 1985: Mugikusa Pass–Mt. Shimagare – Nanatsuike – Amaike – Mugikusa Pass, 2,150–2,400 m alt., Higuchi 12392–12527.

September 30, 2004: Tsuboniwa–Mt. Yokedake (=Mt. Kitayokodake), 2,260–2,360 m alt., Higuchi 42818–42830, Arikawa 4461–4474.

October 1, 2004: Nanatsuike Pond–Mt. Yokedake – Mt. Odake – Futagoike Pond, 2,160–2,410 m alt., Higuchi 42831–42915, Arikawa 4475–4557.

October 2, 2004: Futagoike Pond–Mt. Futagoyama–Kikkoike Pond–Futagoike Pond, 1,970–2,250 m alt., Higuchi 42916–43021, Arikawa 4558–4662.

October 3, 2004: Kikkoike, 2,030 m alt., Higuchi 43022–43031, Arikawa 4663–4670.

II: Central area (between Mugikusa Pass and Natsuzawa Pass).

August 20, 1985: Natsuzawa Pass – Mt. Neishidake – Mt. Tengudake – Nakayama Pass – Shirakomaie, 2,150–2,600 m alt., Higuchi 12275–12391.

October 18, 2004: Shibunoyu–Nakayama Pass, 1,860–2,240 m alt., Higuchi 43032–43043.

October 19, 2004: Nakayama Pass–Mt. Tengudake – Mt. Neishidake – Natsuzawa Pass, 2,450–2,600 m alt., Higuchi 43044–43084.

October 20, 2004: Nakayama Pass, 2,380–2,400 m alt., Higuchi 43095–43149.

October 21, 2004: Nakayama Pass–Shibunoyu, 2,000–2,370 m alt., Higuchi 43150–43161.

III: Southern area (south of Natsuzawa Pass).

August 18, 1985: Minoto – Mt. Akadake, 1,700–2,890 m alt., Higuchi 12148–12186.

August 19, 1985: Mt. Akadake–Mt. Ioudake, 2,600–2,800 m alt., Higuchi 12187–12274.

October 14, 2003: Minoto–Akadake-kosen, 1,500–1,700 m alt., Higuchi 41449–41450.

October 15, 2003: Akadake-kosen–Daidoshin, 2,260–2,600 m alt., Higuchi 41451–41524.

October 16, 2003: Akadake-kosen–Mt. Yokedake, 2,300–2,750 m alt., Higuchi 41525–41577.

October 17, 2003: Akadake-kosen–Gyojagoya, 2,250–2,350 m alt., Higuchi 41578–41617.

October, 18, 2003: Akadake-kosen–Minoto, 1500–1850 m alt., Higuchi 41618–41620.

Results and Discussion

The mosses recognized in this study comprise 34 families, 97 genera and 174 species. Recently Kiguchi et al. (2006) reported 254 species in 125 genera and 37 families of mosses from Mts. Yatsugatake. Consequently the moss flora of Mts. Yatsugatake comprises 291 species in 135 genera and 39 families.

1. Comparison of the moss floras between Mts. Yatsugatake and other mountainous regions in Japan

To make clear the characteristics of the moss flora of Mts. Yatsugatake, it was compared with those of other mountainous regions in Japan, such as (1) Mts. Hakkoda (Deguchi 1981), (2) Mt. Hakusan (Akiyama 1984), (3) Mt. Ontake (Ando & Sasaki 1958, Noguchi 1958) and (4) Mt. Ishizuchi (Higuchi 2000). Although the Southern Japan Alps and Mt. Tsurugizan have rich moss floras (cf. Takaki *et al.* 1970, Deguchi 1982), those were not considered here because of their geology including limestone areas. In Mts. Hakkoda the highest peak is Mt. Odake (40°39'N, 140°52'E) at 1,584 m above sea level. In Mt. Hakusan the highest peak is Mt. Gozen-gamine (36°9'N, 136°46'E) at 2,702 m above sea level. In Mt. Ontake the highest peak is Mt. Kengamine (35°53'N, 137°28'E) at 3,067 m above sea level. In Mt. Ishizuchi the highest peak is Mt. Tengudake (33°46'N, 133°6'E) at 1,982 m above sea level.

Comparison of the moss floras between Mts. Yatsugatake and above regions indicates that the mountains have comparatively rich and unique moss flora. Although the location and the land area are different among them, the moss flora of Mts. Yatsugatake was the richest. Of four regions Mt. Ontake was the most similar for the species composition. There were about 150 species common to both regions. This similarity may be reasonable because of the location and the altitude of the two regions.

There are 78 species present in Mts. Yatsugatake but not in other four regions, which was the highest number (e.g. the next is 45 species in Mts. Hakkoda). This 78 species include several elements of distribution. They are classified roughly into the following floristic groups: circumboreal species (33 spp., 42%), East Asian species including Sino-Japanese floristic element (20 spp., 26%), species endemic to Japan (10 spp., 13%), worldwide species (7 spp., 9%), or others (8 spp., 10%). The circumboreal species, widely occurring in the Northern Hemisphere,

are represented by *Brachydontium trichodes*, *Myurella julacea*, *Plagiopus oederianus*, etc. The East Asian species include *Didymodon constrictus*, *Mielichhoferia sasaokae*, etc. The species endemic to Japan include *Dicranella ditrichoides*, *Diphyscium satoi*, *Plagiobryum japonicum*, etc. The worldwide species, occurring widely without relation to any continent or vegetation types, are represented by *Bartramia halleriana*, *Bryoerythrophyllum recurvirostre*, etc.

2. Noteworthy species

Suzuki & Iwatsuki (2003) described *Seligeria pseudodonniana* Tad.Suzuki & Z.Iwats. based on the specimens from "Mts. Yatsu, Mt. Iwō-dake." This species is similar to *Seligeria donniana* (Sw.) Müll.Hal. in the absence of peristome teeth, but is distinguished from the latter by having differentiated annulus and large, thin-walled exothecial cells. Furuki & Higuchi (1983) reported *Seligeria donniana* (Sw.) Müll.Hal. based on the specimen (Furuki 2448) from Nakayama Pass of Mts. Yatsugatake. We examined the specimen and confirmed that it was not *S. donniana*, but *S. pseudodonniana*. This species is endemic to Mts. Yatsugatake.

Among the species recorded in Mts. Yatsugatake, seventeen are species listed as endangered bryophytes in Japan (cf. Environmental Agency of Japan 2000), which are *Andreaea nivalis* (CR+EN), *Aongstroemia julacea* (VU), *Brachydontium trichodes* (CR+EN), *Campylopus fragilis* (VU), *Helodium sachalinense* (CR+EN), *Mielichhoferia sasaokae* (CR+EN), *Myurella julacea* (CR+EN), *Myurella sibirica* (CR+EN), *Myurella tenerrima* (CR+EN), *Oedipodium griffithianum* (CR+EN), *Oreas martiana* (VU), *Plagiomnium tezukae* (CR+EN), *Plagiothecium neckeroideum* (CR+EN), *Rhodobryum ontariense* (VU), *Schistostega pennata* (CR+EN), *Takakia lepidozoides* (CR+EN) and *Tortula sinensis* (CR+EN).

3. Enumeration of species

In the following enumeration species recorded

from Mts. Yatsugatake are listed. The families, genera and species are arranged alphabetically. Each species is referred by collecting sites (I–III), substrates and collector's numbers of Higuchi (abbreviated as mh) and Arikawa (as ta). The complete set of the specimens are preserved in the herbarium of the Department of Botany, National Science Museum (TNS). An asterisk (*) preceding a species indicates a species to be added to the list of the mosses of Mts. Yatsugatake by Kiguchi *et al.* (2006).

Amblystegiaceae

Campyliadelphus chrysophyllus (Brid.) R.S. Chopra Kiguchi *et al.* (2006).

Campylium hispidulum (Brid.) Mitt. I: on tree-trunk, mh-43026.

Campylium squarrosulum (Broth. & Cardot) Kanda Kiguchi *et al.* (2006).

**Cratoneuron filicinum* (Hedw.) Spruce III: on soil, mh-12247.

Drepanocladus fluitans (Hedw.) Warnst. I: on soil, mh-12461, 12462, 12477, 12521, 42837 (+*Polytrichum commune*); on humus, mh-12522, 42854. III: on humus, mh-12164.

Hygrohypnum ochraceum (Wilson) Loeske Okamura (1917), Kiguchi *et al.* (2006).

Notes. Okamura (1917) described *Callierson perdecurrens* Broth. ex S.Okam. from "Prov. Shinano: Mt. Yatsugadake." Later Kanda (1976) reduced it to a synonym of *Hygrohypnum ochraceum*.

Sanionia uncinata (Hedw.) Loeske I: on tree-trunk, mh-12438; on decaying log, mh-42957 (+*Buxbaumia aphylla*), ta-4466; on humus, mh-42944, ta-4574, 4654. II: on decaying log, mh-12379. III: on rock, mh-12176; on humus, mh-12154, 12205, 12273, 12280.

Andreaeaceae

Andreaea nivalis Hook. II: on boulder, mh-12371.

Andreaea rupestris Hedw. var. *fauriei* (Besch.) Takaki I: on rock, ta-4481; on rock-cliff, mh-

42856, 42913; on boulder, mh-42927. II: on rock, mh-12364; on boulder, mh-43111, 43112; on fallen log, mh-43157. III: on rock, mh-12187; on rock-cliff, mh-41531; on boulder, mh-41470.

Aulacomniaceae

Aulacomnium heterostichum (Hedw.) Bruch & Schimp. Kiguchi *et al.* (2006).

Bartramiaceae

Bartramia halleriana Hedw. Kiguchi *et al.* (2006).

Bartramia ithyphylla Brid. III: on rock-cliff, mh-41499 (+*Anomobryum filiforme*, *Encalypta ciliata*); on soil, mh-12236 (+*Encalypta ciliata*), 12237 (+*Thuidium cymbifolium*).

Bartramia pomiformis Hedw. I: on boulder, ta-4660; on soil, mh-42907; on humus, mh-42820, ta-4524; on decorticated log, ta-4465. II: on rock-cliff, mh-43034, 43057. III: on rock-cliff, mh-12268.

Philonotis fontana (Hedw.) Brid. III: on rock-cliff, mh-12174; on humus, mh-12232.

Plagiopus oederianus (Sw.) H.A.Crum & L.E. Anderson III: on rock-cliff, mh-41511 (+*Myurella julacea*, *Thuidium cymbifolium*).

Brachytheciaceae

Brachythecium brotheri Par. I: on boulder, mh-42937; on humus, mh-42878.

**Brachythecium buchananii* (Hook.) A.Jaeger II: on humus, mh-43059 (+*Brachythecium reflexum*), 43127.

Brachythecium coreanum Cardot Kiguchi *et al.* (2006).

Brachythecium helminthocladum Broth. & Paris Kiguchi *et al.* (2006).

Brachythecium plumosum (Hedw.) Schimp. I: on boulder, mh-42928, 42984. II: on rock-cliff, mh-43102; on boulder, mh-43063, 43094; on stone-works, mh-43132.

Brachythecium populeum (Hedw.) Bruch &

- Schimp. Kiguchi *et al.* (2006).
- **Brachythecium reflexum* (Starke) Schimp. I: on boulder, mh-42950, ta-4579; on humus, mh-42922 (+*Hypnum subimponens* subsp. *ulophyllum*), 42951, 42982, ta-4572. II: on boulder, mh-43061, 43122; on humus, mh-43059 (+*Brachythecium buchananii*), 43124. III: on boulder, mh-41451.
- Brachythecium salebrosum* (F.Weber & Mohr.) Bruch & Schimp. Kiguchi *et al.* (2006).
- **Brachythecium uyematsui* Broth. ex Cardot III: on rock-cliff, mh-12231, 41497, 41518, 41562.
- Brachythecium uncinifolium* Broth. & Paris III: on rock-cliff, mh-41615 (+*Mnium heterophyllum*); on boulder, mh-41608.
- Bryhnia hultenii* Bartr. ex Grout Kiguchi *et al.* (2006).
- Bryhnia novae-angliae* (Sull. & Lesq. ex Sull.) Grout Kiguchi *et al.* (2006).
- Cirriphyllum cirrosum* (Schwägr.) Grout III: on rock-cliff, mh-41550, 41553; on soil, mh-12221 (+*Bryum paradoxum*), 12222.
- **Rhynchostegium pallidifolium* (Mitt.) A.Jaeger II: on humus, mh-43126.
- Rhynchostegium riparioides* (Hedw.) Cardot Kiguchi *et al.* (2006).

Bryaceae

- Anomobryum filiforme* (Griff.) A.Jaeger III: on rock-cliff, mh-12258, 41499 (+*Bartramia ithyphylla*, *Encalypta ciliata*).
- Brachymenium nepalense* Hook. Kiguchi *et al.* (2006).
- **Bryum caespiticium* L. ex Hedw. III: on rock-cliff, mh-41502.
- Bryum capillare* Hedw. Kiguchi *et al.* (2006).
- Bryum pallens* (Brid.) Sw. ex Roehl. Kiguchi *et al.* (2006).
- **Bryum paradoxum* Schwägr. III: on soil, mh-12202, 12221 (+*Cirriphyllum cirrosum*), 12254, 12262.
- Mielichhoferia sasaokae* Broth. Kiguchi *et al.* (2006).
- Plagiobryum japonicum* Nog. II: on rock-cliff,

mh-43091. III: on rock, mh-12286; on rock-cliff, mh-41532.

Notes. Noguchi (1952) described *Plagiobryum japonicum* Nog. from “Honsyu: Mt. Yatsugatake (Iwôdake ca. 2700 m).”

Plagiobryum zierii (Hedw.) Lindb. Kiguchi *et al.* (2006).

Pohlia cruda (Hedw.) Lindb. I: on boulder, ta-4644.

Pohlia elongata Hedw. I: on soil, ta-4610.

Pohlia longicollis (Hedw.) Lindb. I: on rock-cliff, mh-42827, 42883, 42898; on soil, mh-12395, 42979 (+*Dicranella heteromalla*); on decorticated log, ta-4462. II: on soil, mh-12370; on root, mh-43095. III: on rock, mh-12192; on rock-crevice, mh-12283, 41492, 41561; on soil, mh-12319, 12322; on decaying log, mh-12155; on humus, mh-12326.

Pohlia nutans (Hedw.) Lindb. I: on rock-cliff, mh-42911 (+*Bartramiopsis lescurii*, *Takakia lepidozoides*); on soil, mh-42923. II: on rock-cliff, mh-43037; on rock-crevice, mh-43056; on soil, mh-43128; on humus, mh-43123.

Notes. Ochi (1955) described *Pohlia yanoi* H.Ochi from “Prov. Shinano: Mt. Yatsugatake-Yokodake, alt. ca. 2,700 m,” and later he (1959) reduced it to a synonym of *Pohlia schimperi* (Müll.Hal.) A.L.Andrews which is now treated as a synonym of *Pohlia nutans* (cf. Iwatsuki 2004).

**Pohlia prolifera* (Kindb.) Lindb. ex Arn. I: on soil, mh-42921, 42954.

**Pohlia revolvens* (Cardot) Nog. II: on rock-cliff, mh-12332, 43069; on boulder, mh-43049 (+*Pogonatum sphaerothecium*). III: on rock-cliff, mh-41563.

Pohlia wahlenbergii (F.Weber & Mohr) A.L.Andrews III: on rock-cliff, mh-41547.

Rhodobryum ontariense (Kindb.) Kindb. Kiguchi *et al.* (2006).

Rhodobryum roseum (Hedw.) Limpr. II: on humus, mh-43079.

Bryoxiphiaceae

Bryoxiphium norvegicum (Brid.) Mitt. subsp.

japonicum (Berggr.) A.Löve & D.Löve I: on rock-cliff, mh-42899, ta-4544; on boulder, mh-42992, ta-4618. II: on rock-cliff, mh-43050, 43081. III: on rock-cliff, mh-12149, 41503.

Buxbaumiaceae

Buxbaumia aphylla Hedw. I: on soil, mh-42861, 42941, 42970, ta-4477, 4510, 4602; on decaying log, mh-42957 (+*Sanionia uncinata*); on rotten log, mh-42826, ta-4586. II: on soil, mh-43131. III: on soil, mh-12301.

Buxbaumia minakatae Okam. I: on humus, mh-42980; on rotten log, ta-4630.

Diphyscium foliosum (Hedw.) Mohr I: on soil, mh-42865, ta-4622; on boulder, ta-4623. III: on rock-cliff, mh-41605.

Diphyscium satoi Tuzibe Kiguchi *et al.* (2006).

Climaciaceae

Climacium dendroides (Hedw.) F.Weber & Mohr III: on soil, mh-41519, 41555; on humus, mh-12229, 12230.

Climacium japonicum Lindb. Kiguchi *et al.* (2006).

Dicranaceae

Aongstroemia julacea (Hook.) Mitt. III: on rock-cliff, mh-12200.

Arctoa fulvella (Dicks.) Bruch & Schimp. var. *fulvella* II: on boulder, mh-12366 (+*Racomitrium nitidulum*), 43134. III: on rock, mh-12285; on rock-cliff, mh-12175, 12194 (+*Grimmia apiculata*, *Pogonatum sphaerothecium*), 12195 (+*Grimmia longirostris*).

**Arctoa fulvella* (Dicks.) Bruch & Schimp. var. *longisetacea* (Cardot) Iisiba Sakurai (1952c).

Notes. When Sakurai (1952c) described *Orthotrichum takakii* Sakurai, he cited a specimen from "Prov. Shinano, mt. Yatsugatke, Yokodake, 2800 m) as a syntype. Later Noguchi (1968) reduced it to a synonym of *Arctoa fulvella* (Dicks.) Bruch & Schimp. var. *longisetacea* (Cardot) Iisi-

ba.

Campylopus gracilis (Mitt.) A.Jaeger Kiguchi *et al.* (2006).

Campylopus japonicus Broth. Kiguchi *et al.* (2006).

Cynodontium fallax Limpr. Kiguchi *et al.* (2006).

Cynodontium gracilescens (F.Weber & Mohr) Schimp. II: on boulder, mh-43148; on humus, mh-43064.

Cynodontium polycarpum (Hedw.) Schimp. III: on boulder, mh-12288.

Cynodontium strumiferum (Hedw.) Lindb. Kiguchi *et al.* (2006).

Cynodontium tenellum (Schimp.) Limpr. Narita (1950), Sakurai (1953).

Dicranella ditrichoides Broth. Brotherus (1921), Kiguchi *et al.* (2006).

Dicranella heteromalla (Hedw.) Schimp. I: on rock-cliff, mh-42892; on boulder, mh-42825, 42906 (+*Takakia lepidozoides*); on soil, mh-12437 (+*Bartramiopsis lescurii*), 42979 (+*Pohlia longicollis*); on decorticated log, ta-4463; on rotten stump, ta-4650. II: on soil, mh-43036, 43150; on root, mh-43153 (+*Tetraphis pellucida*). III: on rock-cliff, mh-41458 (+*Distichium capillaceum*, *Ditrichum divaricatum*), 41459 (+*Distichium capillaceum*); on soil, mh-12310, 41461; on root, mh-43153 (+*Tetraphis pellucida*).

Dicranella subulata (Hedw.) Schimp. II: on boulder, mh-43055.

**Dicranodontium asperulum* (Mitt.) Broth. I: on rock-cliff, mh-42903; on humus, mh-42877. II: on soil, mh-43145.

Notes. This species is distinguished from Japanese species of *Dicranodontium* by having flexuose laeaves, lax areolation at sheathing base of leaves and serrulate margins of sheathing base of leaves.

Dicranodontium denudatum (Brid.) E.G.Britton ex Williams Kiguchi *et al.* (2006).

Dicranoloma cylindrothecium (Mitt.) Sakurai Kiguchi *et al.* (2006).

Dicranoweisia crispula (Hedw.) Lindb. ex Milde Kiguchi *et al.* (2006).

- Dicranum flagellare* Hedw. Kiguchi *et al.* (2006).
- Dicranum fulvum* Hook. Kiguchi *et al.* (2006).
- Dicranum fuscescens* Turner III: on humus, mh-12302, 12325.
- Dicranum groenlandicum* Brid. Kiguchi *et al.* (2006).
- Dicranum hamulosum* Mitt. I: on tree-trunk, mh-12417, 42840, 42931, ta-4568, 4593. II: on boulder, mh-43070; on rotten log, mh-43115.
- Dicranum japonicum* Mitt. I: on rock-cliff, mh-42889; on boulder, mh-42952; on humus, mh-12515, 42948, 42995. II: on humus, mh-43035.
- Dicranum leiodontum* Cardot II: on humus, mh-43086. III: on rock-crevice, mh-41574; on humus, mh-12216, 12278.
- Dicranum majus* Turner I: on humus, mh-12409, 12480, 42846, 42871, 42908 (+*Hylacomium splendens*), ta-4513. II: on humus, mh-12290, 43066 (+*Rhytidiadelphus triquetrus*), 43121. III: on humus, mh-12220, 41473, 41598.
- Dicranum mayrii* Broth. III: on tree-trunk, mh-12321.
- **Dicranum muehlenbeckii* Bruch & Schimp. I: on tree-trunk, mh-12413, 42917, 43002. II: on decaying log, mh-12345.
Notes. Sakurai (1952) described *Kiaeria blyttii* (Schimp.) Broth. var. *secundifolia* Sakurai from "Prov. Kai, mt. Yatsugatake, 2800 m," which is treated as a synonym of *Dicranum muehlenbeckii* Bruch & Schimp. (cf. Iwatsuki 2004)
- **Dicranum nipponense* Besch. Sakurai (1952).
Notes. Sakurai (1952) described *Dicranum recurvicaule* Sakurai from "Prov. Shinano, mt. Yatsugatake," which was reduced to a synonym of *Dicranum nipponense* Besch. by Takaki (1964).
- Dicranum polysetum* Sw. Narita (1950, as *Dicranum bergeri* Blandow), Kiguchi *et al.* (2006).
- Dicranum setifolium* Cardot Kiguchi *et al.* (2006).
- Dicranum viride* (Sull. & Lesq.) Lindb. var. *hakkodense* (Cardot) Takaki I: on tree-trunk, mh-12432, 12527, 42841, 42958, ta-4578; on decaying log, mh-12448. II: on tree-trunk, mh-12296, 12324, 12346, 43140.
- Kiaeria falcata* (Hedw.) I.Hagen var. *serratifolia* Sakurai Sakurai (1952).
Notes. Sakurai (1952) described *Kiaeria blyttii* (Schimp.) Broth. var. *serratifolia* Sakurai from "Prov. Kai, mt. Yatsugatake, 2500 m."
- Oncophorus wahlenbergii* Brid. var. *wahlenbergii* I: on boulder, mh-43000, ta-4629. II: on rock-cliff, mh-43101, 43104; on soil, mh-12374. III: on tree-trunk, mh-41475; on decaying log, mh-12156.
- Oncophorus wahlenbergii* var. *perbrevipes* Deguchi & H.Suzuki Kiguchi *et al.* (2006).
- Oreas martiana* (Hoppe & Hornsch. ex Hornsch.) Brid. Kiguchi *et al.* (2006).
- Oreoweisia laxifolia* (Hook.) Kindb. Kiguchi *et al.* (2006).
- Paraleucobryum longifolium* (Hedw.) Loeske Kiguchi *et al.* (2006).
- Rhabdoweisia crispata* (With.) Lindb. I: on rock-cliff, mh-42828, 42901; on rock-crevice, mh-12452; on boulder, mh-42993. II: on rock-cliff, mh-43041; on soil, mh-12361, 43144; on root, mh-43082. III: on rock-cliff, mh-41534; on soil, mh-41478.

Ditrichaceae

- Ceratodon purpureus* (Hedw.) Brid. II: on soil, mh-12317.
- Distichium capillaceum* (Hedw.) Bruch & Schimp. III: on rock-cliff, mh-12217, 12256, 41458 (+*Dicranella heteromalla*, *Ditrichum divaricatum*), 41459 (+*Dicranella heteromalla*), 41491, 41513, 41514, 41560, 41569.
- **Ditrichum crispatisimum* (Müll.Hal.) Paris III: on rock-crevice, mh-12250.
- Ditrichum divaricatum* Mitt. I: on soil, mh-42942, ta-4509; on boulder, ta-4546. II: on soil, mh-12375. III: on rock-cliff, mh-41458 (+*Dicranella heteromalla*, *Distichium capillaceum*).

Ditrichum heteromallum (Hedw.) E.G.Britton
I: on boulder, mh-12441, 42819, 42823; on soil, mh-42939. II: on soil, mh-12337, 12353, 12357, 12385. III: on rock-crevice, mh-12190.

Ditrichum macrorhynchum Broth. ex Cardot
Kiguchi *et al.* (2006).

**Ditrichum pallidum* (Hedw.) Hampe I: on soil, mh-42864. II: on soil, mh-43054, 43139. III: on rock-crevice, mh-12152, 12173, 41471; on soil, mh-12279, 41453.

Ditrichum rhynchostegium Kindb. Kiguchi *et al.* (2006).

**Saelania glaucescens* (Hedw.) Broth. III: on soil, mh-41449 (+*Fissidens teysmannianus*).

Encalyptaceae

Encalypta ciliata Hedw. III: on rock-cliff, mh-41400 (+*Anomobryum filiforme*, *Bartramia ithyphylla*), 41485, 41505 (+*Bryoerythrophyllum brachystegium*, *Desmatodon laureri*), 41507 (+*Bryoerythrophyllum brachystegium*); on soil, mh-12236 (+*Bartramia ithyphylla*), 12238 (+*Desmatodon laureri*), 12243, 12245, 41508 (+*Tortula sinensis*).

Entodontaceae

Entodon concinnus (De Not.) Paris subsp. *caliginosus* (Mitt.) Mizush. Kiguchi *et al.* (2006).

Entodon flavescens (Hook.) A.Jaeger Sakurai (1953).

Notes. Sakurai (1953) described *Entodon rubrissimus* Sakurai from "Prov. Shinano, Nobeyama (1500 m)." Later Buck (1980) reduced it to a synonym of *Entodon flavescens*.

Erpodiaceae

Glyphomitrium humillimum (Mitt.) Cardot
Kiguchi *et al.* (2006).

Fissidentaceae

Fissidens bryoides Hedw. III: on rock-cliff,

mh-12266, 41557, 41558

Fissidens dubius P.Beauv. Kiguchi *et al.* (2006).

Fissidens gymnogynus Besch. Kiguchi *et al.* (2006).

**Fissidens taxifolium* Hedw. I: on boulder, mh-42998.

**Fissidens teysmannianus* Dozy & Molk. I: on rock, ta-4628. III: on soil, mh-41449 (+*Saelania glaucescens*).

Grimmiaceae

Campylostelium saxicola (F.Weber & Mohr)
Bruch & Schimp. Kiguchi *et al.* (2006).

**Coscinodon humilis* Nog. III: on rock-cliff, mh-12171, 12207 (+*Grimmia longirostris*).

Grimmia apiculata Hornsch. II: on rock-cliff, mh-43085. III: on rock-cliff, mh-12198, 12203; on rock-crevice, mh-12194 (+*Arctoa fulvella*, *Pogonatum sphaerothecium*).

Grimmia donniana Sm. III: on rock-cliff, mh-41536, 41551.

Grimmia elongata Kaulf. II: on rock-crevice, mh-43044 (+*Arctoa fulvella*).

Grimmia incurva Schwägr. Kiguchi *et al.* (2006).

Grimmia longirostris Hook. I: on boulder, mh-12495. III: on rock, mh-12188, 12189, 12191, 12263; on rock-cliff, mh-12195 (+*Arctoa fulvella*), 12207 (+*Coscinodon humilis*), 12209, 12241, 12335, 41482, 41495, 41611 (+*Schistidium strictum*); on boulder, mh-41573.

Grimmia pilifera P.Beauv. Kiguchi *et al.* (2006).

Racomitrium anomodontoides Cardot III: on rock, mh-12153.

Racomitrium atroviride Cardot Kiguchi *et al.* (2006).

Racomitrium barbulooides Cardot I: on boulder, mh-12435, 42855, 42973, 43028; on soil, ta-4536; on humus, mh-42983 (+*Plagiomnium acutum*). II: on humus, mh-43136. III: on rock, mh-12265.

Racomitrium fasciculare (Hedw.) Brid. I: on rock, ta-4484, 4485; on boulder, mh-42938, 43029, ta-4538; on tree-trunk, mh-42868; on

decaying log, mh-42824. II: on boulder, mh-43053. III: on rock, mh-12151, 12157, 12295; on boulder, mh-41469.

Racomitrium heterostichum (Hedw.) Brid. I: on rock, ta-4482.

Racomitrium laetum Besch. & Cardot I: on boulder, mh-42961, ta-4545. III: on humus, mh-12276.

Racomitrium lanuginosum (Hedw.) Brid. I: on rock, mh-12492; on humus, mh-42869. II: on boulder, mh-43135. III: on boulder, mh-41572; on humus, mh-12208.

Racomitrium muticum (Kindb.) Frisvoll Kiguchi *et al.* (2006).

Racomitrium nitidulum Cardot I: on boulder, mh-12494, 42987. II: on rock-cliff, mh-43087; on boulder, mh-12366 (+*Arctoa fulvela*). III: on rock, mh-12248, 12271.

Schistidium confertum (Funck) Bruch & Schimp. Kiguchi *et al.* (2006).

Schistidium strictum (Turn.) Loeske ex Martensson II: on boulder, mh-43113. III: on rock-cliff, mh-12170, 12251, 41490, 41506 (+*Amphidium lapponicum*), 41556, 41610, 41611 (+*Grimmia longirostris*); on rock-crevice, mh-12249.

Hylocomiaceae

Hylocomiastrum himalayanicum (Mitt.) M.Fleisch. ex Broth. I: on humus, mh-42836, 43016. II: on humus, mh-43138. III: on humus, mh-41590; on decaying log, mh-12391. III: on humus, mh-12165, 41479, 41596.

Hylocomiastrum pyrenaicum (Spruce) M.Fleisch. ex Broth. I: on humus, mh-42985 (+*Helodium paludosum*), 42986 (+*Plagiomnium acutum*). II: on boulder, mh-43098. III: on humus, mh-41566.

Hylocomiastrum umbratum (Hedw.) M.Fleisch. ex Broth. Kiguchi *et al.* (2006).

Hylocomium splendens (Hedw.) Schimp. I: on boulder, mh-42991, ta-4646; on humus, mh-42858, 42908 (+*Dicranum majus*), 42945, ta-4504, 4591, 4613. II: on humus, mh-12356,

43119, 43161. III: on humus, mh-12186, 41521, 41597.

Pleurozium schreberi (Brid.) Mitt. I: on soil, ta-4573; on humus, mh-12411, 42860, 42943, 43005, ta-4469, 4501, 4652; on tree-trunk, mh-12428; on fallen log, mh-12518; on decaying log, mh-43021. II: on decaying log, mh-12355 (+*Hypnum pallescens*); on humus, mh-12359, 43116. III: on rock-cliff, mh-41607; on tree-trunk, mh-12320; on humus, mh-12185, 12233, 41474.

Rhytidiadelphus japonicus (Reimers) T.J.Kop. I: on humus, mh-42862, 42925. II: on humus, mh-43117, 43118. III: on humus, mh-12291.

**Rhytidiadelphus squarrosus* (Hedw.) Warnst. I: on boulder, ta-4563.

Rhytidiadelphus triquetrus (Hedw.) Warnst. I: on boulder, mh-42960; on humus, mh-42859, ta-4502, 4508, 4590, 4612. II: on humus, mh-43099. III: on humus, mh-12148, 12227, 41450.

Rhytidium rugosum (Hedw.) Kindb. II: on rock-cliff, mh-43103; on humus, mh-43142. III: on humus, mh-12204, 41504.

Hypnaceae

Callicladium haldanianum (Grev.) H.A.Crum I: on tree-trunk, mh-42969 (+*Iwatsukiella leucotricha*, *Pylaisiadelpha tenuirostris*); on decaying log, mh-12504, 12525; on tree-trunk, mh-42916. II: on boulder, mh-43155.

Gollania varians (Mitt.) Broth. Kiguchi *et al.* (2006).

**Herzogiella turfacea* (Lindb.) Z.Iwats. I: on humus, mh-42981.

Hypnum callichroum Brid. subsp. *japonicum* Ando II: on rock-cliff, mh-43042; on soil, mh-12373, 12376. III: on boulder, mh-12159.

Hypnum cupressiforme Hedw. Kiguchi *et al.* (2006).

Hypnum dieckii Renaud & Cardot Kiguchi *et al.* (2006).

Hypnum fujiyamae (Broth.) Paris III: on root,

mh-41465.

Hypnum lindbergii Mitt. I: on boulder, mh-43030, ta-4665. III: on humus, mh-12180.

Hypnum pallescens (Hedw.) P.Beauv. I: on rock-cliff, mh-42886 (+*Pogonatum sphaerothecium*); on tree-trunk, mh-12505, 12510, 12526, 42844, 42946, 42953, 42966, 42989, 43031, ta-4493, 4500, 4569, 4597, 4598, 4594 (+*Plagiothecium neckeroideum*); on branch, mh-12487, 42830; on fallen tree, mh-12425, 12426. II: on tree-trunk, mh-12380, 43040; on branch, mh-12377, 43080; on decaying log, mh-12355 (+*Pleurozium schreberi*); on decaying stump, mh-12316. III: on tree-trunk, mh-41480, 41585 (+*Ulota reptans*).

Hypnum plicatum (Lindb.) A.Jaeger & Sauerb. I: on tree-trunk, mh-12520, 42851; on root, mh-12496; on decaying log, mh-12445. II: on tree-trunk, mh-12342, 12351, 12354, 12381, 43097; on fallen log, mh-12347, 43107; on decaying log, mh-12343. III: on rock-cliff, mh-12199; on boulder, mh-42936; on tree-trunk, mh-12184, 12297; on decaying log, mh-12160, 12300, 12313; on humus, mh-43047.

Hypnum sakuraii (Sakurai) Ando Kiguchi *et al.* (2006).

Hypnum subimponens Lesq. subsp. *ulophyllum* (Müll.Hal.) Ando I: on humus, mh-42922 (+*Brachythecium reflexum*). III: on boulder, mh-12298; on humus, mh-12327.

Hypnum tristo-viride (Broth.) Paris I: on rock-cliff, mh-12450; on tree-trunk, mh-12511, 42924. II: on rock-cliff, mh-43159; on boulder, mh-12360. III: on decaying log, mh-41464.

**Platygyrium repens* (Brid.) Bruch & Schimp. I: on decaying log, mh-12516.

Podperaea krylovii (Podp.) Z.Iwats. & Glime Kiguchi & Iwatsuki (2005).

Ptilium crista-castrensis (Hedw.) De Not. I: on boulder, mh-42959; on humus, mh-42866, ta-4503. II: on humus, mh-43110. III: on humus, mh-12287, 12309, 41606.

Pylaisia intricata (Hedw.) Schimp.

Notes. Kiguchi *et al.* (2006) reported this

species as *Pylaisiella intricata* (Hedw.) Grout.

Pylaisia polyantha (Hedw.) Schimp.

Notes. Kiguchi *et al.* (2006) reported this species as *Pylaisiella polyantha* (Hedw.) Grout.

**Pylaisia stereodontoides* Broth. & Yasuda ex Iisiba I: on tree-trunk, mh-12517, 43022, ta-4605, 4663. III: on tree-trunk, mh-12167 (+*Ulota japonica*), 12168, 41613, 41619 (+*Orthotrichum sordidum*).

Notes. *Pylaisia stereodontoides* is characterized by delicate appearance, smaller and concave branch leaves, long-acuminate exostome teeth and fragmentary endostome (Arikawa 2004). This species is distributed in Japan (Honshu and Hokkaido) and Korea, and its southern limit in Japan is Mt. Jizogatake in Yamanashi Prefecture.

Lembophyllaceae

Dolichomitriopsis diversiformis (Mitt.) Nog. I: on tree-trunk, mh-42990.

Isothecium subdiversiforme Broth. Kiguchi *et al.* (2006).

Leskeaceae

Iwatsukiella leucotricha (Mitt.) W.R.Buck & H.A.Crum I: on tree-trunk, mh-12431, 42842, 42935, 42969 (+*Callicaldium haldanianum*, *Pylaisiadelphus tenuirostris*); on decaying log, mh-42956. II: on tree-trunk, mh-12314, 12389 (+*Ulota crispa*), 43073 (+*Rigodiadelphus robustus*); on fallen log, mh-12339, 43065. III: on tree-trunk, mh-12183, 41476.

**Lescuraea incurvata* (Hedw.) E.Lawton III: on rock-cliff, mh-41494.

Lescuraea mutabilis (Brid.) Lindb. ex I.Hagen I: on tree-trunk, mh-42843.

Lescuraea saxicola (Schimp.) Milde III: on rock-cliff, mh-12172, 41496 (+*Pterigynandrum filiforme*).

Lindbergia brachyptera (Mitt.) Kindb. Kiguchi *et al.* (2006).

Orthoamblystegium spurio-subtile (Broth. & Par.) Kanda & Nog. Kiguchi *et al.* (2006).

Pterigynandrum filiforme Hedw. III: on rock-cliff, mh-41496 (+*Lescuraea saxicola*); on rock-crevice, mh-12264.

Rigidiadelphus robustus (Lindb.) Nog. I: on tree-trunk, mh-42845, ta-4492, 4535; on root, ta-4507; on branch, mh-43018; on fallen log, mh-43014. II: on tree-trunk, mh-43073 (+*Iwatsukiella leucotricha*), 43074, 43075. III: on tree-trunk, mh-12274, 41564, 41571; on branch, mh-12306.

Leucodontaceae

**Leucodon sapporensis* Besch. I: on tree-trunk, mh-43025.

Mniaceae

**Mnium heterophyllum* (Hook.) Schwägr. III: rock-cliff, mh-41615 (+*Brachythecium uncinifolium*).

Mnium hornum Hedw. Kiguchi *et al.* (2006).

Mnium lycopodioides Schwägr. I: on tree-trunk, mh-43010. III: on rock-cliff, mh-41510; on soil, mh-12260.

Mnium spinosum (Voit) Schwägr. Kiguchi *et al.* (2006).

Plagiomnium acutum (Lindb.) T.J.Kop. I: on boulder, ta-4614; on humus, mh-42983 (+*Racomitrium barbulooides*), 42986 (+*Hylocomium pyrenaicum*). III: on boulder, mh-41612.

Plagiomnium confertidens (Lindb. & Arnott) T.J.Kop. Kiguchi *et al.* (2006).

**Plagiomnium cuspidatum* (Hedw.) T.J.Kop. II: on humus, mh-43062.

Plagiomnium medium (Bruch & Schimp.) T.J.Kop. Kiguchi *et al.* (2006).

**Plagiomnium tezukae* (Sakurai) T.J.Kop. II: on boulder, mh-43108.

Plagiomnium vesicatum (Besch.) T.J.Kop. Kiguchi *et al.* (2006).

Pseudobryum speciosum (Mitt.) T.J.Kop. I: on humus, mh-42821, 42893, 43003, ta-4467, 4637. II: on fallen log, mh-43106; on humus, mh-12367, 43038, 43151. III: on humus,

mh-12307, 41523.

Rhizomnium hattorii T.J.Kop. Kiguchi *et al.* (2006).

Rhizomnium magnifolium (Horik.) T.J.Kop. I: on soil, ta-4514; on humus, mh-12410, 12473, 42839, 42863, 42971, ta-4497, 4640. II: on humus, mh-43052, 43077. III: on rock-cliff, mh-41600; on humus, mh-12299, 41455.

Rhizomnium nudum (E.G.Britton & R.S. Williams) T.J.Kop. Kiguchi *et al.* (2006).

Rhizomnium striatulum (Mitt.) T.J.Kop. I: on boulder, mh-12497, 43012; on decaying log, mh-12503; on decorticated log, ta-4626; on rotten log, mh-42999. II: on decaying log, mh-12368, 12369; on rotten log, mh-43033, 43158.

Rhizomnium tuomikoskii T.J.Kop. Kiguchi *et al.* (2006).

Trachycystis flagellaris (Sull. & Lesq.) Lindb. I: on rock, ta-4651; on boulder, ta-4566, 4620, 4621; on soil, mh-42920; on decaying log, mh-12499, 12500. II: on fallen log, mh-43105.

Trachycystis ussuriensis (Maack & Regel) T.J.Kop. Kiguchi *et al.* (2006).

Neckeraceae

Homalia trichomanoides (Hedw.) Bruch & Schimp. var. *japonica* (Besch.) S.He Kiguchi *et al.* (2006).

Neckera borealis Nog. Kiguchi *et al.* (2006).

Neckera pennata Hedw. Kiguchi *et al.* (2006).

Orthotrichaceae

Amphidium lapponicum (Hedw.) Schimp. II: on rock-cliff, mh-43093. III: on rock-crevice, mh-41554; on rock-cliff, mh-12242, 12252, 12255, 12261, 41472, 41484, 41506 (+*Schistidium strictum*), 41546.

Amphidium mougeotii (Bruch & Schimp.) Schimp. Kiguchi *et al.* (2006).

**Orthotrichum consobrinum* Cardot I: on tree-trunk, mh-43024.

Orthotrichum erubescens Müll.Hal. Kiguchi *et al.* (2006).

Orthotrichum sordidum Sull. & Lesq. I: on tree-trunk, ta-4582, 4598. III: on tree-trunk, mh-41619 (+*Pylaisia stereodontoides*).

Ulotia crista (Hedw.) Brid. I: on tree-trunk, mh-12433, 12506, 43023 (+*Ulotia drummondii*), 43027 (+*Ulotia drummondii*), ta-4664. II: on tree-trunk, mh-12389 (+*Iwatsukiella leucotricha*), 12390, 43143. III: on tree-trunk, mh-12224, 41583 (+*Ulotia reptans*).

Ulotia drummondii (Hook. & Grev. ex Grev.) Brid. I: on tree-trunk, mh-43023 (+*Ulotia crista*), 43027 (+*Ulotia crista*). III: on decaying log, mh-12293.

Ulotia japonica (Sull. & Lesq.) Mitt. III: on tree-trunk, mh-12167 (+*Pylaisia stereodontoides*).

Ulotia reptans Mitt. I: on tree-trunk, mh-42934, 42967. III: on tree-trunk, mh-12182, 12514, 41462, 41583 (+*Ulotia crista*), 41585 (+*Hypnum pallescens*).

Plagiotheciaceae

Isopterygiopsis muelleriana (Schimp.) Z.Iwats. I: on rock-cliff, mh-42872; on soil, mh-42964. II: on soil, mh-12358. III: on rock-cliff, mh-12253.

**Isopterygiopsis pulchella* (Hedw.) Z.Iwats. III: on rock-crevice, mh-41549.

Plagiothecium cavifolium (Brid.) Z.Iwats. I: on rock-cliff, mh-42882; on boulder, mh-43004. II: on rock-cliff, mh-43083; on humus, mh-43078. III: on humus, mh-12294.

Plagiothecium denticulatum (Hedw.) Schimp. I: on rock-cliff, mh-43020. III: on old plants of *Pogonatum japonicum*, mh-12334.

Plagiothecium euryphyllum (Cardot & Thér.) Z.Iwats. I: on humus, mh-42838, 42955; on tree-trunk, ta-4512.

Plagiothecium lateum Schimp. I: on root, mh-42918. III: on decaying log, mh-12318 (+*Hypnum pallescens*).

Plagiothecium neckeroideum Bruch & Schimp. I: on humus, ta-4515, 4520, 4641; on tree-trunk, ta-4594 (+*Hypnum pallescens*). III:

rock-cliff, mh-41530; on soil, mh-12303.

Plagiothecium nemorale (Mitt.) A.Jaeger I: on rock, ta-4648; on boulder, mh-43008, ta-4619, 4636.

Pleuroziopsidaceae

Pleuroziopsis ruthenica (Weinm.) Kindb. ex E.G.Britton I: on humus, mh-42867, 42894, 43017, ta-4511, 4643. II: on humus, mh-12378, 43076, 43141. III: on humus, mh-12161, 41589.

Polytrichaceae

Atrichum rhytosthyllum (Müll.Hal.) Paris Kiguchi et al. (2006).

Atrichum undulatum (Hedw.) P.Beauv. var. *undulatum* I: on soil, mh-42919.

Atrichum undulatum var. *gracilisetum* Besch. Kiguchi et al. (2006).

Bartramiopsis lescurii (James) Kindb. I: on rock, ta-4533; on boulder, ta-4537; on rock-cliff, mh-42911 (+*Pohlia nutans*, *Takakia lepidozoides*); on soil, mh-12430, 12437 (+*Dicranella heteromalla*), 42977, ta-4470, 4539; on humus, mh-42822. III: on rock-cliff, mh-41594 (+*Pogonatum urnigerum*); on soil, mh-12158, 41530 (+*Plagiothecium neckeroideum*).

Oligotrichum aligerum Mitt. I: on soil, mh-12436, 12349, 42835, 42940, 42965, ta-4559. II: on soil, mh-43129.

Oligotrichum parallelum (Mitt.) Kindb. II: on rock-cliff, mh-43039; on soil, mh-43130. III: on soil, mh-41603.

Pogonatum alpinum (Hedw.) Röhl. II: on rock-cliff, mh-43051, 43100. III: on rock-cliff, mh-12267, 41559; on boulder, mh-41609; on soil, mh-12239, 12289; on humus, mh-12219, 12275.

Pogonatum contortum (Brid.) Lesq. I: on soil, mh-42831, 42897, 42933, 42976, ta-4474, 4478, 4560; on humus, 4649. II: on boulder, mh-43156. III: on soil, mh-41456.

Pogonatum dentatum (Brid.) Brid. II: on soil, mh-43084. III: on rock-crevice, mh-12193.

Pogonatum japonicum Sull. & Lesq. I: on soil, mh-42926, 43067, ta-4554; on humus, mh-42880, ta-4642. II: on soil, mh-12344, 43149. III: on soil, mh-12292.

Pogonatum neesii (Müll.Hal.) Dozy Kiguchi *et al.* (2006).

Pogonatum sphaerothecium Besch. I: on rock-cliff, mh-42886 (+*Hypnum pallescens*). II: on rock-cliff, mh-43060; on boulder, mh-43049 (+*Pohlia revolvens*). III: on rock-cliff, mh-12333, 41575; on rock-crevice, mh-12194 (+*Arctoa fulvella*, *Grimmia apiculata*); on boulder, mh-41528.

Pogonatum urnigerum (Hedw.) P.Beauv. I: on boulder, mh-42829. III: on rock-cliff, mh-41594 (+*Bartramiopsis lescurii*); on humus, mh-12277.

Polytrichum commune Hedw. I: on soil, mh-12484, 42837 (+*Drepanocladus fluitans*), 42932, ta-4473, 4499. II: on soil, mh-43072. III: on soil, mh-12181, 41527; on decaying stump, mh-41599.

Polytrichum formosum Hedw. I: on humus, mh-42852.

Polytrichum juniperinum Hedw. Kiguchi *et al.* (2006).

Polytrichum norvegicum Hedw. Kiguchi *et al.* (2006).

Polytrichum ohioense Renaud & Cordot Kiguchi *et al.* (2006).

Polytrichum piliferum Hedw. Kiguchi *et al.* (2006).

Pottiaceae

Anoetangium stracheyanum Mitt. Kiguchi *et al.* (2006).

Anoetangium thomsonii Mitt. Kiguchi *et al.* (2006).

Barbula unguiculata Hedw. Kiguchi *et al.* (2006).

Bryoerythrophyllum brachystegium (Besch.) K.Saito III: on rock-cliff, mh-41498, 41501, 41505 (+*Desmatodon laureri*, *Encalypta ciliata*), 41507 (+*Encalypta ciliata*), 41517.

Bryoerythrophyllum gymnostomum (Broth.)

Chen III: on rock-cliff, mh-41512 (+*Didymodon constrictus*, *Myurella julacea*).

Bryoerythrophyllum recurvirostre (Hedw.) P.C.Chen Kiguchi *et al.* (2006).

Bryoerythrophyllum rubrum (Jur.) P.C.Chen var. *minus* K.Saito Kiguchi *et al.* (2006).

Desmatodon laureri (Schultz) Bruch & Schimp. III: on rock-crevice, mh-12234, 12238 (+*Encalypta ciliata*), 12259.

Didymodon constrictus (Mitt.) K.Saito III: on rock-cliff, mh-41512 (+*Bryoerythrophyllum gymnostomum*, *Myurella julacea*).

Didymodon rigidicaulis (Müll.Hal.) K.Saito Kiguchi *et al.* (2006).

Didymodon rigidulus Hedw. var. *gracilis* (Schreiech ex Hook. & Grev.) R.H.Zander Kiguchi *et al.* (2006).

Gymnostomum aurantiacum (Mitt.) Paris Kiguchi *et al.* (2006).

Oxystegus tenuirostris (Hook. & Taylor) A.J.E.Smith I: on soil, mh-42975, 42988. II: on rock-cliff, mh-43109; on rock-crevice, mh-41493.

Tortella tortuosa (Hedw.) Limpr. Kiguchi *et al.* (2006).

Tortula norvegica (F.Weber) Wahlenb. ex Lindb. Kiguchi *et al.* (2006).

Tortula sinensis (Müll.Hal.) Broth. III: on rock-cliff, mh-12240; on soil, mh-41508 (+*Encalypta ciliata*).

Trichostomum brachydontium Bruch Kiguchi *et al.* (2006).

Weisiopsis anomala Broth. & Paris Kiguchi *et al.* (2006).

Weissia controversa Hedw. Kiguchi *et al.* (2006).

Pterobryaceae

Pterobryum arbuscula Mitt. I: on tree-trunk, mh-43001.

Schistostegaceae

Schistostega pennata (Hedw.) F.Weber & Mohr I: on soil, mh-42832, 42876, 42885, ta-4517.

II: on soil, mh-12382, 12352. III: on soil, mh-41466, 41525.

Seligeriaceae

Blindia japonica Broth. Kiguchi *et al.* (2006).

Brachydontium noguchii Z.Iwats., Tad.Suzuki & H.Kiguchi Iwatsuki *et al.* (2004), Kiguchi *et al.* (2006).

Notes. When Iwatsuki *et al.* (2004) described *Brachydontium noguchii* Z.Iwats., Tad.Suzuki & H.Kiguchi, they cited specimens collected from Mts. Yatsugatake as one of paratypes.

Brachydontium trichodes (F.Weber) Milde I: on rock, ta-4519; on boulder, mh-42881. II: on rock, T. Furuki-2431.

Seligeria pseudodonniana Tad.Suzuki & Z.Iwats. II: on rock-cliff, mh-12329, 12330, 12362, 43058. III: on boulder, mh-41576, 41577.

Sematophyllaceae

**Brotherella henonii* (Duby) M.Fleisch. I: on humus, ta-4528. II: on rotten log, mh-43032.

**Brotherella recurvans* (Mich.) M.Fleisch. I: on soil, mh-12451; on decaying log, mh-12449. II: on decaying log, mh-43154. III: on rock-cliff, mh-41533.

Heterophyllum affine (Hook.) M.Fleisch. I: on rock-cliff, mh-42910; on tree-trunk, mh-42929, 42930, ta-4564; on decaying log, mh-12501; on rotten log, mh-43015; on root, ta-4645. II: on tree-trunk, mh-12372; on decaying log, mh-12365; on rotten log, mh-43114.

Pylaisiadelpha tenuirostris (Bruch & Schimp.) W.R.Buck I: on tree-trunk, mh-42968, 42969 (+*Callicladium haldanianum*, Iwatsukiella *leucotricha*), ta-4576, 4601.

Sphagnaceae

Sphagnum capillifolium (Ehrh.) Hedw. I: on humus, mh-12457, 42818 (+*Sphagnum fimbriatum*), 42833, 42847, 42914.

Notes. Kiguchi *et al.* (2006) reported this species as *Sphagnum nemoreum* Scop. from central region of Mts. Yatsugatake.

**Sphagnum fimbriatum* Wilson ex Wilson & Hook.f. I: on humus, mh-12523, 12524, 42818 (+*Sphagnum capillifolium*).

Sphagnum girgensohnii Russow I: on humus, mh-12446, 12453, 12474, 12481, 42870, 42972, 42974, 42994, ta-4461, 4475, 4556, 4653. II: on humus, mh-12383, 43090, 43120, 43137, 43152. III: on rock, mh-12179; on humus, mh-12162, 12281, 41454, 41529, 41540, 41593.

**Sphagnum quinquefarium* (Lindb. ex Braithw.) Warnst. I: on humus, mh-42853, 42915.

Sphagnum squarrosum Crome I: on humus, mh-43019. III: on humus, mh-12163.

Sphagnum tenellum Ehrh. ex Hoffm. Kiguchi *et al.* (2006).

Splachnaceae

Oedipodium griffithianum (Dicks.) Schwägr. Kiguchi *et al.* (2006).

**Splachnum ampullaceum* Hedw. Nishimura & Inoue (1981).

Tetraplodon angustatus (Hedw.) Bruch & Schimp. II: on stump, mh-12349; on humus, mh-43125, 43147. III: on boulder, mh-41539.

Tetraplodon mnioides (Hedw.) Bruch & Schimp. II: on stump, mh-12348.

Takakiaceae

**Takakia lepidozoides* S.Hatt. & Inoue I: on rock-cliff, mh-42873, 42874, 42890, 42891, 42896, 42900, 42902, 42906 (+*Dicranella heteromalla*), 42911 (+*Bartramiopsis lescurii*, *Pohlia nutans*), ta-4521, 4527, 4534, 4542, 4555.

Notes. Higuchi & Arikawa (2005) reported this species for the first time from Mt. Yokodake (sometimes called as “Mt. Kita-yokodake” when it is distinguished from Mt. Yokodake situated in southern area) of Mts. Yatsugatake, where is the

southernmost locality in Japan.

Tetraphidaceae

Tetraphis geniculata Girg. ex Milde I: on boulder, ta-4661; on decaying log, mh-12502; on decorticated log, ta-4631; on rotten log, mh-12416. II: on root, mh-43043, 43160. III: on rotten log, mh-41526.

Tetraphis pellucida Hedw. III: on root, mh-43153 (+*Dicranella heteromalla*).

Tetrodontium brownianum (Dicks.) Schägr. var. *repandum* (Funck) Limpr. I: on rock, ta-4516, 4518, 4658; on rock-cliff, mh-42875, 42879; on boulder, mh-42997, 43011, ta-4617. II: on rock-cliff, mh-43046, 43068, 43071, 43092; on boulder, mh-43096. III: on rock-cliff, mh-12328, 12331, 41457, 41537, 41565.

Theliaceae

Myurella julacea (Schwägr.) Bruch, Schimp. & Gumbel III: on rock-cliff, mh-41486, 41489, 41511 (+*Plagiopus oederianus*, *Thuidium cymbifolium*), 41512 (+*Bryoerythrophyllum gymnostomum*, *Didymodon constrictus*), 41515.

Myurella sibirica (Müll.Hal.) Reimers Kiguchi *et al.* (2006).

Myurella tenerrima (Brid.) Lindb. Kiguchi *et al.* (2006).

Thuidiaceae

Abietinella abietina (Hedw.) M.Fleisch. III: on humus, mh-12218; on boulder, mh-41481; on rock-cliff, mh-41516.

Anomodon rugelii (Müll.Hal.) Keissl. I: on decaying log, mh-43009.

Boulaya mittenii (Broth.) Cardot I: on tree-trunk, mh-43002 (+*Dicranum muehlenbeckii*), ta-4667. II: on tree-trunk, mh-12384.

Bryonoguchia molkenboeri (Sande Lac.) Z.Iwats. & Inoue III: on humus, mh-41620.

Claopodium pellucinerve (Mitt.) Best III: on rock-crevice, mh-12244.

Claopodium prionophyllum (Müll.Hal.) Broth. Kiguchi *et al.* (2006).

Haplocladium microphyllum (Hedw.) Broth. Kiguchi *et al.* (2006).

Haplocladium perparaphyllum R.Watan. Kiguchi *et al.* (2006).

**Haplohymenium pseudo-triste* (Müll.Hal.) Broth. III: on rock-cliff, mh-41483.

Haplohymenium sieboldii (Dozy & Molk.) Dozy & Molk. Kiguchi *et al.* (2006).

**Helodium paludosum* (Austin) Broth. I: on humus, mh-42985 (+*Hylocomiastrum pyrenaicum*).

Helodium sachalinense (Lindb.) Broth. Kiguchi *et al.* (2006).

Pelekium versicolor (Müll.Hal.) Touw Kiguchi *et al.* (2006).

Rauiella fujisana (Paris) Reimers Kiguchi *et al.* (2006).

Thuidium cymbifolium (Dozy & Molk.) Dozy & Molk. III: on rock-cliff, mh-12235; on soil, mh-12237 (+*Bartramia ithyphylla*).

Thuidium lepidozaceum Sakurai Kiguchi *et al.* (2006).

Thuidium philibertii Limpr. Kiguchi *et al.* (2006).

Thuidium pristocalyx (Müll.Hal.) A.Jaeger Kiguchi *et al.* (2006).

Thuidium recognitum (Hedw.) Lindb. var. *delicatulum* (Hedw.) Warnst. Kiguchi *et al.* (2006).

Thuidium tamariscinum (Hedw.) Bruch & Schimp. Kiguchi *et al.* (2006).

Trachypodaceae

Duthiella speciosissima Broth. ex Cardot Kiguchi *et al.* (2006).

Trachypus bicolor Reinw. & Hornsch. Kiguchi *et al.* (2006).

Acknowledgements

We wish to thank Prof. H. Deguchi and Dr. T. Furuki for the specimens and Mr. R. Suda for his help in the field research in 1985. This study was

supported in part by Grant-in Aid (no. 13640707 to Higuchi) from the Ministry of Education, Culture, Sports, Science and Technology, Japan

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