

A Small Collection of Mosses from Kunashir Island, the Kuriles

Masanobu Higuchi¹ and Ken Sato²

¹ Department of Botany, National Science Museum, 4–1–1 Amakubo, Tsukuba, Ibaraki 305–0005, Japan.

E-mail: higuchi@kahaku.go.jp

² Faculty of Engineering, Hokkai-Gakuen University, 4–1–40 Asahi-machi, Toyohira-ku, Sapporo 062–8605, Japan.

E-mail: kensatoh@elsa.hokkai-s-u.ac.jp

Abstract Seventeen species of mosses are reported from Kunashir (Kunashiri) Island, the Kuriles. *Dicranum japonicum*, *Grimmia elongata* and *Plagiothecium denticulatum* are new additions to the moss flora of the Kuriles. *Arctoa fulvella*, *Dicranum hamulosum*, *Pogonatum sphaerothecium*, *Polytrichum piliferum* and *Sphagnum palustre* are new to Kunashir Island.

Key words: bryophytes, mosses, Kunashir, the Kuriles.

This is a report on the mosses collected from Kunashir Island, the Kuriles, in 1999. The Kuriles is a chain of islands connecting Hokkaido (Japan) and Kamchatka Peninsula. Geologically the islands originated from volcanic activity. Kunashir Island is situated in the southwest of the islands (Fig. 1). The highest peak is Mt. Tyatya (44°21'N, 146°15'E) on the northern part of the island at 1,822 m. The land area is ca. 1,499 km², which follows Honshu, Hokkaido, Kyushu, Shikoku and Iturup (Etorofu) Islands.

The moss flora of the Kuriles is still insufficiently known. The mosses of the islands have been reported by Brotherus (1899), Horikawa (1934, 1940) and Noguchi (1967). Bardunov & Cherdantseva (1984) compiled a catalog of mosses of the southern Kurile Islands. Recently Minami et al. (2001) reported bryophytes on Paramushir Island, northern Kuriles, and Otnyukova (2001) recorded *Dicranum nipponese* from Kunashir Island. Among 17 species recognized in this study, *D. japonicum*, *Grimmia elongata* and *Plagiothecium denticulatum* are new additions to the moss flora of the Kuriles. *Arctoa fulvella*, *Dicranum hamulosum*, *Pogonatum sphaerothecium*, *Polytrichum piliferum* and *Sphagnum palustre* are new to Kunashir Island.

Study Area

From July 29 to August 5, 1999, the second author visited Kunashir Island to make a field research of vascular flora and vegetation, and also collected bryophyte specimens mainly on Mt. Tyatya (July 30–Aug. 3) and some specimens on Mt. Mendeleev (Mt. Rausu) (Aug. 4).

Altitudinal vegetation zones and plant communities observed on the southeastern slopes of Mt. Tyatya were as follows (cf. Sato 2001, Sato & Eremenko 2002).

I: Montane zone (below 250 m).

Ia: Herb communities on sandy beach and rocky coast (seashore).

Ib: Tall-herb community and small forest stands on coastal terrace (below 70 m).

Ic: Coniferous forest accompanied with temperate hardwoods (70–160 m).

Id: Dense deciduous thicket accompanied with temperate hardwoods and *Polygonum weyrichii* var. *alpinum* community (160–250 m).

II: Subalpine zone (250–850 m).

IIa: Sparse deciduous thicket and *Polygonum weyrichii* var. *alpinum* community (250–400 m).

IIb: *Polygonum weyrichii* var. *alpinum* community and *Dicentra peregrina* community on the scoria desert, and *Racomitrium lanuginosum* community on the volcanic boulders.

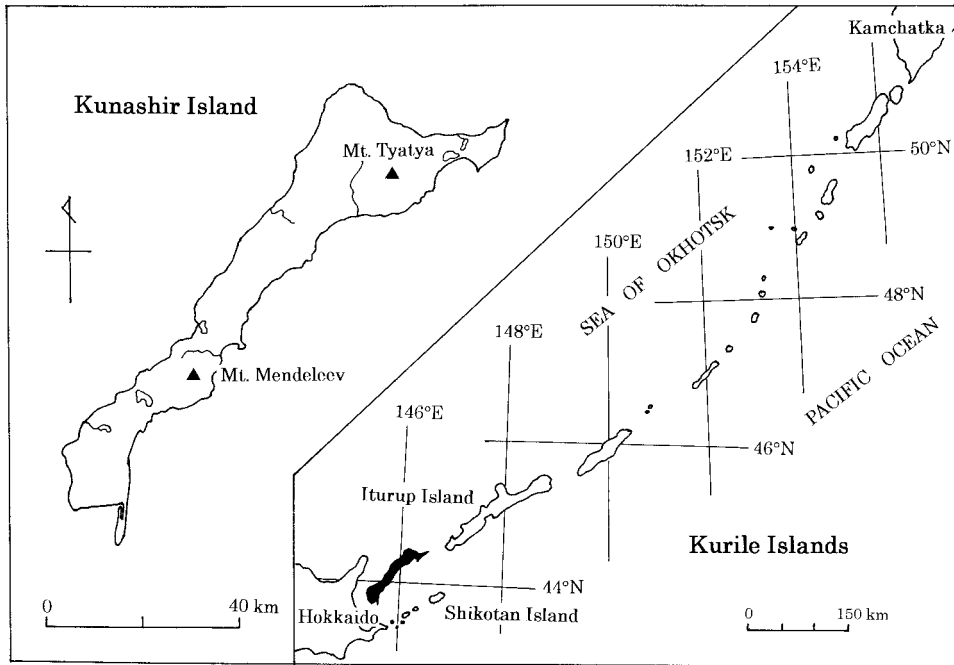


Fig. 1. Map showing study sites.

IIc: *Betula ermanii* forest and *Alnus maximowiczii* thicket (650–850 m).

III: So-called alpine zone above the forest limit (850–1,822 m).

IIIa: *Pinus pumila* scrub, *Alnus maximowiczii* thicket, *Dicentra peregrina* community, *Loiseleuria procumbens* community, *Phyllodoce caerulea* community on the somma (850–1,486 m).

IIIb: *Carex flavocuspis* community and *Loiseleuria procumbens* community in the atrio (crater floor; 1,350–1,400 m).

IIIc: *Phyllodoce caerulea* community and *Phyllodoce aleutica* community in the depression of lava flows, *Pentstemon frutescens* community on unstable slopes and *Racomitrium lanuginosum* community on the lava flows of central cone (1,400–1,822 m).

Among the above communities, communities of Id, Ia and Ib, showing the physiognomy of volcanic desert, are considered as the regenerating stages after the eruption of adventive cone (ca. 650 m) in 1973. Communities of IIIb and IIIc must be influenced strongly by the eruption at the

summit in 1812, because these communities show sparse physiognomy and also are extremely poor in species compared with those of IIIa.

On the other hand, the mountain foots of Mt. Mendeleev (30–180 m) are mainly covered with *Picea glehnii* forest, and there are small stands of *Abies sachalinensis* forest and solfatar communities characterized by the occurrence of *Pinus pumila*, *Deschampsia flexuosa*, *Miscanthus sinensis*, etc. in the subalpine forest zone.

Enumeration of Species

In the following enumeration an asterisk (*) preceding a species indicates “new to the Kuriles.” The collections are preserved in the herbarium of the National Science Museum (TNS).

1. *Arctoa fulvella* (Dicks.) Bruch & Schimp. in B. S. G., Bryol. Eur. 1: 156 (1846).

Kunashir Island, Mt. Tyatya, 1430 m, in *Phyllodoce caerulea* community (IIIa), Aug. 2, 1999 (Sato 4732), 1510 m, in *Phyllodoce caerulea*

community (IIIc), Aug. 1, 1999 (*Sato 4717*), 1550 m in *Racomitrium lanuginosum* community (IIIc) (*Sato 4714*).

Distribution. Europe, Siberia, China, Japan, N. America and Greenland. New to Kunashir Island.

Minami et al. (2001) listed the species in Table 1 in their report of the bryophytes on Paramushir Island without data of the specimen.

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

Kunashir Island, Mt. Tyatya, 1400 m, in *Pinus pumila scrub* (IIIa), Aug. 2, 1999 (*Sato 4721*).

Distribution. Far East Russia, China, Taiwan and Japan. New to Kunashir Island.

Minami et al. (2001) listed the species in Table 1 in their report of the bryophytes on Paramushir Island without data of the specimen.

3. **Dicranum japonicum* Mitt., Trans. Linn. Soc. London Bot. 3: 155 (1891).

Kunashir Island, Mt. Tyatya, ca. 1300 m, Aug. 3, 1999, coll. N. Eremenko (*Sato 4758*), 1400 m, in *Loiseleuria procumbens* community (IIIa), Aug. 2, 1999 (*Sato 4728*), 1415 m, in *Alnus maximowiczii* thicket (IIIa) (*Sato 4737*).

Distribution. China, Taiwan, Korea and Japan.

4. **Grimmia elongata* Kaulf. in Sturm, Deutschl. Fl. 2: 14 (1816).

Kunashir Island, Mt. Tyatya, 1380 m, in *Phylodoce aleutica* community (IIIc), Aug. 1, 1999 (*Sato 4718*).

Distribution. Widely distributed in the Northern Hemisphere.

5. *Hypnum plicatulum* (Lindb.) A.Jaeger & Sauerb., Ber. S. Gall. Naturw. Ges. 1877–78: 316 (1880).

Kunashir Island, Mt. Tyatya, 135–300 m, in volcanic desert (IIIId), July 31, 1999 (*Sato 4701*), 1430 m, in *Alnus maximowiczii* thicket (IIIa), Aug. 2, 1999 (*Sato 4742*).

Distribution. Europe, Korea, Far East Russia,

Japan, Alaska and western Canada.

This species has been reported from Iturup (Etorofu) and Shikotan Islands as well as Kunashir Island (cf. Bardunov & Cherdantseva 1984).

6. **Plagiothecium denticulatum* (Hedw.) Schimp. in B.S.G., Bryol. Eur. 5: 190 (1851).

Kunashir Island, Mt. Tyatya, 1415 m, in *Alnus maximowiczii* thicket (IIIa), Aug. 2, 1999 (*Sato 4738*).

Distribution. Widely distributed in the world.

7. *Pogonatum alpinum* (Hedw.) Rohl., Ann. Wetterau Ges. 3: 226 (1814).

Kunashir Island, Mt. Tyatya, ca. 1300 m, Aug. 3, 1999, coll. N. Eremenko (*Sato 4759*), 1415 m, in *Alnus maximowiczii* thicket (IIIa), Aug. 2, 1999 (*Sato 4736*).

Distribution. Europe, Africa, Far East Russia, China, Taiwan, Korea, Japan and N. America. New to Kunashir Island.

This species has been reported from Iturup Island (cf. Bardunov & Cherdantseva 1984).

8. *Pogonatum sphaerothecium* Besch., Ann. Sc. Nat. Bot. sér. 7, 17: 353 (1893).

Kunashir Island, Mt. Tyatya, 1450–1680 m, in IIIc, Aug. 1, 1999 (*Sato 4720*).

Distribution. China, Korea, Far East Russia, Japan and Aleutian. New to Kunashir Island.

This species has been reported from Iturup Island (cf. Bardunov & Cherdantseva 1984).

9. *Polytrichum juniperinum* Willd. ex Hedw., Spec. Musc. 89 (1801).

Kunashir Island, Mt. Tyatya, 135–300 m, in volcanic desert (Id), July 31, 1999 (*Sato 4702*), ca. 350 m, in volcanic desert (IIa), July 30, 1999 (*Sato 4756*).

Distribution. Widely distributed in the world.

This species has been reported from Kunashir and Iturup Islands (cf. Bardunov & Cherdantseva 1984).

10. *Polytrichum piliferum* Hedw., Spec.

Musc. 90 (1801).

Kunashir Island, Mt. Tyatya, 1400 m, in *Loiseleuria procumbens* community (IIIa), Aug. 2, 1999 (*Sato 4727*), 1415 m, in *Phyllodoce caerulea* community (IIIc), Aug. 1, 1999 (*Sato 4712*), 1510 m, in *Phyllodoce caerulea* community (IIIc), Aug. 2, 1999 (*Sato 4716*).

Distribution. Widely distributed in the world. New to Kunashir Island.

Minami et al. (2001) listed the species in Table 1 in their report of the bryophytes on Paramushir Island without data of the specimen.

11. *Racomitrium heterostichum* (Hedw.) Brid., Mant. Musc. 79 (1819).

Kunashir Island, Mt. Tyatya, 1430 m, in *Alnus maximowiczii* thicket (IIIa), Aug. 2, 1999 (*Sato 4741*).

Distribution. Europe, Nepal, W. Bengal, Sikkim, Bhutan, Taiwan, Korea, Japan, N. America and Greenland.

This species has been reported from Kunashir Island (cf. Bardunov & Cherdantseva 1984).

12. *Racomitrium japonicum* Dozy & Molk., Musci Frond. Ined. Archip. Indici 5: 130 (1847).

Kunashir Island, Mt. Tyatya, 135–300 m, in volcanic desert (Id), July 31, 1999 (*Sato 4703*).

Distribution. China, Vietnam, Korea, Far East Russica and Japan.

The species reported as *Racomitrium canescens* from Kunashir and Iturup Islands (cf. Bardunov & Cherdantseva 1984) may be attributed to this species.

13. *Racomitrium lanuginosum* (Hedw.) Brid., Mant. Musc. 79 (1819).

Kunashir Island, Mt. Tyatya, 520 m, in *Racomitrium lanuginosum* community (IIb), July 31, 1999 (*Sato 4707*), 630 m in *Racomitrium lanuginosum* community (IIb) (*Sato 4709*), 1330 m, in *Loiseleuria procumbens* community (IIIa), Aug. 1, 1999 (*Sato 4710*), 1400 m, in *Loiseleuria procumbens* community (IIIa), Aug. 2, 1999 (*Sato 4726*), 1430 m, in *Phyllodoce caerulea* community (IIIa) (*Sato 4734, 4735*),

1550 m, in *Racomitrium lanuginosum* community (IIIc), Aug. 1, 1999 (*Sato 4713*), 1450–1680 m, in *Racomitrium lanuginosum* community (IIIc) (*Sato 4719*).

Distribution. Widely distributed in the world.

This species has been reported from Kunashir and Iturup Islands (cf. Bardunov & Cherdantseva 1984).

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

Kunashir Island, Mt. Tyatya, ca. 1300 m, in IIIa, Aug. 3, 1999 (*Sato 4757*), 1430 m, in *Phyllodoce caerulea* community (IIIa), Aug. 2, 1999 (*Sato 4733*).

Distribution. Widely distributed in the Northern Hemisphere.

This species has been reported from Iturup and Shikotan Islands as well as Kunashir Island (cf. Bardunov & Cherdantseva 1984).

15. *Sphagnum girgensohnii* Russ., Arch. Naturk. Livl. Ehstl. Kurl. Ser. 2, 7: 124 (1865).

Kunashir Island, Mt. Mendeleev (Mt. Rausu), 60 m, in *Abies sachalinensis* forest, Aug. 4, 1999 (*Sato 4742*).

Distribution. Widely distributed in the Northern Hemisphere.

This species has been reported from Kunashir and Iturup Islands (cf. Bardunov & Cherdantseva 1984).

16. *Sphagnum palustre* L., Spec. Pl. ed. 2, 1106 (1753).

Kunashir Island, Mt. Mendeleev (Mt. Rausu), 60 m, in *Picea glehnii* forest, Aug. 4, 1999 (*Sato 4754*).

Distribution. Widely distributed in the world. New to Kunashir Island.

This species has been reported from Shikotan Island (cf. Bardunov & Cherdantseva 1984).

17. *Sphagnum squarrosum* Crome in Hoppe, Bot. Zeit. Regensburg 2: 324 (1803).

Kunashir Island, Mt. Mendeleev (Mt. Rausu), 60 m, in *Picea glehnii* forest, Aug. 4, 1999 (*Sato*

4753).

Distribution. Widely distributed in the Northern Hemisphere.

This species has been reported from Iturup and Shikotan Islands as well as Kunashir Island (cf. Bardunov & Cherdantseva 1984).

Discussion

The moss flora of Kunashir Island has been compiled by Bardunov & Cherdantseva (1984) who enumerated 146 species in 86 genera and 32 families. The updated moss flora of Kunashir Island comprises 154 species in 87 genera and 32 families. They are floristically composed of circumboreal species (77 spp., 49.7%), East Asian species (31 spp., 20%), cosmopolitan species (28 spp., 18.7%), East Asian–North Pacific species (6 spp., 3.9%), etc. (12 spp., 7.7%). There are no endemic taxa to Kunashir Island. The East Asian–North Pacific species are distributed in northwestern North America (e.g. Aleutian, Alaska or western Canada) as well as East Asia, and include *Bartramiopsis lescurii*, *Helodium paludosum*, *Iwatsukiella leucotricha*, *Myuroclada maximowiczii*, *Oligotrichum aligerum* and *Pogonatum sphaerothecium*. Iwatsuki (1962) reported the moss flora of Rishiri and Rebun Islands located northwest of Hokkaido. The highest peak is Mt. Rishiri (45°10'N, 141°14'E) on the central part of Rishiri Island at 1,719 m. They are floristically composed of circumboreal species (101 spp., 47.2%), East Asian species (60 spp., 28.0%), East Asian–North Pacific species (13 spp., 6.1%), Eurasian species (9 spp., 4.2%), etc. (31 spp., 14.5%). Although the land area of both islands is different, the ratio of the phytogeographical element of those moss floras is similar. Their similarity may be due to geological and climatic factors.

Acknowledgements

We wish to thank Miss N. Eremenko of the

Kurilsky State Nature Reserve, Dr. Jun-ichiro Samejima and all members of the field research on Kunashir Island in 1999 for their kind help in the field study. Thanks are also due to Dr. M. S. Ignatov of Main Botanical Garden of Russian Academy of Sciences and Dr. T. Yamaguchi of Hiroshima University for providing some relevant literature. This study was partly supported by a Grant-in-Aid (no. 13640707) from the Ministry of Education, Science, Sports, Culture and Technology, Japan.

References

- Bardunov, L. V. and V. Y. Cherdantseva, 1984. Materials towards a flora of mosses of the southern Kurile Islands. In V. Ya. Cherdantseva (ed.), Systematics and flora studies of spore plants of the Far East, pp. 34–53. Vladivostok, Akademiya Nauk SSSR. (In Russian.)
- Brotherus, V. F., 1899. Neue Beitrage zur Moosflora Japans. *Hedwigia* **38**: 204–247.
- Horikawa, Y. 1934. The bryological flora of the northern Kurile Islands. *Bull. Biogeogr. Soc. Japan* **4**(4): 335–338.
- Horikawa, Y., 1940. Hepatics and mosses of Shikotan Island. *Memoirs of the Attic Museum* **47**: 59–62. (In Japanese.)
- Minami, Y., S. Okitsu, H. Kanda, V. Ya. Cherdantseva and S. Yu. Grishin, 2001. Occurrence of bryophytes on Paramushir Island, northern Kuriles, Far East Russia. *Mem. Natl. Inst. Polar Res.*, Special Issue **54**: 487–493.
- Noguchi, A., 1967. A small collection of bryophytes made by Dr. S. Bergman in the Kuriles. *J. Jap. Bot.* **42**(8): 85–90.
- Otnyukova, T. N., 2001. Notes on *Dicranum* (Dicranaceae, Musci) in Russia. 1. *Dicranum nipponense* found in Far East. *Arctoa* **10**: 157–160.
- Sato, K., 2001. Biological diversity of vascular plants in the four islands: Iturup, Kunashir, Shikotan and Habomai. In Aruga, Y. (ed.), UNESCO/MAB-IUCN Workshop: Nature Conservation Cooperation on Kunashir, Iturup, Shikotan and Habomai Islands, pp. 27–35. Japanese Coordinating Committee for MAB and Biodiversity Network Japan, Tokyo.
- Sato, K. and N. Eremenko, 2002. Geobotanical characteristics at the northeastern limit of Eastern Asiatic Region, observed on Mt. Tyatya, Kunashir Island, Southern Kuriles. Proceedings of the VIII INTECOL International Congress of Ecology, p. 234. Seoul.